Ethynylbenziodazolones (EBZ) as Electrophilic Alkynylation Reagents for the Highly Enantioselective Copper-Catalyzed Oxy-Alkynylation of Diazo Compounds

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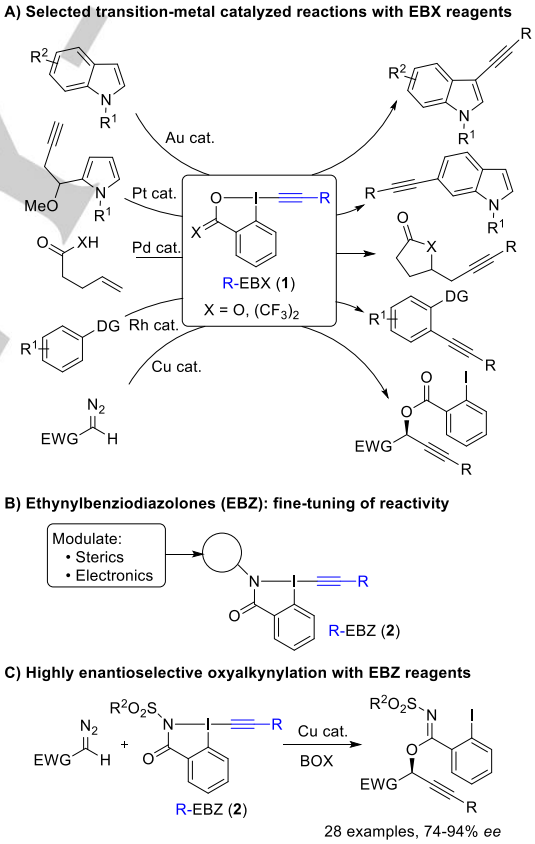
Abstract: Ethynylbenziodoxol(on)es (EBXs) cyclic hypervalent iodine reagents are now established reagents for the alkynylation of radicals and nucleophiles, yet they present limited possibilities for further structure and reactivity modification. Herein, we report the first synthesis of the corresponding Ethynylbenziodazolones (EBZs) reagents, in which the oxygen atom in the iodoheterocycle is replaced by a nitrogen. The substituent on the nitrogen enables further fine-tuning of the reagent structure and reactivity. EBZ reagents were easily obtained from the corresponding benzamides using a one-step procedure, and displayed a reactivity comparable to that of EBX reagents. In particular, they were applied in an asymmetric copper-catalyzed oxyalkynylation of diazo compounds, which proceeded in high yield and enantioselectivity for a broad range of substituents on the diazo compounds and the alkyne.

Introduction

Alkynes are among the most versatile functional groups in synthetic chemistry.[1] They have also found widespread applications in chemical biology and material sciences.[2] Therefore, synthetic methods to make or transfer triple bonds are of high importance. As terminal acetylenes are easily deprotonated, acetylide additions and cross-coupling reactions have been most often used for the alkynylation of electrophiles. More recently, alternative electrophilic alkynylation reagents have been developed for the functionalization of nucleophiles.[3] The use of hypervalent iodine reagents has been especially successful in this context and our group used for the first time ethynylbenziodoxole (EBX) reagents for the direct or metal-mediated alkynylation of nucleophiles and radicals.[4] EBX reagents are now widely used in synthetic chemistry.[5] They are particularly well-suited for transition metal based catalytic processes, due to their unique combination of stability and reactivity (Scheme 1A).[4a,4b,6] Examples of successful processes include the gold or platinum-catalyzed synthesis of alkynylated heterocycles,[4a,6a] the palladium-catalyzed functionalization of olefins,[4b] the rhodium-catalyzed alkynylation of C-H bonds[6b-d] and the copper-catalyzed oxyalkynylation of diazo compounds.[6e-f,7] The latter is particularly interesting, as it allows to transfer both parts of the reagent (iodobenzoic acid and alkyne) to the product.[8] Using a copper catalyst with a chiral bisoxazoline (BOX) ligand gave access to propargylic esters with high enantiopurity.[6f] These new transformations further extended the scope of multiple-functionalization of metal-carbene intermediates, a rapidly expanding field of organic chemistry.[9]



Scheme 1. Established EBX reagents (**A**), newly designed EBZ reagents (**B**), and their application in the enantioselective oxyalkynylation of diazo compounds (**C**).

EBX reagents also offer the possibility of fine-tuning the reactivity by modifying the structure of the heterocyclic core. This has already proven essential for success in several transformations.[5]

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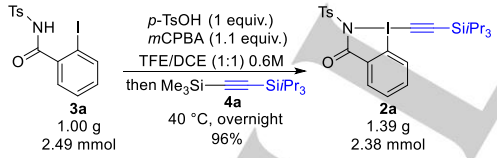
The heteroatom connected to the iodine atom is expected to have the strongest impact on reactivity, yet so far only oxygen has been investigated. We were therefore highly interested in developing new reagents based on the benziodazolone core, in which the oxygen coordinated to iodine is replaced by a nitrogen atom. The extra substituent on nitrogen will allow to further modulate the electronic and steric environment of the reactive iodine atom (Scheme 1B). Benziodazolone-based hypervalent iodine reagents have been studied in the past, especially by Zhdankin and co-workers,[10] but alkynylation reagents have never been reported to the best of our knowledge.

Herein, we report the first synthesis of ethynylbenziodazolone reagents (EBZ). EBZ bearing either a carbamide or a sulfonyl amide could be synthesized in high yield starting from the corresponding iodide. We further demonstrate that EBZ and EBX reagents have similar reactivities in both metal-free and metal-catalyzed transformations. In particular, they allowed the oxyalkynylation of diazo compounds with high enantioselectivities for aliphatic diazo esters as substrates (Scheme 1C).

Results and Discussion

Synthesis and structure of EBZ reagents

In order to access stable reagents, low electron-density on the nitrogen substituent next to the iodine center was expected to be essential. Therefore, we first selected tosyl substituted benzamide **3a** as starting material, which had already been used for the synthesis of cyclic hypervalent iodine reagents before.[11] In fact, the corresponding azidobenziodazolone had displayed enhanced stability when compared to the benziodoxolone reagent. The first EBZ reagent, TIPS-Ts-EBZ (**2a**) could be obtained in 96% yield on a gram scale using a slightly modified one-pot oxidation/alkynylation protocol develop by Olofsson and co-workers.[12] In contrast to Olofsson's work, the most convenient trimethylsilyl acetylene **4a** could be used as precursor instead of the corresponding boronic ester.



Scheme 2. Synthesis of TIPS-Ts-EBZ (**2a**).

Good quality crystals of **2a** were obtained, and the structure of TIPS-EBX (**1a**) and TIPS-Ts-EBZ (**2a**) were compared by X-ray analysis (Figure 1 and 2).[13] Bond lengths and angles around the iodine atom were similar for both reagents. The iodine alkyne bond, as well as the iodine-heteroatom bond were slightly longer in **2a** when compared to **1a** (2.060(9) vs 2.054(2) Å and 2.387(6) vs 2.338(1), Å respectively. As for TIPS-EBX (**1a**), the hypervalent bond in **2a** was close to linearity and in the plane of the aromatic ring. An interesting feature of the structure of **2a** was a possible interaction between one of the two oxygen atoms of the sulfonamide (O3 in Figure 2) and the hypervalent iodine center (distance 3.281(5) Å).

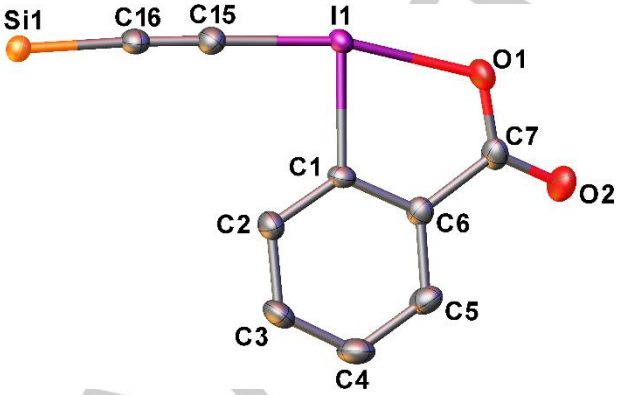


Figure 1. Structure of TIPS-EBX (**1a**) as determined by X-ray diffraction. Selected bond lengths and angles: I1-C15: 2.054(2) Å; I1-O1 2.338(1) Å; Angle O1-I1-C15: 166.11(6)°; C15-I1-C1: 91.37(7)°; Torsion C15-I1-C1-C2: -8.3(2)°. H-atom and substituents on Si are omitted for clarity.

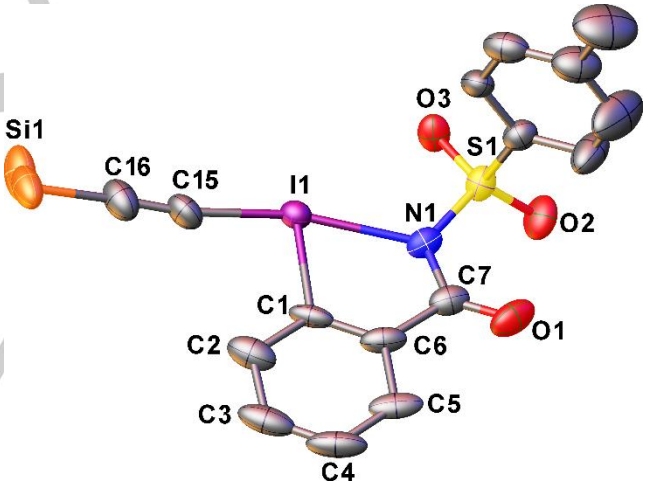
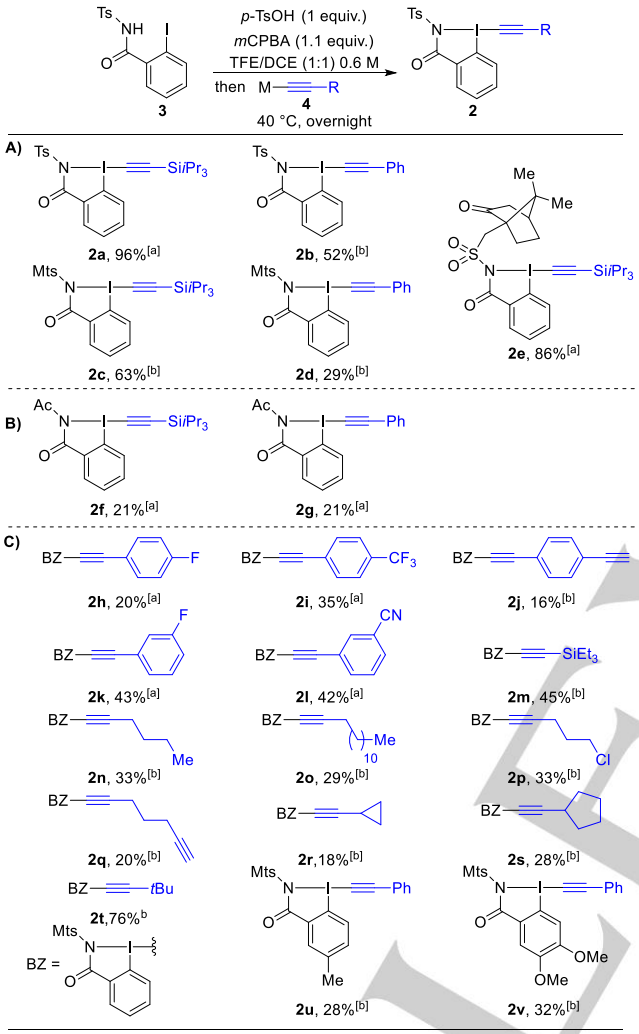


Figure 2. Structure of TIPS-Ts-EBZ (**2a**) as determined by X-ray diffraction. Selected bond lengths and angles: I1-C15: 2.060(9) Å; I1-N1: 2.387(6) Å; O3-I1: 3.281(5) Å; Angle N1-I1-C15: 165.8(3) °; C15-I1-C1: 92.1(3) °; Torsion C2-C1-I1-C15: 6.6(7) °; I1-N1-S1-O3: -17.6(4)°. H-atom and substituents on Si are omitted for clarity.

Different EBZ sulfonyl reagents were synthesized next (Scheme 3A). A phenylethynyl substituent could be introduced to give reagent **2b** in 52% yield. In this case, good results were obtained when adding directly the terminal alkyne after in situ oxidation to iodine(III). Tosyl-derived reagents **2a** and **2b** displayed a lower solubility in commonly used organic solvents. Therefore, the mesitylenesulfonyl (Mts) **2c** and **2d** were synthesized. Indeed, these reagents were more soluble, although the yields obtained for their synthesis were lower. Reagent **2e** derived from an aliphatic camphorsulphonamide could be also obtained in high yield. Reagents **2f** and **2g** bearing an acetyl group instead of the

sulfonyl group on the nitrogen atom could also be accessed, but only in 21% yield (Scheme 3B). Furthermore, these reagents were less stable and decomposition was observed upon storage at 4 °C. Further modification of the mesitylenesulfonyl derived reagents were then investigated, as they gave best results in the enantioselective oxyalkynylation of diazo compounds (*vide infra*).

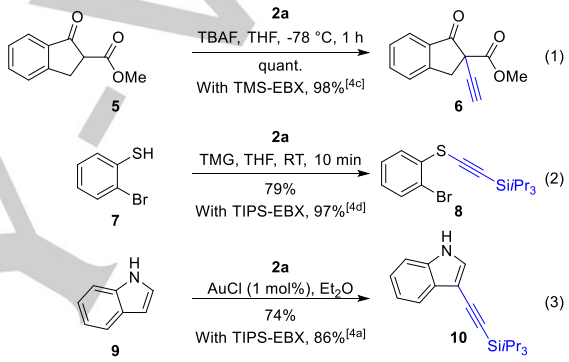


Scheme 3. Scope of EBZ reagents. Mts = Mesitylenesulfonyl [a]The trimethylsilylalkyne was used for the synthesis.[b]The terminal alkyne was used for the synthesis.

Arylalkynyl derivatives **2h-l** bearing fluoro, trifluoromethyl, alkynyl or cyano groups in *para* or *meta* positions could be obtained in 20-42% yield. Triethylsilylethynyl reagent **2m** could be also synthesized in 45% yield. The protocol could be also extended to aliphatic reagents without further optimization. Primary (**2n-q**), secondary (**2r** and **2s**) and tertiary (**2t**) alkyl groups could be all introduced successfully. Finally, derivatives **2u** and **2v** bearing methyl or methoxy substituents on the benzamide core could also be accessed. Although the yields obtained for the synthesis of the reagent are moderate, the single step procedure is very convenient and both terminal or silyl alkynes can be used depending on their availability. No attempt was made to re-optimize the reaction conditions for specific reagents.

Comparison of the reactivity of EBZ and EBX reagents

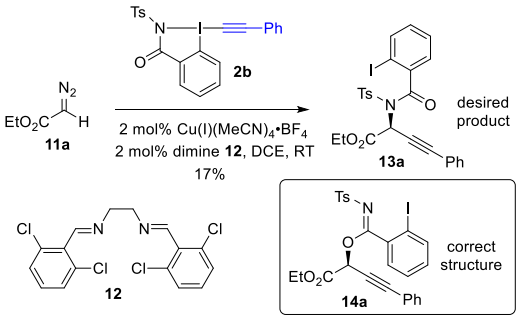
As the structure of the EBZ reagents was very similar to the one of the highly successful EBXs, a few standard transformations reported for the latter were then examined (Scheme 4). The alkynylation of ketoesters was first investigated (eq. 1).[4c] TIPS-Ts-EBZ (**2a**) was as efficient as TMS-EBX in this transformation, giving the alkynylated product **6** in quantitative yield. With thiol nucleophile **7**, **2a** was slightly less efficient than TIPS-EBX, but the desired product **8** was still obtained in 79% yield (eq. 2).[4d] Finally, **2a** could be also used in the gold-catalyzed alkynylation of indole (**9**) (eq. 3).[4a] These preliminary results are promising for the use of EBZ reagents in electrophilic alkynylation reactions.



Scheme 4. Alkynylation of keto ester **5**, thiol **7** and indole (**9**) with TIPS-Ts-EBZ (**2a**).

Copper-catalyzed enantioselective oxyalkynylation of diazo compounds

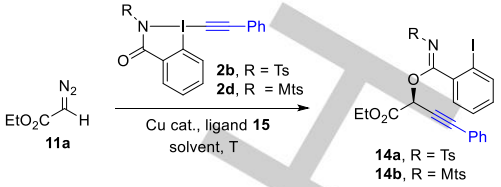
Having established that EBZ reagents and EBXs have similar reactivity, we decided to investigate their use in the functionalization of diazo compounds.[6e-f] In this transformation, the benzoic acid core of the reagent is incorporated in the product. Our goal was therefore to achieve an aminoalkynylation of diazo compounds to access important amino acid derivatives (Scheme 5). Although no product was observed with silylated alkynes, 17% of an addition product could be obtained when using Ph-Ts-EBZ (**2b**). The NMR and mass data were in good accordance with the desired aminoalkynylation product **13a**. Nevertheless, X-ray diffraction on the more crystalline derivative **14n** later showed that oxyalkynylation had occurred to give imidate **14a**.[14] In fact, full selectivity for reaction at the oxygen atom of EBZ reagents was always observed. This would be in agreement with a reaction mechanism involving first a nucleophilic attack of the more accessible oxygen atom onto an electrophilic carbene intermediate, followed by an alkyne transfer, as previously proposed in our work with EBX reagents.[6e-f]



Scheme 5. Attempt of aminoalkynylation of diazo compound **11a** with Ph-Ts-EBZ (**2b**) resulting in oxyalkynylation instead.

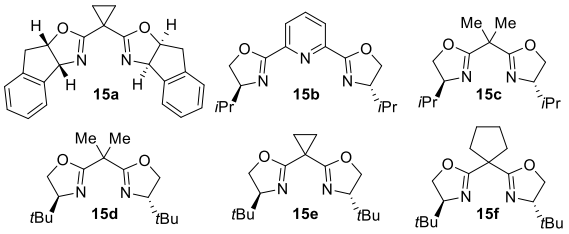
We then turned to the optimization of an enantioselective variation of the oxyalkynylation reaction (Table 1). When the oxyalkynylation of ethyl diazoacetate (**11a**) was attempted with Ph-Ts-EBZ (**2b**) and 2 mol% CuOAC as catalyst with bisoxazoline (BOX) ligand **15a**, which had given high yield and enantioselectivity in the oxyalkynylation reaction with EBX reagents,[6f] **14a** could be obtained in an improved yield of 55% (entry 1). However, **14a** was formed with only 33% *ee*. We therefore examined other BOX ligands. The use of PyBOX ligand **15b** led to low yield and enantioselectivity (entry 2). With simple valine-derived BOX ligand **15b**, oxyalkynylation product **14a** was formed with 55% yield and 40% *ee* (entry 3). Better results were obtained with BOX **15d** bearing more bulky *tert*-butyl groups (65% yield, 69% *ee*, entry 4). Cyclopropane- and cyclopentane- derived BOX ligands **15e** and **15f** led to a very fast reaction, but lower yields and enantioselectivities (entries 5 and 6). At this stage, solvent effects were investigated. Acetonitrile, xylene and chlorobenzene gave lower yields and enantioselectivities (entries 7-9). The results in dichloromethane were similar to dichloroethane, but the reaction could be conducted at 35 °C instead of 60 °C without increasing the reaction time (entry 10). Further attempts to improve the yield or enantioselectivity by tuning the reaction conditions were not successful. Therefore, modification of the EBZ reagents was investigated. Gratifyingly, the use of mesitylenesulfonyl derived reagent **2d** led to the formation of **14a** in 81% yield and 80% *ee*, although the reaction was slower (entry 11). As a final factor, we investigated counter ion effects on the copper catalyst, whereas the active catalysts where generated in situ by combining CuCl with a silver salt. A triflimide counter ion led to a sluggish reaction (entry 12). In contrast, the use of tosylate allows further increasing the yield to 91% (entry 13). In this case, the reaction could also be run at room temperature, allowing improving the *ee* to 88% (entry 14). Finally, by using 3 mol% of copper catalyst, the desired product **14a** could be obtained in 98% yield and 88% *ee* after one hour at room temperature (entry 15).

Table 1. Optimization of the oxyalkynylation reaction[a]



Entry	EBZ	Cat./L	Solvent/T (°C)	Time	Yield[b]/*ee*[c](%)
1	**2b**	CuOAc/**15a**	DCE/60	2 h	55/33[d]
2	**2b**	CuOAc/**15b**	DCE/60	15 min	20/10
3	**2b**	CuOAc/**15c**	DCE/60	3 h	55/40
4	**2b**	CuOAc/**15d**	DCE/60	1 h	65/69
5	**2b**	CuOAc/**15e**	DCE/60	5 min	46/37
6	**2b**	CuOAc/**15f**	DCE/60	5 min	46/63
7	**2b**	CuOAc/**15d**	CH_3CN/60	1 h	<5/ND
8	**2b**	CuOAc/**15d**	xylene/60	1 h	9/ND
9	**2b**	CuOAc/**15d**	PhCl/60	1 h	29/59
10	**2b**	CuOAc/**15d**	DCM/35	1 h	68/68
11	**2d**	CuOAc/**15d**	DCM/35	24 h	81/80
12	**2d**	CuCl/$AgNTf_2$/**15d**	DCM/35	1 h	10/60
13	**2d**	CuCl/AgOTs/**15d**	DCM/35	2 h	91/82
14	**2d**	CuCl/AgOTs/**15d**	DCM/RT	2 h	93/88
15[e]	**2d**	CuCl/AgOTs/**15d**	DCM/RT	1 h	98/88

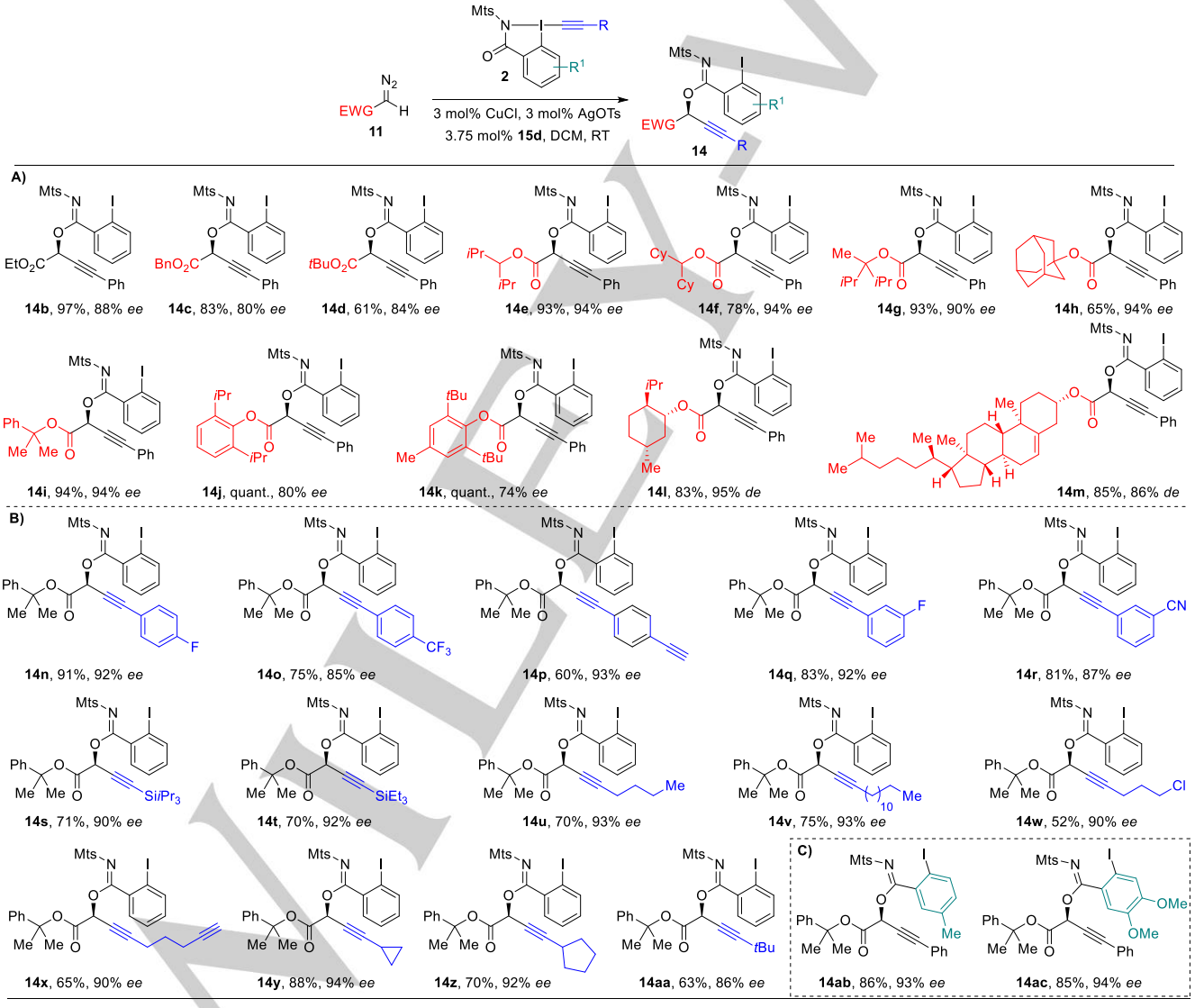
[a]Reaction conditions: 0.20 mmol ethyldiazoacetate (**11a**), 0.10 mmol of **2b** or **2d**, copper catalyst (2.0 mol%), silver catalyst (2.0 mol%, if indicated), ligand **15** (2.5 mol%), solvent (0.05 M). [b]Yield after purification by column chromatography. [c]Obtained by chiral HPLC. [d]The opposite enantiomer of the product was obtained. [e]Copper catalyst (3.0 mol%), ligand **15d** (3.75 mol%).



Next the scope of diazo compounds was examined (Scheme 6A). Oxyalkynylation products **14c** and **14d** bearing benzyl and *tert*-butyl esters respectively were obtained with lower enantioselectivity. More bulky alkyl groups in contrast led to ee over 90% (products **14e-i**) with the best yield and ee (94%) reached for dimethylbenzylester **14i**. In contrast, bulky aryl esters **14j** and **14k**, which gave best results with EBX reagents,[6f] were obtained with lower enantioselectivities. Interestingly, good

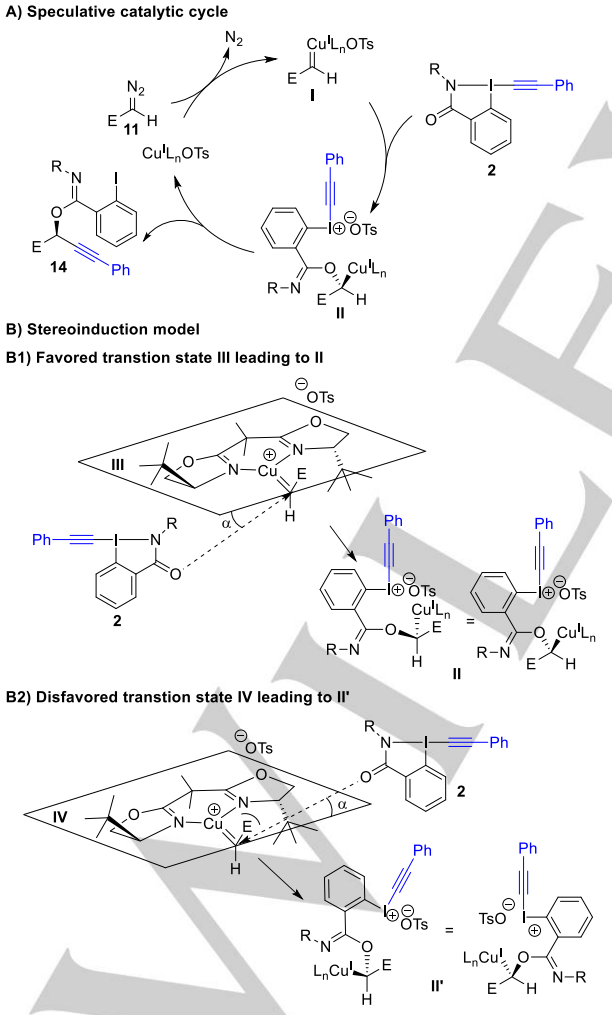
diastereoselectivities could be achieved with chiral menthol and cholesterol derivatives (**14l** and **14m**).

We then turned to modification of the alkyne substituent on the EBZ reagent using dimethylbenzylester-derived diazo compounds (Scheme 6B). Aryl EBZs gave access to the corresponding oxyalkynylation products **14n-r** bearing fluoro, trifluoromethyl, alkynyl or cyano group in *para*- or *meta*- position of the aryl group in 60-91% yield and 85-93% *ee*. Gratifyingly, silylated alkynes could be now used successfully to give products **14s** and **14t** with more than 90% *ee*. Alkyl substituents on the alkyne were investigated next. Excellent results were obtained with primary alkyl groups bearing a simple aliphatic chain (**14u** and **14v**) or a chloride/alkyne substituent (**14w** and **14x**). Secondary alkyl groups, such as cyclopropane (**14y**) and cyclopentane (**14z**) were also well tolerated. *Tert*-butyl alkyne **14aa** was obtained in 63% yield and 86% *ee*. Finally, modification of the aromatic core of the EBZ reagent was also possible to give products **14ab** and **14ac** in excellent yield and enantioselectivity. Overall, EBZ reagents gave therefore superior or comparable results than EBXs, without the need of a bulky aryl ester substituent to reach high enantioselectivity. Unfortunately, all attempts to isomerize the obtained imidate to the originally targeted amide, or to initiate an Overman-type rearrangement for transferring the nitrogen atom to the triple bond were unsuccessful.



Scheme 6. Scope of the oxyalkynylation of diazo compounds.

Based on the well-established reactivity of electrophilic metal carbenes towards heteroatom nucleophiles,[9] a tentative reaction mechanism can be proposed (Scheme 7A). Reaction of the copper catalyst with diazo compound **11** leads to copper carbene complex **I**. Nucleophilic attack of EBZ **2** gives then copper ylide **II**. Interestingly, the exclusive formation of the oxyalkynylation product supports a direct attack of the heteroatom not coordinated to the iodine, a fact that could not be established when using EBX reagents. Finally, electrophilic alkynylation of the copper ylide by the iodonium would give product **14**. Further studies would be needed to propose an exact mechanism for this intriguing alkyne transfer. Concerning stereoinduction, the model proposed in our previous work with EBX reagents[6f] remains valid (Scheme 7B). We assume a 90° angle between carbene and bisoxazoline[15] and attack of EBZ **2** on carbene **I** in the plane opposite to the bulky *tert*-butyl group. Attack on the *Re* face of **I** (Scheme 7B1, transition state **III**) is unhindered and favored, leading to the observed absolute stereochemistry of **14** if the alkynylation occurs with retention of the configuration. Attack on the *Si* face of **I** (Scheme 7B2, transition state **IV**) leads to steric interactions with the ester group on carbene **I** and is therefore disfavored.



Scheme 7. Speculative mechanism and stereoinduction model for the oxyalkynylation reaction.

Conclusions

In summary, the first synthesis of ethynylbenziodazolone (EBZ) reagents has been described. The reagents can be easily obtained using a one-step procedure. Preliminary structure and stability studies showed their similarity with the more established ethynylbenziodoxolones (EBXs). In addition, the nitrogen substituent gave further flexibility to fine-tune the physical properties and reactivity of the reagent. The latter was instrumental in the development of a highly enantioselective oxyalkynylation of diazo compounds. This reaction proceeded with high yield and enantioselectivity for a broad range of diazo compounds and EBZ reagents. Our research is now focusing on further synthetic applications of the obtained enantioenriched imidate products, as well as on alternative strategies to implement the initially targeted aminoalkynylation process.

Acknowledgements

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Keywords: carbenes • diazo compounds • enantioselective transformation • catalysis • hypervalent iodine

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[11] S. Alazet, J. Preindl, R. Simonet-Davin, S. Nicolai, A. Nanchen, T. Meyer, J. Waser, *J. Org. Chem.* **2018**, *83*, 12334.

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[13] The structures of **2a** and **2e** were determined by X-ray diffraction. The data are available from the Cambridge Crystallographic Data Center (CCDC numbers 1896879 (**2a**) and 1896878 (**2e**)). The structure of **1a** is already available (CCDC 863342), a new refined structure has been recently submitted (CCDC 1900537).

[14] The structure of **14n** was determined by X-ray diffraction. The data are available from the Cambridge Crystallographic Data Center (CCDC number 1896880).

[15] J. M. Fraile, J. I. García, V. Martínez-Merino, J. A. Mayoral, L. Salvatella, *J. Am. Chem. Soc.* **2001**, *123*, 7616.

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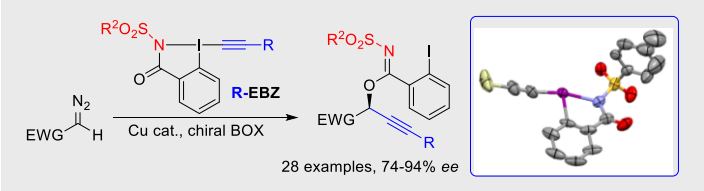
FULL PAPER



Ethynylbenziodazolone (EBZ) cyclic hypervalent iodine reagents have been synthesized for the first time and displayed similar structure and reactivity when compared to the established ethynylbenziodoxolone (EBX) reagents. They were used in the oxyalkynylation of diazo compounds to access imidate derivatives in high yield and enantioselectivity for a broad scope of diazo compounds and alkynes.

*Durga Prasad Hari, Lionel Schouwey, Verity Barber, Rosario Scopelliti, Farzaneh Fadaei Tirani and Jerome Waser**

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Ethynylbenziodazolones (EBZ) as Electrophilic Alkynylation Reagents for the Highly Enantioselective Copper-Catalyzed Oxy-Alkynylation of Diazo Compounds

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Supporting Information

(262 pages)

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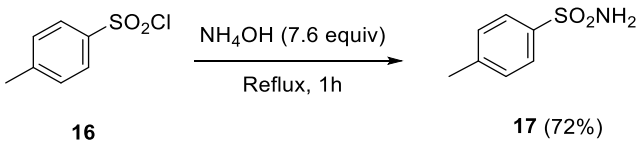
1. General Methods

All reactions were carried out in oven dried glassware under an atmosphere of nitrogen, unless stated otherwise. For quantitative flash chromatography technical grade solvents were used. For flash chromatography for analysis, HPLC grade solvents from Sigma-Aldrich were used. THF, Et_2O, CH_3CN, toluene, hexane and CH_2Cl_2 were dried by passage over activated alumina under nitrogen atmosphere (H_2O content < 10 ppm, *Karl-Fischer* titration). The solvents were degassed by Freeze-Pump-Thaw method when mentioned. All chemicals were purchased from Acros, Aldrich, Fluka, VWR, Aplichem or Merck and used as such unless stated otherwise. Chromatographic purification was performed as flash chromatography using Macherey-Nagel silica 40-63, 60 Å, using the solvents indicated as eluent with 0.1-0.5 bar pressure. TLC was performed on Merck silica gel 60 F_{254} TLC glass plates or aluminium plates and visualized with UV light, permanganate stain, CAN stain or Anisaldehyde stain. Melting points were measured on a Büchi B-540 melting point apparatus using open glass capillaries, the data is uncorrected. ^{1}H-NMR spectra were recorded on a Brucker DPX-400 400 MHz spectrometer in chloroform-d, DMSO-d_6 or CD_3OD, all signals are reported in ppm with the internal chloroform signal at 7.26 ppm, the internal DMSO signal at 2.50 ppm or the internal methanol signal at 3.30 ppm as standard. The data is being reported as (s = singlet, d = doublet, t = triplet, q = quadruplet, qi = quintet, m = multiplet or unresolved, br = broad signal, app = apparent, coupling constant(s) in Hz, integration, interpretation).^{13}C-NMR spectra were recorded with ^{1}H-decoupling on a Brucker DPX-400 100 MHz spectrometer in chloroform-d, DMSO-d_6 or CD_3OD, all signals are reported in ppm with the internal chloroform signal at 77.0 ppm, the internal DMSO signal at 39.5 ppm or the internal methanol signal at 49.0 ppm as standard. Infrared spectra were recorded on a JASCO FT-IR B4100 spectrophotometer with an ATR PRO410-S and a ZnSe prisma and are reported as cm^{-1} (w = weak, m = medium, s = strong, br = broad). High resolution mass spectrometric measurements were performed by the mass spectrometry service of ISIC at the EPFL on a MICROMASS (ESI) Q-TOF Ultima API. HPLC measurements were done on a Agilent 1260 Infinity autosampler using a CHIRALPAK IA, IB, IC or ID column from DAICEL Chemical. Optical rotations were measured on a polarimeter using a 10 cm cell with a Na 589 nm filter. The specific solvents and concentrations (in g/100 mL) are indicated.

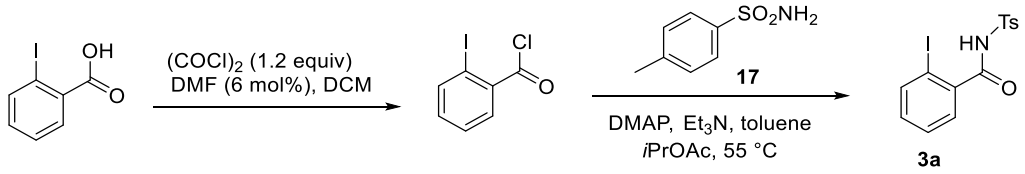
2. Preparation of EBZ reagents

4-Methylbenzenesulfonamide (17)



Following a slightly modified reported procedure,[1] in a 100 mL round-bottom flask, a solution of 4-methylbenzene-1-sulfonyl chloride (4.00 g, 21.0 mmol, 1.00 equiv) in ammonium hydroxide solution 25% w/w (25.0 mL, 161 mmol, 7.70 equiv) was heated to reflux for 1 h. After reaction completion, the reaction mixture was cooled down and filtered. The crude product was recrystallized in water to afford 4-methylbenzenesulfonamide (**17**) as white crystalline solid (2.81 g, 16.4 mmol, 78%). **^{1}H NMR** (400 MHz, $CDCl_3$): δ 7.82 (d, *J* = 8.3 Hz, 2H, Ar*H*), 7.32 (d, *J* = 8.0 Hz, 2H, Ar*H*), 4.77 (br s, 2H, NH_2), 2.43 (s, 3H, ArCH_3). The characterization data corresponded to the reported values.[2]

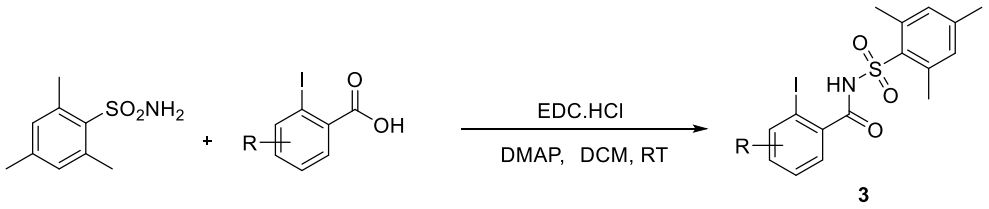
2-Iodo-*N*-tosylbenzamide (3a)



In a 25 mL round-bottom flask, 2-iodobenzoic acid (2.48 g, 10.0 mmol, 1.00 eqiv) and DMF (1 drop, ~6 mol%) were suspended in DCM (7.0 mL). Oxalyl chloride (1.1 mL, 12 mmol, 98 %, 1.2 equiv) was added dropwise at 0 °C. After the addition, the reaction was warmed up to RT and stirred for 3 h. The solvent and the oxalyl chloride excess were removed in vacuum. The crude 2-iodobenzoyl chloride was dissolved in toluene (6.5 mL) and transferred to a solution of 4-methylbenzenesulfonamide (**17**) (1.50 g, 8.15 mmol, 0.820 equiv), *N*,*N*-dimethyl-4-amino-pyridine (5.5 mg, 0.05 mmol, 0.005 equiv), and Et_3N (3.2 mL, 23 mmol, 2.3 equiv) in isopropyl acetate (20 mL). The reaction mixture was heated to 55 °C and stirred for 1 h. Water (10 mL) was added to quench the excess of acyl chloride. The organic layer was washed with 0.7 M HCl solution (70 mL) and the aqueous layer was back extracted with ethyl acetate (2 X 100 mL). The organic layers were combined, dried and the solvent was removed under reduced pressure. The crude product was purified by flash chromatography using EtOAc:Pentane 1:3.5 as mobile phase to afford **3a** as a slightly brown gum (2.92 g, 7.27 mmol, 80%). TLC (EtOAc:Pentane 1:3.5): R_f = 0.26, $KMnO_4$; ^{1}H NMR (400 MHz, $CDCl_3$): δ 9.04 (s, 1H, N*H*), 7.98 (d, *J* = 8.3 Hz, 2H, Ar*H*), 7.76 (d, *J* = 7.9 Hz, 1H, Ar*H*), 7.34 (m, 4H, Ar*H*), 7.10 – 7.03 (m, 1H, Ar*H*), 2.43 (s, 3H, ArCH_3); ^{13}C NMR (101 MHz, $CDCl_3$): δ 165.9, 145.4,

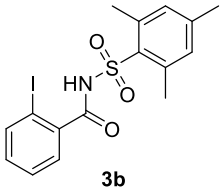
140.2, 138.4, 135.3, 135.0, 132.5, 129.6, 128.9, 128.3, 91.8, 21.8; IR ν 3057 (w), 2363 (w), 1711 (m), 1594 (w), 1434 (m), 1353 (m), 1270 (s), 1172 (m), 1126 (w), 1081 (w), 1041 (w), 896 (w), 834 (m); HRMS (ESI) calcd. for $C_{14}H_{13}INO_3S^+$ $[M+H]^+$ 401.9655 ; found 401.9669.

General procedure 1 (GP1)



A solution of 2-iodobenzoic acid (16.6 mmol, 1.10 equiv), *N*-(3-dimethylaminopropyl)-*N′*-ethylcarbodiimide hydrochloride (22.6 mmol, 1.50 equiv) and 4-dimethylaminopyridine (22.6 mmol, 1.50 equiv) in DCM (0.5 M) was stirred for 1 h at RT. 2,4,6-Trimethylbenzenesulfonamide (15 mmol, 1.0 equiv) was added in one portion to the solution and the reaction mixture was stirred overnight. The reaction mixture was quenched with 1 M HCl (50 mL) solution and stirred for 1 h. The organic layer was washed with 1 M HCl (2 X 50 mL) followed by saturated NaCl solution (50 mL). The combined aqueous layers were extracted with DCM (2 X 50 mL). The organic layers were combined and dried over $MgSO_4$, filtered and the solvent removed under reduced pressure. The product was purified by flash column chromatography using EtOAc:pentane (1:3 v/v).

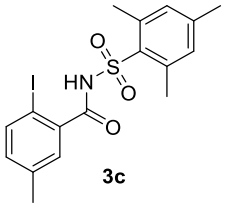
2-Iodo-*N*-[2,4,6-trimethylbenzenesulfonamide]benzamide (3b)



Following **GP1**, 2-iodobenzoic acid (4.11 g, 16.6 mmol, 1.10 equiv), *N*-(3-dimethylaminopropyl)-*N′*-ethylcarbodiimide hydrochloride (4.33 g, 22.6 mmol, 1.50 equiv), 4-dimethylaminopyridine (2.76 g, 22.6 mmol, 1.50 equiv) and 2,4,6-trimethylbenzenesulfonamide (3.00 g, 15.0 mmol, 1.00 equiv) were stirred for 14 h. The crude reaction mixture was concentrated under reduced pressure and purified by flash chromatography using EtOAc:pentane 1:3 as mobile phase to afford **3b** as a white solid (5.12 g, 11.9 mmol, 79%). Mp: 206-209 ºC; TLC (EtOAc:pentane 1:2 v/v): R_f = 0.55, $KMnO_4$; ^{1}H NMR (400 MHz, $CDCl_3$): δ 8.44 (s, 1H, N*H*), 7.86 (d, *J* = 7.9 Hz, 1H, Ar*H*), 7.44 – 7.32 (m, 2H, Ar*H*), 7.15 – 7.12 (m, , 1H, Ar*H*), 7.01 (s, 2H, Ar*H*), 2.74 (s, 6H, ArC*H*$_3$), 2.33 (s, 3H, ArC*H*$_3$); ^{13}C NMR (100 MHz, $CDCl_3$): δ 166.1, 144.0, 140.9, 140.3, 138.9, 132.4, 132.1, 132.0, 128.6, 128.3, 91.5, 23.1, 21.1; IR ν 3210 (w), 2850 (w), 1710 (m), 1603 (w), 1468 (m), 1430

(s), 1343 (m), 1277 (w), 1239 (w), 1165 (s), 1098 (m), 1054 (w), 1037 (w), 1017 (w), 887 (w), 822 (m); HRMS (ESI) calcd. for $C_{16}H_{17}INO_3S^+$ $[M+H]^+$ 429.9968; found 429.9972.

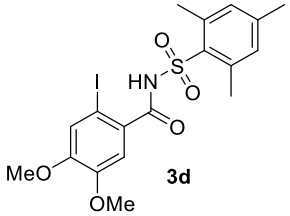
2-Iodo-*N*-(mesitylsulfonyl)-5-methylbenzamide (3c)



3c

Following **GP1**, 2-iodo-5-methylbenzoic acid (0.725 g, 2.76 mmol, 1.10 equiv), *N*-(3-dimethylaminopropyl)-*N′*-ethylcarbodiimide hydrochloride (0.721 g, 3.76 mmol, 1.50 equiv), 4-dimethylaminopyridine (0.460 g, 3.76 mmol, 1.50 equiv) and 2,4,6-trimethylbenzenesulfonamide (0.50 g, 2.5 mmol, 1.0 equiv) were stirred for 14 h. The crude reaction mixture was concentrated under reduced pressure and purified by flash chromatography using EtOAc:pentane 1:3 as mobile phase to afford **3c** as a white solid (0.864 g, 1.95 mmol, 78%). Mp: 194-198 ^oC; TLC (EtOAc:pentane 1:3 v/v): R_f = 0.39, $KMnO_4$; ^1H NMR (400 MHz, $CDCl_3$): δ 8.42 (s, 1H, N*H*), 7.71 (d, *J* = 8.1 Hz, 1H, Ar*H*), 7.23 – 7.22 (m, 1H, Ar*H*), 7.01 (s, 2H, Ar*H*), 6.97 (dd, *J* = 8.1, 2.1 Hz, 1H, Ar*H*), 2.74 (s, 6H, 2 X ArCH_3), 2.32 (s, 3H, ArCH_3), 2.30 (s, 3H, ArCH_3); ^{13}C NMR (100 MHz, $CDCl_3$): δ 166.1, 143.9, 140.9, 140.1, 138.7, 138.6, 133.4, 132.1, 129.6, 87.3, 23.1, 21.1, 20.8; IR ν 3225 (w), 2943 (w), 1711 (m), 1602 (w), 1566 (w), 1427 (m), 1341 (m), 1283 (w), 1245 (w), 1194 (w), 1160 (s), 1097 (m), 1053 (w), 1016 (w), 852 (m). One carbon was not resolved at 100 MHz. Couldn't identify the mass of the compound in HRMS. However, the product (**14ab**) of the next step is completely characterized.

2-Iodo-*N*-(mesitylsulfonyl)-4,5-dimethoxybenzamide (3d)

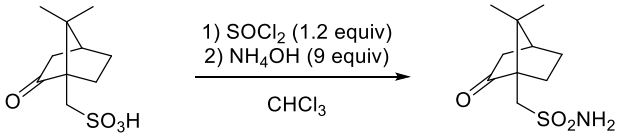


3d

Following **GP1**, 2-iodo-4,5-dimethoxybenzoic acid (0.850 g, 2.76 mmol, 1.00 equiv), *N*-(3-dimethylaminopropyl)-*N′*-ethylcarbodiimide hydrochloride (0.721 g, 3.76 mmol, 1.50 equiv), 4-dimethylaminopyridine (0.460 g, 3.76 mmol, 1.50 equiv) and 2,4,6-trimethylbenzenesulfonamide (0.50 g, 2.5 mmol, 1.0 equiv) were stirred for 14 h. The crude reaction mixture was concentrated under reduced pressure and purified by flash chromatography using EtOAc:pentane 1:3 as mobile phase to afford as a white solid (0.450 g,

0.920 mmol, 37%). Mp: 223-226 ºC; TLC (EtOAc:pentane 1:3 v/v): R_f = 0.3, $KMnO_4$; ^{1}H NMR (400 MHz, $CDCl_3$): δ 8.75 (s, 1H, N*H*), 7.22 (s, 1H, Ar*H*), 7.08 (s, 1H, Ar*H*), 7.01 (s, 2H, Ar*H*), 3.89 (s, 3H, ArOC*H*$_3$), 3.84 (s, 3H, ArOC*H*$_3$), 2.76 (s, 6H, 2 X ArC*H*$_3$), 2.65 (s, 3H, ArC*H*$_3$); ^{13}C NMR (100 MHz, $CDCl_3$): δ 165.2, 151.7, 149.3, 143.9, 140.8, 132.1, 131.9, 130.2, 122.5, 112.7, 80.9, 56.4, 56.2, 23.1, 21.1; IR ν 3241 (w), 2938 (w), 2846 (w), 1699 (w), 1594 (w), 1565 (w), 1505 (w), 1422 (m), 1369 (w), 1336 (m), 1261 (m), 1207 (w), 1159 (s), 1094 (m), 1031 (w), 951 (w), 854 (m); HRMS (ESI) calcd. for $C_{18}H_{21}INO_5S^+$ $[M+H]^+$ 490.0180; found 490.0179.

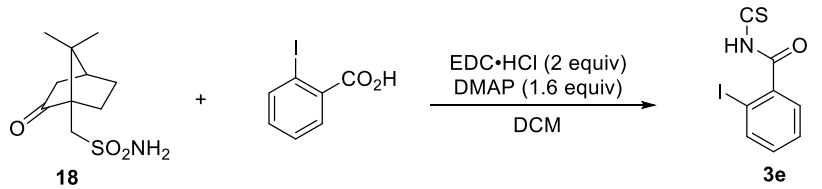
(1*S*)-(+)-Camphorsulfonamide (18)



18

In a 20 ml round-bottom flask, thionyl chloride (0.42 mL, 5.7 mmol, 1.2 equiv) was slowly added to a refluxing solution of (1*S*)-(+)-camphorsulfonic acid (1.10 g, 4.74 mmol, 1.00 equiv) in chloroform (5.0 mL). The reflux was maintained overnight. The reaction was cooled down to 0 °C and added over 1 h to 25 % w/w ammonium hydroxide solution (11.0 mL, 78.0 mmol, 16.6 equiv) at 0 °C. The reaction mixture was then heated to RT and stirred for 4 h. The aqueous layer was extracted with DCM (3 X 20 mL) and the combined organic layers were washed with brine (20 mL). The organic layers were dried with Na_2SO_4 and the solvent was removed under reduced pressure. The crude product was purified by flash chromatography using EtOAc:pentane 1:2 as mobile phase to afford **18** as a white solid (574 mg, 2.48 mmol, 53%). TLC (EtOAc:pentane 1:2 v/v): R_f = 0.27, $KMnO_4$; ^{1}H NMR (400 MHz, $CDCl_3$): δ 5.36 (s, 2H, N*H*$_2$), 3.14 and 3.53 (AB quartet, *J* = 15.1 Hz, 2H, C*H*$_2$SO$_2$NH$_2$), 2.43–1.43 (m, 7H, C(O)-C-C*H*$_2$-C*H*$_2$-C*H*-C*H*$_2$), 1.01 (s, 3H, C*H*$_3$), 0.93 (s, 3H, C*H*$_3$). The characterization data corresponded to the reported values.[3]

2-Iodo-*N*-camphorsulfonylbenzamide (3e)



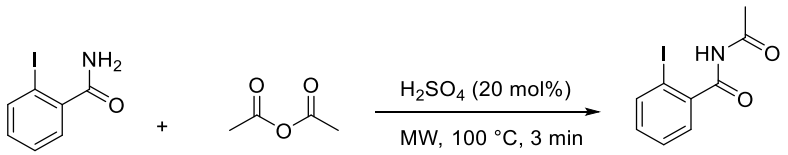
18 **3e**

CS = Camphorsulfonyl

A solution of DMAP (450 mg, 3.68 mmol, 1.60 equiv), EDC (882 mg, 4.60 mmol, 2.00 equiv) and 2-iodobenzoic acid (570 mg, 2.30 mmol, 1.00 equiv) in DCM (40 mL) was stirred 1 h at RT. (1*S*)-(+)-Camphorsulfonamide **(18**) (532 mg, 2.32 mmol, 1.00 equiv) was added in one

portion to the solution and the reaction mixture was stirred overnight at RT. The reaction mixture was diluted with DCM (100 mL) and washed with 1 M HCl solution (2 X 50 mL) and water (50 mL). The organic layer was dried with Na_2SO_4, filtered, and the solvent was removed under reduced pressure. The crude product was purified by flash chromatography using MeOH:DCM 5:95 as mobile phase to afford **3e** as a pale yellow solid (833 mg, 1.81 mmol, 79%). Mp: 89.8-90.7 ºC; TLC (MeOH:DCM 5:95 v/v): R_f = 0.19, $KMnO_4$; ^{1}H NMR (400 MHz, $CDCl_3$): δ 8.51 (s, 1H, N*H*), 7.88 (d, *J* = 7.9 Hz, 1H, Ar*H*), 7.61 (d, *J* = 7.4 Hz, 1H, Ar*H*), 7.37 (t, *J* = 7.4 Hz, 1H, Ar*H*), 7.12 (t, *J* = 7.4 Hz, 1H, Ar*H*), 4.06 and 3.46 (AB quartet, 14.0 Hz, 2H, C*H*$_2$SO$_2$NH), 2.46 - 1.25 (m, 7H, C(O)-C-C*H*$_2$-C*H*$_2$-C*H*-C*H*$_2$), 1.06 (s, 3H, C*H*$_3$), 0.89 (s, 3H, C*H*$_3$); ^{13}C NMR (100 MHz, $CDCl_3$): δ 215.5, 167.1, 140.8, 138.6, 132.8, 129.0, 128.5, 92.4, 59.2, 52.0, 49.0, 43.0, 43.0, 27.2, 26.5, 20.1, 19.8; IR ν 3667 (w), 2979 (s), 2903 (s), 2361 (w), 1748 (w), 1698 (w), 1627 (w), 1402 (m), 1251 (w), 1058 (s), 889 (w); HRMS (ESI) calcd. for $C_{17}H_{20}INO_4SNa^+$ $[M+Na]^+$ 484.0050; found 484.0063.

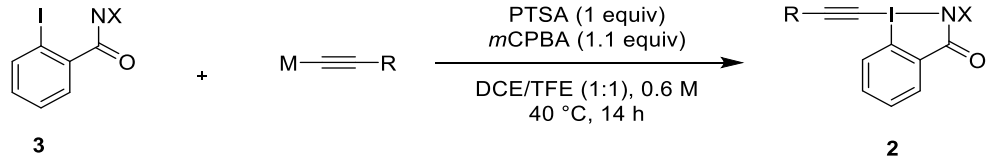
2-Iodo-*N*-acetylbenzamide (3f)



3f

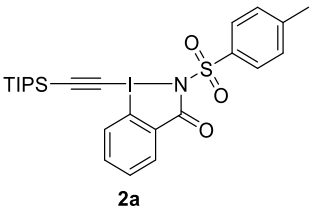
In a 2-5 ml microwave reaction vial, 2-iodobenzamide (247 mg, 1.00 mmol, 1.00 equiv) suspended in acetic anhydride (0.3 ml, 3 mmol, 3 equiv). Sulfuric acid (2 drops) was added and the tube was sealed. The vial was kept in microwave for 3 min at 100 °C (100 W). The reaction mixture was diluted with ethyl acetate (20 mL), washed with a saturated $NaHCO_3$ solution (10 mL) and brine (10 mL). The aqueous layers were back extracted with ethyl acetate (2 X 10 mL). The organic layers were combined, dried with Na_2SO_4 and the solvent was removed under reduced pressure. The crude product was purified by flash chromatography using EtOAc:pentane 1:3 as mobile phase to afford **3f** as a white solid (0.267 g, 0.924 mmol, 92%). Mp: 102.2-103.8 ºC; TLC (EtOAc:pentane 1:3.5 v/v): R_f = 0.29, $KMnO_4$; ^{1}H NMR (400 MHz, $CDCl_3$): δ 8.27 (s, 1H, N*H*), 7.92 (d, *J* = 7.9 Hz, 1H, Ar*H*), 7.44 (m, 2H, Ar*H*), 7.25 – 7.12 (m, 1H, Ar*H*), 2.58 (s, 3H, COC*H*$_3$); ^{13}C NMR (100 MHz, $CDCl_3$): δ 172.4, 167.6, 140.6, 140.2, 132.5, 128.6, 128.4, 92.1, 25.6; IR ν 3269 (m), 3177 (w), 2961 (w), 1732 (s), 1694 (s), 1592 (w), 1495 (s), 1429 (m), 1375 (m), 1269 (s), 1226 (s), 1127 (w), 1019 (m), 953 (w), 887 (w), 839 (w); HRMS (ESI) calcd. for $C_9H_9INO_2^+$ $[M+H]^+$ 289.9672 ; found 289.9683.

General procedure 2 (GP2)



In a 2-5 mL microwave reaction vial, 2-iodo-*N*-substituted benzamide (2.5 mmol, 1.0 equiv), *p*-toluenesulfonic acid (1.0 equiv) and *meta*-chloroperbenzoic acid (1.1 equiv) were dissolved in dichloroethane - trifluoroethanol mixture (1:1 ratio, 0.6 M). The solution was stirred for 1 h at 40 °C. The corresponding terminal or silylated alkyne (1.4 equiv) was then added and the reaction mixture was stirred at 40 °C overnight. The precipitate was dissolved in DCM (25 mL) and the organic layer was washed with $NaHCO_3$ sat. solution (2 X 20 mL) and with brine (15 mL). The combined aqueous layers were back-extracted with DCM (2 X 20 mL). The organic layers were combined, dried with Na_2SO_4, filtrated and the solvent was removed under reduced pressure. The crude product was purified using the described method to afford the corresponding EBZ compound.

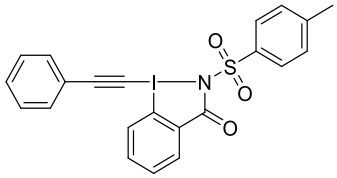
***N*-[Tolylsulfonyl]-1-[tri*iso*propylsilylethynyl]-1,2-benziodazol-3(1*H*)-one (2a)**



2a

Following **GP2**, 2-iodo-*N*-tosylbenzamide **3a** (1.00 g, 2.49 mmol, 1.00 equiv) and tri*iso*propyl((trimethylsilyl)ethynyl) silane (0.888 g, 3.49 mmol, 1.40 equiv) were stirred for 14 h. The crude reaction mixture was purified by recrystallization in ethyl acetate (35 mL) to afford **2a** as white crystals (1.39 g, 2.38 mmol, 96%). Mp: 241.0-243.6 ^{o}C (dec.); ^{1}H NMR (400 MHz, $CDCl_3$): δ 8.40 – 8.34 (m, 1H, Ar*H*), 8.32 – 8.27 (m, 1H, Ar*H*), 8.01 (d, *J* = 8.3 Hz, 2H, Ar*H*), 7.70 (dd, *J* = 6.5, 3.5 Hz, 2H, Ar*H*), 7.28 (d, *J* = 8.2 Hz, 2H, Ar*H*), 2.38 (s, 3H, C*H*$_3$), 1.15 (m, 21H, TIPS); ^{13}C NMR (100 MHz, $CDCl_3$): δ 160.7, 143.4, 137.9, 135.2, 134.3, 132.0, 131.6, 129.2, 128.0, 127.1, 115.0, 114.0, 70.6, 21.6, 18.6, 11.2; IR ν 2950 (w), 2867 (w), 1661 (s), 1463 (w), 1440 (w), 1384 (w), 1287 (s), 1249 (w), 1148 (s), 1089 (m), 1002 (w), 894 (m), 862 (s), 819 (w); HRMS (ESI) calcd. for $C_{25}H_{33}INO_3SSi^+$ $[M+H]^+$ 582.0990; found 582.0995.

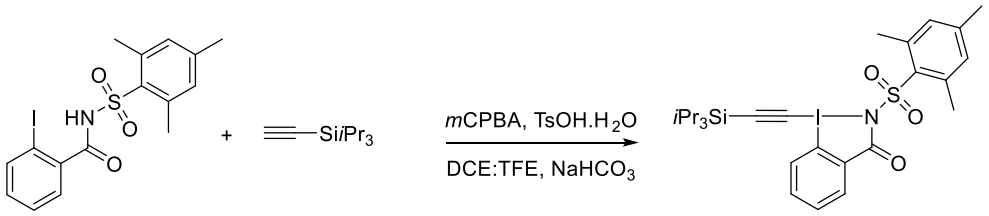
***N*-[Tolylsulfonyl]-1-[phenylethynyl]-1,2-benziodazol-3(1*H*)-one (2b)**



2b

Following **GP2**, 2-iodo-*N*-tosylbenzamide **3a** (1.00 g, 2.49 mmol, 1.00 equiv) and phenylacetylene (0.39 mL, 3.5 mmol, 1.4 equiv) were stirred for 14 h. The crude reaction mixture was concentrated under reduced pressure and purified by flash chromatography using EtOAc:DCM 1:24 as mobile phase followed by recrystallization by evaporation of DCM from a mixture of ethyl acetate / DCM (0.5 mL / 10 mL) to afford **2b** as white crystals (0.654 g, 1.31 mmol, 52%). Mp: 157.6-160.1 ºC (dec.); TLC (EtOAc:DCM 1:24 v/v): R_f = 0.21, $KMnO_4$; ^{1}H NMR (400 MHz, $CDCl_3$): δ 8.34 (dd, *J* = 7.9, 1.3 Hz, 1H, Ar*H*), 8.30 (dd, *J* = 7.0, 2.2 Hz, 1H, Ar*H*), 8.03 (d, *J* = 8.3 Hz, 2H, Ar*H*), 7.75 – 7.67 (m, 2H, Ar*H*), 7.60 (d, *J* = 8.2 Hz, 2H, Ar*H*), 7.53 – 7.41 (m, 3H, Ar*H*), 7.29 (d, *J* = 8.1 Hz, 2H, Ar*H*), 2.39 (s, 3H, ArC*H*$_3$); ^{13}C NMR (100 MHz, $CDCl_3$): δ 160.8, 143.5, 137.9, 135.4, 134.2, 132.9, 132.0, 131.6, 130.8, 129.3, 128.8, 128.0, 127.3, 120.5, 115.5, 106.5, 56.3, 21.6; IR ν 2360 (w), 2327 (w), 2146 (w), 1652 (s), 1521 (w), 1490 (w), 1439 (m), 1314 (s), 1294 (s), 1247 (w), 1150 (s), 1087 (m), 1038 (w), 897 (m), 857 (s), 799 (w); HRMS (ESI) calcd. for $C_{22}H_{17}INO_3S^+$ $[M+H]^+$ 507.9968 ; found 501.9974.

***N*-[Mesitylsulfonyl]-1-[(tri*iso*propylsilyl)ethynyl]-1,2-benziodazol-3(1*H*)-one (2c)**

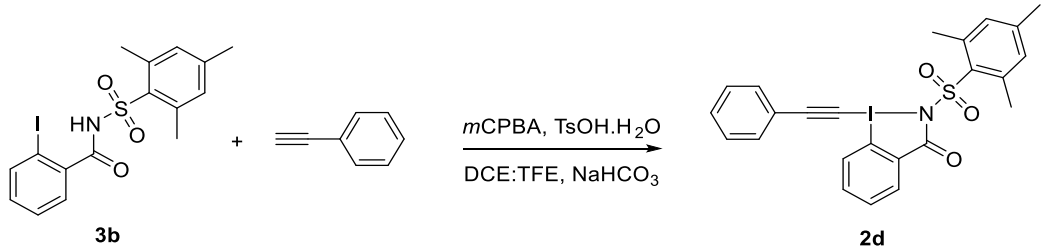


3b **2c**

In a 5 mL sealed tube, 2-iodo-*N*-(mesitylsulfonyl)benzamide (**3b**) (0.500 g, 1.17 mmol, 1.00 equiv), 4-methylbenzenesulfonic acid hydrate (0.201 g, 1.17 mmol, 1.00 equiv) and *m*CPBA (0.287 g, 77% purity, 2.56 mmol, 1.10 equiv) were suspended in DCE:TFE 1:1 (2 mL) and stirred for 1 h at 40 °C. Ethynyltriisopropylsilane (0.297 g, 1.63 mmol, 1.40 equiv) was then added and the reaction mixture was stirred at 40 °C for 16 h. The solvent was evaporated and the residue was dissolved in CH_2Cl_2 (10 mL) and stirred vigorously with saturated solution of $NaHCO_3$ (10 mL). After 1 h, the reaction mixture was transferred into a separating funnel and the layers were separated. The aqueous layer was extracted with CH_2Cl_2 (2 X 10 mL). The

combined organic layers were washed with a saturated solution of $NaHCO_3$ (15 mL), brine (15 mL), dried over $MgSO_4$, filtered and concentrated under reduced pressure. The crude product was purified by flash chromatography using EtOAc:Pentane 1:4 as mobile phase followed by recrystallization in EtOAc (*ca* 10 mL) to afford **2c** as white crystals (0.450 g, 0.738 mmol, 63%). Mp: 219–223 °C; TLC (EtOAc:Pentane 1:3): R_f = 0.73, $KMnO_4$; ^{1}H NMR (400 MHz, $CDCl_3$): δ 8.41 (d, *J* = 8.9 Hz, 1H, Ar*H*), 8.32 – 8.25 (m, 1H, Ar*H*), 7.79 – 7.64 (m, 2H, Ar*H*), 6.92 (s, 2H, Ar*H*), 2.78 (s, 6H, 2 X ArC*H*$_3$), 2.26 (s, 3H, ArC*H*$_3$), 1.36 – 0.83 (m, 21H, TIPS); ^{13}C NMR (101 MHz, $CDCl_3$): δ 161.2, 142.2, 139.8, 135.1, 134.9, 134.4, 131.9, 131.6, 131.6, 127.0, 115.0, 113.9, 70.7, 23.2, 21.0, 18.5, 11.2; IR ν 2940 (m), 2865 (m), 1656 (s), 1606 (w), 1465 (w), 1440 (w), 1380 (w), 1290 (s), 1249 (w), 1141 (s), 1055 (w), 998 (w), 892 (m), 849 (s); HRMS (ESI) calcd. for $C_{27}H_{37}INO_3SSi^+$ $[M+H]^+$ 610.1303; found 610.1305.

***N*-[Mesitylsulfonyl]-1-[phenylethynyl]-1,2-benziodazol-3(1*H*)-one (2d)**

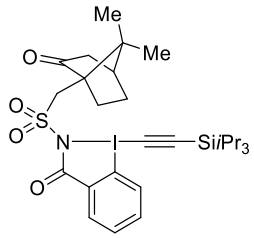


3b **2d**

In a 5 mL sealed tube, 2-iodo-*N*-(mesitylsulfonyl)benzamide (**3b**) (1.00 g, 2.33 mmol, 1.00 equiv), 4-methylbenzenesulfonic acid hydrate (0.401 g, 2.33 mmol, 1.00 equiv) and *m*CPBA (0.574 g, 77% purity, 2.56 mmol, 1.10 equiv) were suspended in DCE:TFE 1:1 (4 mL) and stirred for 1 h at 40 °C. Ethynylbenzene (0.36 mL, 3.3 mmol, 1.4 equiv) was then added and the reaction mixture was stirred at 40 °C for 16 h. The solvent was evaporated and the residue was dissolved in CH_2Cl_2 (20 mL) and stirred vigorously with saturated solution of $NaHCO_3$ (20 mL). After 1 h, the reaction mixture was transferred into a separating funnel and the layers were separated. The aqueous layer was extracted with CH_2Cl_2 (2 X 20 mL). The combined organic layers were washed with a saturated solution of $NaHCO_3$ (30 mL), brine (30 mL), dried over $MgSO_4$, filtered and concentrated under reduced pressure. The crude product was purified by flash chromatography using EtOAc:DCM 1:25 as mobile phase followed by washing with EtOAc (3 X 3 mL) to afford **2d** as a white solid (0.352 g, 0.665 mmol, 29%). Mp: 204–206 °C; TLC (EtOAc:DCM 1:25): R_f = 0.18, $KMnO_4$; ^{1}H NMR (400 MHz, $CDCl_3$): δ 8.37 (dd, *J* = 8.0, 1.1 Hz, 1H, Ar*H*), 8.29 (dd, *J* = 7.2, 2.1 Hz, 1H, Ar*H*), 7.82 – 7.64 (m, 2H, Ar*H*), 7.64 – 7.56 (m, 2H, Ar*H*), 7.53 – 7.37 (m, 3H, Ar*H*), 6.93 (s, 2H Ar*H*), 2.80 (s, 6H, 2 X ArC*H*$_3$), 2.27 (s, 3H, ArC*H*$_3$); ^{13}C NMR (100 MHz, $CDCl_3$): δ 161.3, 142.3, 139.8, 135.2, 134.9, 134.4, 132.9, 131.9, 131.7, 130.8, 128.8, 127.2, 120.6, 115.4, 106.5, 56.5, 23.2, 21.0; IR ν 3072 (w), 2937

(w), 2146 (w), 1655 (s), 1525 (w), 1441 (m), 1294 (s), 1248 (w), 1142 (s), 1054 (w), 897 (m), 849 (s); HRMS (ESI) calcd. for $C_{24}H_{21}INO_3S^+$ $[M+H]^+$ 530.0281; found 530.0283. One carbon was not resolved at 100 MHz.

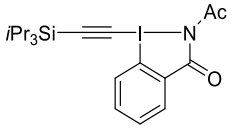
2-((((1*S*,4*S*)-7,7-Dimethyl-2-oxobicyclo[2.2.1]heptan-1-yl)methyl)sulfonyl)-1-((tri*iso*propylsilyl)ethynyl)- 1,2-benziodazol-3(1*H*)-one (2e)



2e

Following **GP2**, 2-iodo-*N*-camphorsulfonylbenzamide **3e** (138 mg, 0.300 mmol, 1.00 equiv) and ethynyltriisopropylsilane (107 mg, 0.420 mmol, 1.40 equiv) were stirred for 14 h. The crude product was purified by flash chromatography using EtOAc:pentane 1:1.5 as mobile phase to afford **2e** as a white solid (0.166 g, 0.259 mmol, 86%). Mp: 167.3–170.0 ^oC; TLC (EtOAc:pentane 1:1.5): R_f = 0.26, $KMnO_4$; ^1H NMR (400 MHz, $CDCl_3$): δ 8.43 – 8.32 (m, 2H, Ar*H*), 7.77 – 7.67 (m, 2H, Ar*H*), 3.90 and 3.37 (AB quartet, 14.9 Hz, 2H, C*H*$_2$SO$_2$N), 2.46-1.42 (m, 7H, C(O)-C-C*H*$_2$-C*H*$_2$-C*H*-C*H*$_2$), 1.18 – 1.08 (m, 21H, TIPS), 1.08 (s, 3H, C*H*$_3$) , 0.86 (s, 3H, C*H*$_3$); ^{13}C NMR (100 MHz, $CDCl_3$): δ 215.3, 162.0, 135.3, 134.3, 132.0, 131.7, 127.2, 114.9, 113.9, 70.6, 59.0, 50.1, 48.5, 42.8, 42.7, 27.2, 25.6, 19.9, 18.6, 18.4, 11.2; IR ν 3667 (w), 3500 (w), 2963 (s), 2361 (w), 1744 (m), 1650 (m), 1582 (w), 1528 (w), 1449 (m), 1401 (m), 1313 (s), 1255 (m), 1134 (s), 1057 (s), 892 (m), 856 (m); HRMS (ESI) calcd. for $C_{28}H_{41}INO_4SSi^+$ $[M+H]^+$ 642.1565; found 642.1570.

***N*-[Acetyl]-1-[(tri*iso*propylsilyl)ethynyl]-1,2-benziodazol-3(1*H*)-one (2f)**

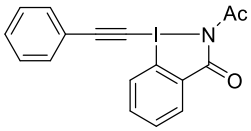


2f

Following **GP2**, 2-iodo-*N*-acetylbenzamide **3f** (289 mg, 1.00 mmol, 1.00 equiv) and ethynyltriisopropylsilane (356 mg, 1.40 mmol, 1.40 equiv) were stirred for 14 h. The crude product was purified by flash chromatography using EtOAc:pentane 1:9 as mobile phase to afford **2f** as a white solid (0.102 g, 0.217 mmol, 21%). Mp: 109.6–111.3 ^oC; TLC (EtOAc:pentane 1:9): R_f = 0.10, $KMnO_4$; ^1H NMR (400 MHz, $CDCl_3$): δ 8.56 – 8.51 (m, 1H, Ar*H*), 8.39 – 8.34 (m, 1H, Ar*H*), 7.76 – 7.71 (m, 2H, Ar*H*), 2.55 (s, 3H, C*H*$_3$), 1.13 (m, 21H, TIPS); ^{13}C NMR (100 MHz, $CDCl_3$): δ 179.9, 162.1, 135.3, 135.1, 131.4, 131.3 127.4, 115.4,

109.2, 81.1, 26.8, 18.5, 11.1; IR ν 2944 (w), 2867 (w), 2324 (w), 1666 (s), 1617 (s), 1464 (w), 1441 (w), 1375 (s), 1344 (s), 1237 (w), 1158 (w), 1116 (w), 1021 (w), 885 (w); HRMS (ESI) calcd. for $C_{20}H_{29}INO_2Si^+$ $[M+H]^+$ 470.1007 ; found 470.1037.

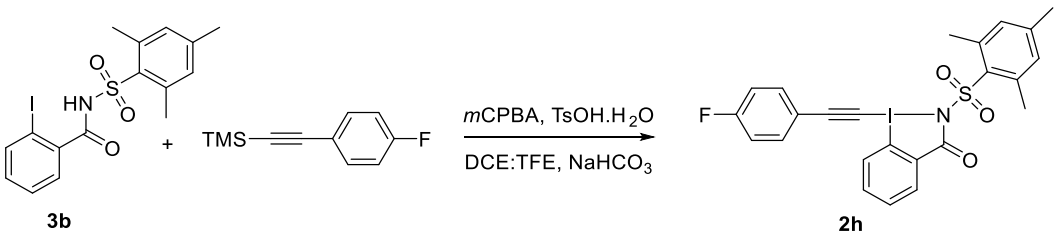
***N*-[Acetyl]-1-[phenylethynyl]-1,2-benziodazol-3(1*H*)-one (2g)**



2g

Following **GP2**, 2-iodo-*N*-acetylbenzamide **3f** (725 mg, 2.51 mmol, 1.00 equiv) and phenylacetylene (0.40 mL, 3.5 mmol, 1.4 equiv) were stirred for 14 h. The crude product was purified by flash chromatography using EtOAc:DCM 1:25 as mobile phase to afford **2g** as a white solid (0.204 g, 0.524 mmol, 21%). Mp: 173.6–176.0 °C; TLC (EtOAc:DCM 1:25): R_f = 0.24, $KMnO_4$; ^{1}H NMR (400 MHz, $CDCl_3$): δ 8.48 (d, *J* = 9.3 Hz, 1H, Ar*H*), 8.37 (d, *J* = 9.2 Hz, 1H, Ar*H*), 7.75 (d, *J* = 4.2 Hz, 2H, Ar*H*), 7.56 (d, *J* = 7.7 Hz, 2H, Ar*H*), 7.46 – 7.36 (m, 3H, Ar*H*), 2.57 (s, 3H, C*H*$_3$); ^{13}C NMR (100 MHz, $CDCl_3$): δ 179.8, 162.2, 135.4, 135.3, 132.6, 131.6, 131.4, 130.0, 128.7, 127.5, 121.7, 115.8, 103.3, 65.8, 26.9; IR ν 2986 (w), 2908 (w), 2324 (w), 2141 (w), 1658 (s), 1616 (s), 1489 (w), 1443 (w), 1379 (s), 1344 (s), 1237 (w), 1211 (w), 1157 (w), 1118 (w), 1023 (w), 905 (w), 860 (w); HRMS (ESI) calcd. for $C_{17}H_{12}INNaO_2S^+$ $[M+Na]^+$ 411.9805 ; found 411.9810**.**

***N*-[Mesitylsulfonyl]-1-[(4-fluorophenyl)ethynyl]-1,2-benziodazol-3(1*H*)-one (2h)**

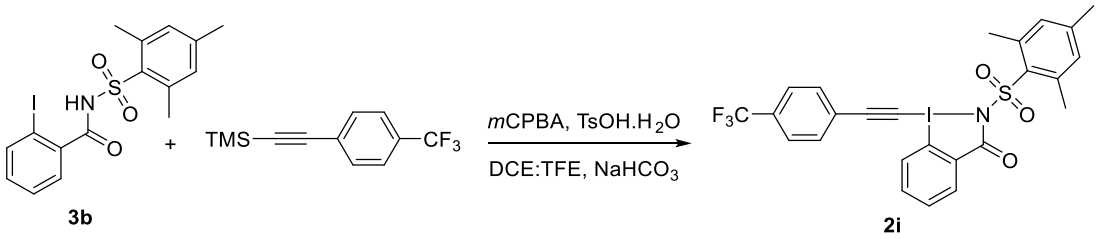


3b **2h**

In a 5 mL sealed tube, 2-iodo-*N*-(mesitylsulfonyl)benzamide (**3b**) (0.500 g, 1.17 mmol, 1.00 equiv), 4-methylbenzenesulfonic acid hydrate (0.201 g, 1.17 mmol, 1.00 equiv) and *m*CPBA (0.287 g, 77% purity, 2.56 mmol, 1.10 equiv) were suspended in DCE:TFE 1:1 (2 mL) and stirred for 1 h at 40 °C. ((3-Fluorophenyl)ethynyl)trimethylsilane (0.314 g, 1.63 mmol, 1.40 equiv) was then added and the reaction mixture was stirred at 40 °C for 16 h. The solvent was evaporated and the residue was dissolved in CH_2Cl_2 (10 mL) and stirred vigorously with saturated solution of $NaHCO_3$ (10 mL). After 1 h, the reaction mixture was transferred into a separating funnel and the layers were separated. The aqueous layer was extracted with CH_2Cl_2 (2 X 10 mL). The combined organic layers were washed with saturated solution of $NaHCO_3$ (15 mL), brine (15 mL), dried over $MgSO_4$, filtered and concentrated under reduced pressure.

The crude product was purified by flash chromatography using EtOAc:DCM 1:20 as mobile phase followed by washing with EtOAc (3 X 3 mL) to afford **2h** as a white solid (0.125 g, 0.228 mmol, 20%). Mp: 205–209 °C; TLC (EtOAc:DCM 1:20): R_f = 0.43, $KMnO_4$; ^{1}H NMR (400 MHz, $CDCl_3$): δ 8.34 (dd, 1H, Ar*H*), 8.29 (dd, 1H, Ar*H*), 7.72 (pd, *J* = 7.2, 1.6 Hz, 2H, Ar*H*), 7.63 – 7.55 (m, 2H, Ar*H*), 7.19 – 7.08 (m, 2H, Ar*H*), 6.93 (s, 2H, Ar*H*), 2.80 (s, 6H, 2 X ArC*H*$_3$), 2.26 (s, 3H, ArC*H*$_3$); ^{13}C NMR (100 MHz, $CDCl_3$): δ 163.9 (d, *J* = 253.8 Hz), 161.2, 142.3, 139.8, 135.2, 135.1 (d, *J* = 8.8 Hz), 134.8, 134.4, 131.9, 131.7, 127.2, 116.7 (d, *J* = 3.5 Hz), 116.3 (d, *J* = 22.4 Hz), 115.4, 105.3, 56.8, 23.2, 21.0; IR ν 3074 (w), 2920 (w), 2145 (w), 1655 (m), 1600 (m), 1505 (m), 1438 (w), 1294 (s), 1239 (m), 1131 (s), 1054 (w), 898 (m), 859 (s), 839 (m); HRMS (ESI) calcd. for $C_{24}H_{19}FINNaO_3S^+$ $[M+Na]^+$ 570.0007; found 570.0013. One carbon was not resolved at 100 MHz.

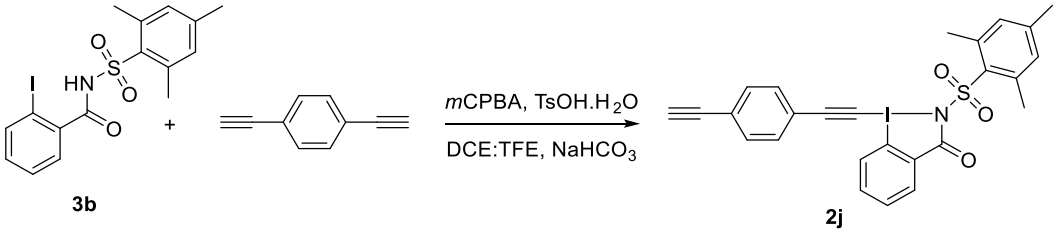
***N*-[Mesitylsulfonyl]-1-[(4-(trifluoromethyl)phenyl)ethynyl]-1,2-benziodazol-3(1*H*)-one (2i)**



In a 5 mL sealed tube, 2-iodo-*N*-(mesitylsulfonyl)benzamide (**3b**) (0.500 g, 1.17 mmol, 1.00 equiv), 4-methylbenzenesulfonic acid hydrate (0.201 g, 1.17 mmol, 1.00 equiv) and *m*CPBA (0.287 g, 77% purity, 2.56 mmol, 1.10 equiv) were suspended in DCE:TFE 1:1 (2 mL) and stirred for 1 h at 40 °C. Trimethyl((4-(trifluoromethyl)phenyl)ethynyl)silane (0.395 g, 1.63 mmol, 1.40 equiv) was then added and the reaction mixture was stirred at 40 °C for 16 h. The solvent was evaporated and the residue was dissolved in CH_2Cl_2 (10 mL) and stirred vigorously with saturated solution of $NaHCO_3$ (10 mL). After 1 h, the reaction mixture was transferred into a separating funnel and the layers were separated. The aqueous layer was extracted with CH_2Cl_2 (2 X 10 mL). The combined organic layers were washed with saturated solution of $NaHCO_3$ (15 mL), brine (15 mL), dried over $MgSO_4$, filtered and concentrated under reduced pressure. The crude product was purified by flash chromatography using EtOAc:DCM 1:25 as mobile phase followed by washing with EtOAc (3 X 3 mL) to afford **2i** as a white solid (0.240 g, 0.402 mmol, 35%). Mp: 237–240 °C; TLC (EtOAc:DCM 1:15): R_f = 0.56, $KMnO_4$; ^{1}H NMR (400 MHz, $CDCl_3$): δ 8.35 (dd, *J* = 8.0, 1.2 Hz, 1H, Ar*H*), 8.30 (dd, *J* = 7.2, 2.1 Hz, 1H, Ar*H*), 7.78 – 7.71 (m, 6H, Ar*H*), 6.94 (s, 2H, Ar*H*), 2.80 (s, 6H, 2 X ArC*H*$_3$), 2.27 (s, 3H, ArC*H*$_3$); ^{13}C NMR (100 MHz, $CDCl_3$): δ 161.1, 142.4, 139.9, 135.4, 134.7, 134.3, 133.0, 132.2 (q, $J_{C\text{-}F}$

= 33.5 Hz), 132.0, 131.8, 131.7, 127.2, 125.7 (q, $J_{C\text{-}F}$ = 3.8 Hz), 124.4, 123.5 (q, $J_{C\text{-}F}$ = 272.4 Hz), 115.3, 104.0, 60.3, 23.2, 21.0; IR ν 3299 (w), 2935 (w), 2159 (w), 1762 (w), 1619 (m), 1573 (m), 1537 (m), 1435 (w), 1361 (m), 1324 (s), 1251 (m), 1169 (s), 1122 (s), 1060 (w), 1013 (w), 902 (w), 852 (m), 815 (m); HRMS (ESI) calcd. for $C_{25}H_{20}F_3INO_3S^+$ $[M+H]^+$ 598.0155; found 598.0167.

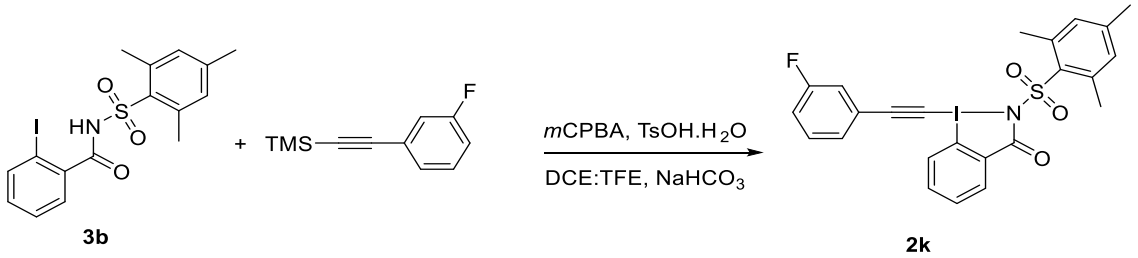
***N*-[Mesitylsulfonyl]-1-[(4-ethynylphenyl)ethynyl]-1,2-benziodazol-3(1*H*)-one (2j)**



3b **2j**

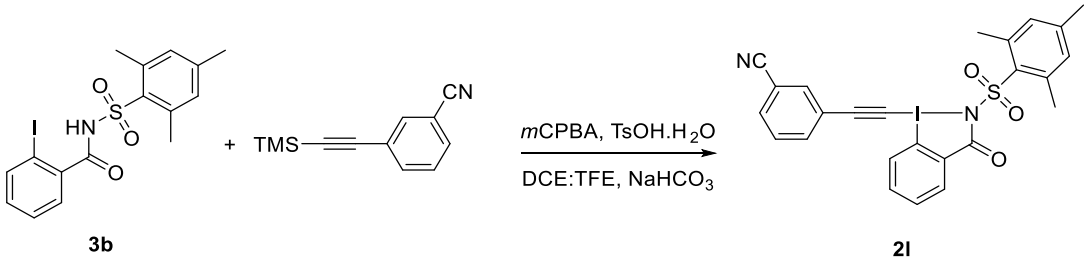
In a 5 mL sealed tube, 2-iodo-*N*-(mesitylsulfonyl)benzamide (**3b**) (0.500 g, 1.17 mmol, 1.00 equiv), 4-methylbenzenesulfonic acid hydrate (0.201 g, 1.17 mmol, 1.00 equiv) and *m*CPBA (0.287 g, 77% purity, 2.56 mmol, 1.10 equiv) were suspended in DCE:TFE 1:1 (2 mL) and stirred for 1 h at 40 °C. 1,4-Diethynylbenzene (0.206 g, 1.63 mmol, 1.40 equiv) was then added and the reaction mixture was stirred at 40 °C for 16 h. The solvent was evaporated and the residue was dissolved in CH_2Cl_2 (10 mL) and stirred vigorously with saturated solution of $NaHCO_3$ (10 mL). After 1 h, the reaction mixture was transferred into a separating funnel and the layers were separated. The aqueous layer was extracted with CH_2Cl_2 (2 X 10 mL). The combined organic layers were washed with saturated solution of $NaHCO_3$ (15 mL), brine (15 mL), dried over $MgSO_4$, filtered and concentrated under reduced pressure. The crude product was purified by flash chromatography using EtOAc:DCM 1:20 as mobile phase followed by washing with EtOAc to afford **2j** as a pale yellow solid (0.100 g, 0.181 mmol, 16%). Mp: 205-209 °C; TLC (EtOAc:DCM 1:20): R_f = 0.29, $KMnO_4$; ^{1}H NMR (400 MHz, $CDCl_3$): δ 8.35 (dd, *J* = 7.9, 1.4 Hz, 1H, Ar*H*), 8.29 (dd, *J* = 7.2, 2.2 Hz, 1H, Ar*H*), 7.77 – 7.68 (m, 2H, Ar*H*), 7.54 (s, 4H, Ar*H*), 6.93 (s, 2H, Ar*H*), 3.27 (s, 1H, CC*H*), 2.80 (s, 6H, 2 X ArCH_3), 2.27 (s, 3H, ArCH_3); ^{13}C NMR (100 MHz, $CDCl_3$): δ 161.2, 142.3, 139.9, 135.3, 134.8, 134.4, 132.7, 132.4, 132.0, 131.7, 131.7, 127.2, 124.6, 120.8, 115.4, 105.4, 83.0, 81.0, 59.0, 23.2, 21; IR ν 3074 (w), 2920 (w), 2145 (w), 1655 (m), 1600 (m), 1505 (m), 1438 (w), 1294 (s), 1239 (m), 1131 (s), 1054 (w), 898 (m), 859 (s), 839 (m); HRMS (ESI) calcd. for $C_{26}H_{21}INO_3S^+$ $[M+H]^+$ 554.0281; found 554.0281.

***N*-[Mesitylsulfonyl]-1-[(3-fluorophenyl)ethynyl]-1,2-benziodazol-3(1*H*)-one (2k)**



In a 5 mL sealed tube, 2-iodo-*N*-(mesitylsulfonyl)benzamide (**3b**) (0.500 g, 1.17 mmol, 1.00 equiv), 4-methylbenzenesulfonic acid hydrate (0.201 g, 1.17 mmol, 1.00 equiv) and *m*CPBA (0.287 g, 77% purity, 2.56 mmol, 1.10 equiv) were suspended in DCE:TFE 1:1 (2 mL) and stirred for 1 h at 40 °C. ((3-Fluorophenyl)ethynyl)trimethylsilane (0.314 g, 1.63 mmol, 1.40 equiv) was then added and the reaction mixture was stirred at 40 °C for 16 h. The solvent was evaporated and the residue was dissolved in CH_2Cl_2 (10 mL) and stirred vigorously with saturated solution of $NaHCO_3$ (10 mL). After 1 h, the reaction mixture was transferred into a separating funnel and the layers were separated. The aqueous layer was extracted with CH_2Cl_2 (2 X 10 mL). The combined organic layers were washed with saturated solution of $NaHCO_3$ (15 mL), brine (15 mL), dried over $MgSO_4$, filtered and concentrated under reduced pressure. The crude product was purified by flash chromatography using EtOAc:DCM 1:20 as mobile phase followed by washing with EtOAc (3 X 3 mL) to afford **2k** as a white solid (0.275 g, 0.487 mmol, 43%). Mp: 221–225 ^oC; TLC (EtOAc:DCM 1:20): R_f = 0.48, $KMnO_4$; ^1H NMR (400 MHz, $CDCl_3$): δ 8.35 (dd, *J* = 8.1, 1.0 Hz, 1H, Ar*H*), 8.29 (dd, *J* = 7.3, 2.0 Hz, 1H, Ar*H*), 7.79 – 7.66 (m, 2H, Ar*H*), 7.43 – 7.36 (m, 2H, Ar*H*), 7.27 – 7.25 (m, 1H, Ar*H*) 7.24 – 7.14 (m, 1H, Ar*H*), 6.92 (s, 2H, Ar*H*), 2.79 (s, 6H, 2 X ArC*H*$_3$), 2.26 (s, 3H, ArC*H*$_3$); ^{13}C NMR (100 MHz, $CDCl_3$): δ 162.2 (d, *J* = 248.7 Hz), 161.3, 142.3, 139.8, 135.3, 134.8, 134.3, 131.9, 131.7, 131.7, 130.5 (d, *J* = 8.4 Hz), 128.7 (d, *J* = 3.2 Hz), 127.3, 122.3 (d, *J* = 9.2 Hz), 119.5 (d, *J* = 23.3 Hz), 118.2 (d, *J* = 21.4 Hz), 115.3, 104.4 (d, *J* = 2.9 Hz), 58.3, 23.2, 21.0; IR ν 2972 (w), 2922 (w), 2145 (w), 1654 (m), 1604 (w), 1580 (w), 1480 (w), 1438 (w), 1293 (s), 1137 (s), 1055 (w), 940 (w), 895 (m), 851 (s); HRMS (ESI) calcd. for $C_{24}H_{20}FINO_3S^+$ $[M+H]^+$ 548.0187; found 548.0188.

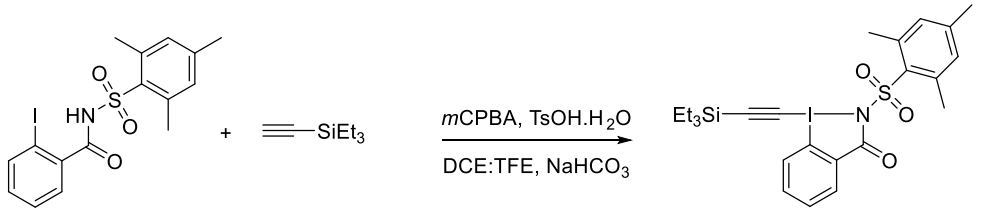
***N*-[Mesitylsulfonyl]-1-[(3-cyanophenyl)ethynyl]-1,2-benziodazol-3(1*H*)-one (2l)**



3b **2l**

In a 5 mL sealed tube, 2-iodo-*N*-(mesitylsulfonyl)benzamide (**3b**) (0.500 g, 1.17 mmol, 1.00 equiv), 4-methylbenzenesulfonic acid hydrate (0.201 g, 1.17 mmol, 1.00 equiv) and *m*CPBA (0.287 g, 77% purity, 2.56 mmol, 1.10 equiv) were suspended in DCE:TFE 1:1 (2 mL) and stirred for 1 h at 40 °C. 3-((Trimethylsilyl)ethynyl)benzonitrile (0.325 g, 1.63 mmol, 1.40 equiv) was then added and the reaction mixture was stirred at 40 °C for 16 h. The solvent was evaporated and the residue was dissolved in CH_2Cl_2 (10 mL) and stirred vigorously with saturated solution of $NaHCO_3$ (10 mL). After 1 h, the reaction mixture was transferred into a separating funnel and the layers were separated. The aqueous layer was extracted with CH_2Cl_2 (2 X 10 mL). The combined organic layers were washed with saturated solution of $NaHCO_3$ (15 mL), brine (15 mL), dried over $MgSO_4$, filtered and concentrated under reduced pressure. The crude product was purified by flash chromatography using EtOAc:DCM 1:20 as mobile phase followed by washing with EtOAc (3 X 3 mL) to afford **2l** as a white solid (0.270 g, 0.487 mmol, 42%). Mp: 230–234 °C; TLC (EtOAc:DCM 1:20): R_f = 0.29, $KMnO_4$; ^{1}H NMR (400 MHz, $CDCl_3$): δ 8.33 (dd, *J* = 8.0, 1.3 Hz, 1H, Ar*H*), 8.29 (dd, *J* = 7.2, 2.2 Hz, 1H, Ar*H*), 7.86 – 7.82 (m, 1H, Ar*H*), 7.82 – 7.69 (m, 4H, Ar*H*), 7.60 – 7.54 (m, 1H, Ar*H*), 6.93 (s, 2H, Ar*H*), 2.79 (s, 6H, 2 X ArC*H*$_3$), 2.27 (s, 3H, ArC*H*$_3$); ^{13}C NMR (100 MHz, $CDCl_3$): δ 161.1, 142.5, 139.9, 136.6, 135.9, 135.4, 134.6, 134.3, 133.6, 132.1, 131.9, 131.7, 129.8, 127.2, 122.4, 117.4, 115.2, 113.5, 102.7, 61.0, 23.2, 21.0; IR ν 3068 (w), 2235 (w), 2138 (w), 1763 (w), 1654 (m), 1477 (w), 1438 (w), 1295 (s), 1247 (w), 1133 (s), 1053 (w), 899 (m), 852 (s); HRMS (ESI) calcd. for $C_{25}H_{19}IN_2NaO_3S^+$ $[M+Na]^+$ 577.0053; found 577.0055.

***N*-[Mesitylsulfonyl]-1-[(triethylsilyl)ethynyl]-1,2-benziodazol-3(1*H*)-one (2m)**

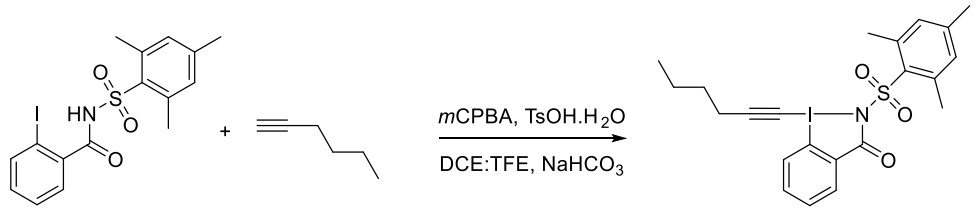


3b **2m**

In a 5 mL sealed tube, 2-iodo-*N*-(mesitylsulfonyl)benzamide (**3b**) (0.500 g, 1.17 mmol, 1.00 equiv), 4-methylbenzenesulfonic acid hydrate (0.201 g, 1.17 mmol, 1.00 equiv) and *m*CPBA

(0.287 g, 77% purity, 2.56 mmol, 1.10 equiv) were suspended in DCE:TFE 1:1 (2 mL) and stirred for 1 h at 40 °C. Triethyl(ethynyl)silane (0.229 g, 1.63 mmol, 1.40 equiv) was then added and the reaction mixture was stirred at 40 °C for 16 h. The solvent was evaporated and the residue was dissolved in CH_2Cl_2 (10 mL) and stirred vigorously with saturated solution of $NaHCO_3$ (10 mL). After 1 h, the reaction mixture was transferred into a separating funnel and the layers were separated. The aqueous layer was extracted with CH_2Cl_2 (2 X 10 mL). The combined organic layers were washed with saturated solution of $NaHCO_3$ (15 mL), brine (15 mL), dried over $MgSO_4$, filtered and concentrated under reduced pressure. The crude product was purified by flash chromatography using EtOAc:Pentane 1:4.5 as mobile phase to afford **2m** as a white solid (295 mg, 0.520 mmol, 45%). Mp: 196–200 °C; TLC (EtOAc:Pentane 1:4.5): R_f = 0.3, $KMnO_4$; ^{1}H NMR (400 MHz, $CDCl_3$): δ 8.38 – 8.35 (m, 1H, Ar*H*), 8.29 – 8.27 (m, 1H, Ar*H*),7.84 – 7.58 (m, 2H, Ar*H*), 6.92 (s, 2H, Ar*H*), 2.78 (s, 6H, 2 X ArC*H*$_3$), 2.26 (s, 3H, ArC*H*$_3$), 1.08 (t, *J* = 7.9 Hz, 9H, 3 X CH_2C*H*$_3$), 0.74 (q, *J* = 7.9 Hz, 6H, 3 X C*H*$_2$$CH_3$); ^{13}C NMR (100 MHz, $CDCl_3$): δ 161.1, 142.2, 139.8, 135.1, 134.9, 134.4, 131.9, 131.6, 131.6, 127.0, 114.8, 114.7, 70.6, 23.2, 21.0, 7.4, 4.1; IR ν 2936 (w), 2868 (w), 2165 (w), 1653 (m), 1603 (w), 1438 (w), 1380 (w), 1290 (s), 1246 (w), 1169 (w), 1134 (s), 1055 (w), 1003 (w), 895 (m), 854 (s); HRMS (ESI) calcd. for $C_{24}H_{30}INNaO_3SSi^+$ $[M+Na]^+$ 590.0653; found 590.0652.

***N*-[Mesitylsulfonyl]-1-[(butyl)ethynyl]-1,2-benziodazol-3(1*H*)-one (2n)**

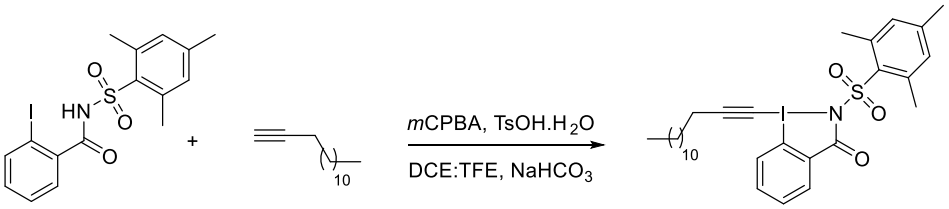


3b 2n

In a 5 mL sealed tube, 2-iodo-*N*-(mesitylsulfonyl)benzamide (**3b**) (0.500 g, 1.17 mmol, 1.00 equiv), 4-methylbenzenesulfonic acid hydrate (0.201 g, 1.17 mmol, 1.00 equiv) and *m*CPBA (0.287 g, 77% purity, 2.56 mmol, 1.10 equiv) were suspended in DCE:TFE 1:1 (2 mL) and stirred for 1 h at 40 °C. Hex-1-yne (0.134 g, 0.190 mL, 1.63 mmol, 1.40 equiv) was then added and the reaction mixture was stirred at 40 °C for 16 h. The solvent was evaporated and the residue was dissolved in CH_2Cl_2 (10 mL) and stirred vigorously with saturated solution of $NaHCO_3$ (10 mL). After 1 h, the reaction mixture was transferred into a separating funnel and the layers were separated. The aqueous layer was extracted with CH_2Cl_2 (2 X 10 mL). The combined organic layers were washed with saturated solution of $NaHCO_3$ (15 mL), brine (15 mL), dried over $MgSO_4$, filtered and concentrated under reduced pressure. The crude product

was purified by flash chromatography using EtOAc:Pentane 1:4 as mobile phase followed by recrystallization in ethyl acetate (4 mL) to afford **2n** as a white solid (194 mg, 0.380 mmol, 33%). Mp: 205–210 °C; TLC (EtOAc:Pentane 1:4): R_f = 0.3, $KMnO_4$; ^{1}H NMR (400 MHz, $CDCl_3$): δ 8.30 – 8.25 (m, 2H, Ar*H*), 7.75 – 7.65 (m, 2H, Ar*H*), 6.91 (s, 2H, Ar*H*), 2.78 (s, 6H, 2 X ArC*H*$_3$), 2.58 (t, *J* = 7.1 Hz, 2H, CCC*H*$_2$), 2.25 (s, 3H, ArC*H*$_3$), 1.69 – 1.60 (m, 2H, CCCH$_2$C*H*$_2$), 1.57 – 1.42 (m, 2H, C*H*$_2$CH$_3$), 0.98 (t, *J* = 7.3 Hz, 3H, CH$_2$C*H*$_3$); ^{13}C NMR (100 MHz, $CDCl_3$): δ 161.3, 142.1, 139.7, 135.0, 135.0, 134.4, 131.8, 131.6, 131.5, 127.1, 114.8, 109.7, 45.5, 30.1, 23.2, 22.0, 21.0, 20.1, 13.5; IR ν 2933 (w), 2868 (w), 2166 (w), 1653 (m), 1603 (w), 1438 (w), 1380 (w), 1290 (s), 1246 (w), 1168 (w), 1134 (s), 1053 (w), 1003 (w), 895 (m), 854 (s); HRMS (ESI) calcd. for $C_{22}H_{25}INO_3S^+$ $[M+H]^+$ 510.0594; found 510.0609.

N-[Mesitylsulfonyl]-1-[(dodecyl)ethynyl]-1,2-benziodazol-3(1*H*)-one (2o)

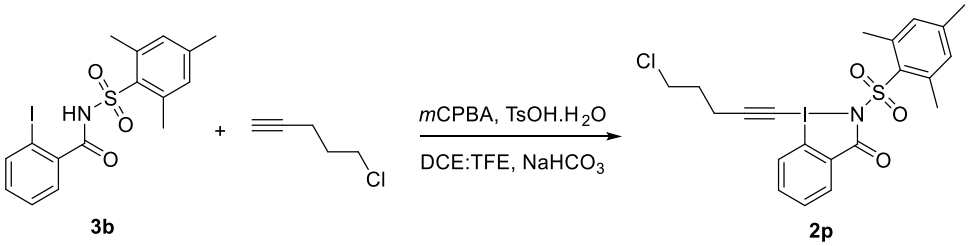


3b **2o**

In a 5 mL sealed tube, 2-iodo-*N*-(mesitylsulfonyl)benzamide (**3b**) (0.500 g, 1.17 mmol, 1.00 equiv), 4-methylbenzenesulfonic acid hydrate (0.201 g, 1.17 mmol, 1.00 equiv) and *m*CPBA (0.287 g, 77% purity, 2.56 mmol, 1.10 equiv) were suspended in DCE:TFE 1:1 (2 mL) and stirred for 1 h at 40 °C. Tetradec-1-yne (0.317 g, 0.400 mL, 1.63 mmol, 1.40 equiv) was then added and the reaction mixture was stirred at 40 °C for 16 h. The solvent was evaporated and the residue was dissolved in CH_2Cl_2 (10 mL) and stirred vigorously with saturated solution of $NaHCO_3$ (10 mL). After 1 h, the reaction mixture was transferred into a separating funnel and the layers were separated. The aqueous layer was extracted with CH_2Cl_2 (2 X 10 mL). The combined organic layers were washed with saturated solution of $NaHCO_3$ (15 mL), brine (15 mL), dried over $MgSO_4$, filtered and concentrated under reduced pressure. The crude product was purified by flash chromatography using EtOAc:Pentane 1:4 as mobile phase followed by recrystallization in ethyl acetate (5 mL) to afford **2o** as a white solid (0.207 g, 0.333 mmol, 29%). Mp: 182–188 °C; TLC (EtOAc:Pentane 1:2): R_f = 0.6, $KMnO_4$; ^{1}H NMR (400 MHz, $CDCl_3$): δ 8.32 – 8.24 (m, 2H, Ar*H*), 7.74 – 7.65 (m, 2H, Ar*H*), 6.92 (s, 2H, Ar*H*), 2.77 (s, 6H, 2 X ArC*H*$_3$), 2.58 (t, *J* = 7.1 Hz, 2H, CCC*H*$_2$), 2.25 (s, 3H, ArC*H*$_3$), 1.65 (p, *J* = 7.1 Hz, 2H, CCCH$_2$C*H*$_2$CH$_2$), 1.51 – 1.41 (m, 2H, C*H*$_2$), 1.38 – 1.22 (m, 16H, 10 X C*H*$_2$), 0.87 (t, 3H, CH$_2$CH$_3$); ^{13}C NMR (101 MHz, $CDCl_3$): δ 161.3, 142.1, 139.8, 135.0, 135.0, 134.5, 131.8, 131.6, 131.5, 127.1, 114.9, 109.8, 45.6, 31.9, 29.7, 29.6, 29.5, 29.3, 29.1, 28.9, 28.2, 27.7, 23.2,

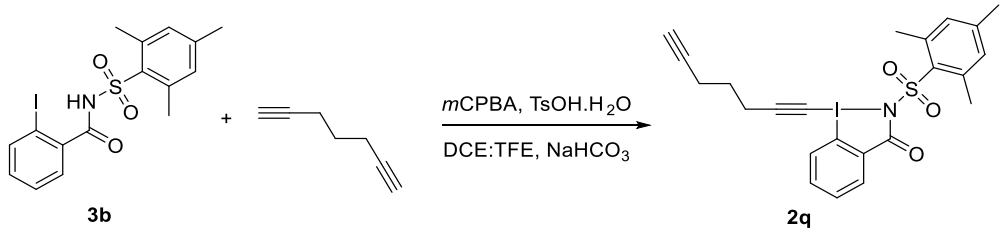
22.7, 21.0, 20.4, 14.1; IR ν 3056 (w), 2920 (s), 2850 (m), 2166 (w), 1652 (m), 1606 (w), 1470 (w), 1441 (w), 1298 (s), 1247 (w), 1165 (w), 1139 (s), 1056 (w), 898 (w), 856 (s); HRMS (ESI) calcd. for $C_{30}H_{41}INO_3S^+$ $[M+H]^+$ 622.1846; found 622.1845.

***N*-[Mesitylsulfonyl]-1-[(3-chloropropyl)ethynyl]-1,2-benziodazol-3(1*H*)-one (2p)**



In a 5 mL sealed tube, 2-iodo-*N*-(mesitylsulfonyl)benzamide (**3b**) (0.500 g, 1.17 mmol, 1.00 equiv), 4-methylbenzenesulfonic acid hydrate (0.201 g, 1.17 mmol, 1.00 equiv) and *m*CPBA (0.287 g, 77% purity, 2.56 mmol, 1.10 equiv) were suspended in DCE:TFE 1:1 (2 mL) and stirred for 1 h at 40 °C. 5-Chloropent-1-yne (0.167 g, 0.180 mL, 1.63 mmol, 1.40 equiv) was then added and the reaction mixture was stirred at 40 °C for 16 h. The solvent was evaporated and the residue was dissolved in CH_2Cl_2 (10 mL) and stirred vigorously with saturated solution of $NaHCO_3$ (10 mL). After 1 h, the reaction mixture was transferred into a separating funnel and the layers were separated. The aqueous layer was extracted with CH_2Cl_2 (2 X 10 mL). The combined organic layers were washed with saturated solution of $NaHCO_3$ (15 mL), brine (15 mL), dried over $MgSO_4$, filtered and concentrated under reduced pressure. The crude product was purified by flash chromatography using EtOAc:pentane 1:1 as mobile phase to afford **2p** as a white solid (186 mg, 0.350 mmol, 30%). Mp: 209–212 ^oC; TLC (EtOAc:pentane 1:1): R_f = 0.5, $KMnO_4$; ^1H NMR (400 MHz, $CDCl_3$): δ 8.32 – 8.24 (m, 2H, Ar*H*), 7.77 – 7.65 (m, 2H, Ar*H*), 6.92 (s, 2H, Ar*H*), 3.71 (t, *J* = 6.1 Hz, 2H, CH_2CH_2Cl), 2.81 (t, *J* = 6.9 Hz, 2H, $CCCH_2CH_2$), 2.77 (s, 6H, 2 X $ArCH_3$), 2.26 (s, 3H, $ArCH_3$), 2.11 (p, *J* = 6.8 Hz, 2H, $CH_2CH_2CH_2Cl$); ^{13}C NMR (100 MHz, $CDCl_3$): δ 161.2, 142.2, 139.8, 135.1, 134.9, 134.4, 131.9, 131.6, 131.6, 127.1, 114.8, 107.0, 47.5, 43.2, 30.6, 23.2, 21.0, 17.8; IR ν 2942 (w), 2161 (w), 1657 (m), 1602 (w), 1586 (w), 1438 (w), 1313 (m), 1290 (s), 1247 (w), 1170 (w), 1133 (s), 1055 (w), 898 (m), 857 (s); HRMS (ESI) calcd. for $C_{21}H_{22}ClINO_3S^+$ $[M+H]^+$ 530.0048; found 530.0050.

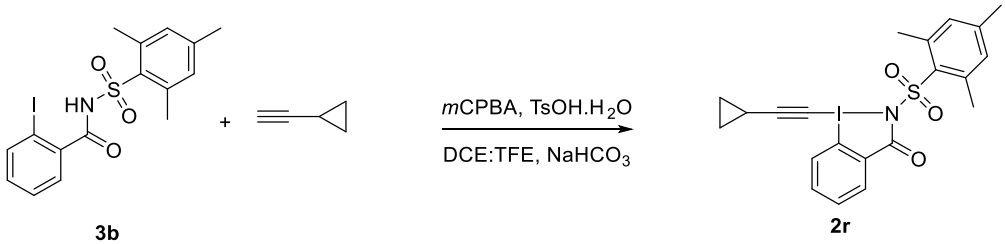
***N*-[Mesitylsulfonyl]-1-[hepta-1,6-diynyl]-1,2-benziodazol-3(1*H*)-one (2q)**



3b 2q

In a 5 mL sealed tube, 2-iodo-*N*-(mesitylsulfonyl)benzamide (**3b**) (0.500 g, 1.17 mmol, 1.00 equiv), 4-methylbenzenesulfonic acid hydrate (0.201 g, 1.17 mmol, 1.00 equiv) and *m*CPBA (0.287 g, 77% purity, 2.56 mmol, 1.10 equiv) were suspended in DCE:TFE 1:1 (2 mL) and stirred for 1 h at 40 °C. Hepta-1,6-diyne (0.150 g, 0.190 mL, 1.63 mmol, 1.40 equiv) was then added and the reaction mixture was stirred at 40 °C for 16 h. The solvent was evaporated and the residue was dissolved in CH_2Cl_2 (10 mL) and stirred vigorously with saturated solution of $NaHCO_3$ (10 mL). After 1 h, the reaction mixture was transferred into a separating funnel and the layers were separated. The aqueous layer was extracted with CH_2Cl_2 (2 X 10 mL). The combined organic layers were washed with saturated solution of $NaHCO_3$ (15 mL), brine (15 mL), dried over $MgSO_4$, filtered and concentrated under reduced pressure. The crude product was purified by flash chromatography using EtOAc:Pentane 1:2 as mobile phase followed by washing with EtOAc (2 X 3 mL) to afford **2q** as a white solid (0.120 g, 0.231 mmol, 20%). Mp: 178–182 ^oC; TLC (EtOAc:Pentane 1:2): R_f = 0.4, $KMnO_4$; ^1H NMR (400 MHz, $CDCl_3$): δ 8.32 – 8.24 (m, 2H, Ar*H*), 7.76 – 7.65 (m, 2H, Ar*H*), 6.92 (s, 2H, Ar*H*), 2.77 (s, 6H, 2 X ArCH_3), 2.74 (d, *J* = 7.1 Hz, 2H, CH_2), 2.41 (td, *J* = 6.8, 2.7 Hz, 2H, CH_2), 2.26 (s, 3H, ArCH_3), 2.05 (t, *J* = 2.7 Hz, 1H, C*H*), 1.88 (p, *J* = 7.0 Hz, 2H, CH_2); ^{13}C NMR (101 MHz, $CDCl_3$): δ 161.3, 142.2, 139.8, 135.1, 134.9, 134.4, 131.8, 131.6, 131.5, 127.1, 114.8, 108.0, 82.5, 69.8, 46.8, 26.8, 23.2, 21.0, 19.3, 17.6; IR ν 3232 (w), 2166 (w), 1648 (s), 1604 (w), 1438 (w), 1315 (s), 1295 (s), 1247 (w), 1176 (w), 1136 (s), 1057 (w), 1004 (w), 900 (m), 858 (s); HRMS (ESI) calcd. for $C_{23}H_{23}INO_3S^+$ $[M+H]^+$ 520.0438; found 520.0444.

***N*-[Mesitylsulfonyl]-1-[(cyclopropyl)ethynyl]-1,2-benziodazol-3(1*H*)-one (2r)**

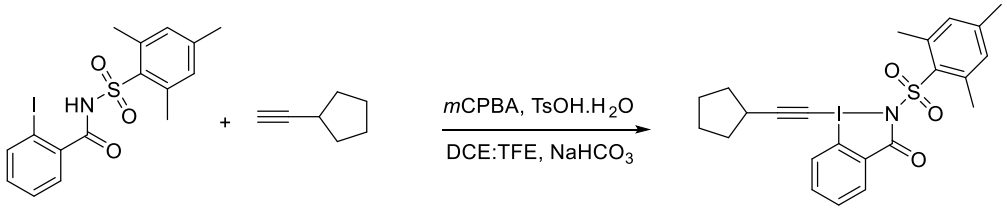


3b 2r

In a 5 mL sealed tube, 2-iodo-*N*-(mesitylsulfonyl)benzamide (**3b**) (0.500 g, 1.17 mmol, 1.00 equiv), 4-methylbenzenesulfonic acid hydrate (0.201 g, 1.17 mmol, 1.00 equiv) and *m*CPBA

(0.287 g, 77% purity, 2.56 mmol, 1.10 equiv) were suspended in DCE:TFE 1:1 (2 mL) and stirred for 1 h at 40 °C. Ethynylcyclopropane (0.108 g, 0.140 mL, 1.63 mmol, 1.40 equiv) was then added and the reaction mixture was stirred at 40 °C for 16 h. The solvent was evaporated and the residue was dissolved in CH_2Cl_2 (10 mL) and stirred vigorously with saturated solution of $NaHCO_3$ (10 mL). After 1 h, the reaction mixture was transferred into a separating funnel and the layers were separated. The aqueous layer was extracted with CH_2Cl_2 (2 X 10 mL). The combined organic layers were washed with saturated solution of $NaHCO_3$ (15 mL), brine (15 mL), dried over $MgSO_4$, filtered and concentrated under reduced pressure. The crude product was purified by flash chromatography using EtOAc:Pentane 1:1 as mobile phase followed by washing with EtOAc (2 X 3 mL) to afford **2r** as a white solid (0.100 g, 0.203 mmol, 18%). Mp: 212–217 ^{o}C; TLC (EtOAc:Pentane 1:1): R_f = 0.4, $KMnO_4$; ^{1}H NMR (400 MHz, $CDCl_3$): δ 8.27 (td, *J* = 7.8, 1.5 Hz, 2H, Ar*H*), 7.80 – 7.55 (m, 2H, Ar*H*), 6.91 (s, 2H, Ar*H*), 2.77 (s, 6H, 2 X ArC*H*$_3$), 2.25 (s, 3H, ArC*H*$_3$), 1.84 – 1.50 (m, 1H, CC*H*$(CH_2)_2$), 1.17 – 0.85 (m, 4H, 2 X C*H*$_2$); ^{13}C NMR (100 MHz, $CDCl_3$): δ 161.3, 142.1, 139.7, 135.0, 135.0, 134.5, 131.8, 131.6, 131.5, 127.0, 115.1, 113.4, 41.3, 23.2, 21.0, 9.8, 1.0; IR ν 3010 (w), 2853 (w), 2164 (w), 1709 (w), 1653 (m), 1605 (w), 1476 (w), 1437 (w), 1313 (m), 1292 (s), 1247 (w), 1167 (w), 1131 (s), 1055 (w), 965 (w), 896 (m), 858 (s), 821 (w); HRMS (ESI) calcd. for $C_{21}H_{21}INO_3S^+$ $[M+H]^+$ 494.0281; found 494.0289.

***N*-[Mesitylsulfonyl]-1-[(cyclopentyl)ethynyl]-1,2-benziodazol-3(1*H*)-one (2s)**

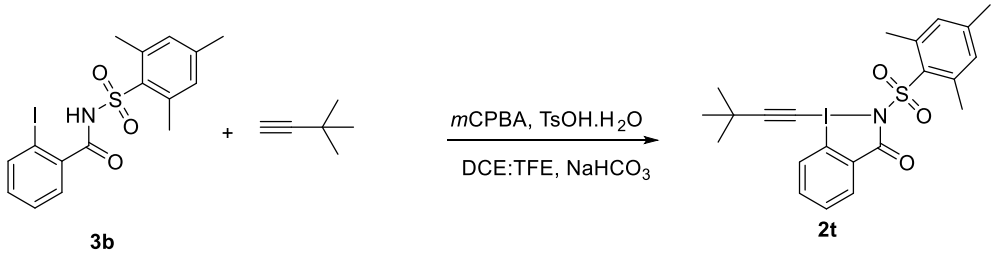


3b **2s**

In a 5 mL sealed tube, 2-iodo-*N*-(mesitylsulfonyl)benzamide (**3b**) (0.500 g, 1.17 mmol, 1.00 equiv), 4-methylbenzenesulfonic acid hydrate (0.201 g, 1.17 mmol, 1.00 equiv) and *m*CPBA (0.287 g, 77% purity, 2.56 mmol, 1.10 equiv) were suspended in DCE:TFE 1:1 (2 mL) and stirred for 1 h at 40 °C. Ethynylcyclopentane (0.154 g, 0.190 mL, 1.63 mmol, 1.40 equiv) was then added and the reaction mixture was stirred at 40 °C for 16 h. The solvent was evaporated and the residue was dissolved in CH_2Cl_2 (10 mL) and stirred vigorously with saturated solution of $NaHCO_3$ (10 mL). After 1 h, the reaction mixture was transferred into a separating funnel and the layers were separated. The aqueous layer was extracted with CH_2Cl_2 (2 X 10 mL). The combined organic layers were washed with saturated solution of $NaHCO_3$ (15 mL), brine (15

mL), dried over $MgSO_4$, filtered and concentrated under reduced pressure. The crude product was purified by flash chromatography using EtOAc:Pentane 1:1 as mobile phase followed by washing with EtOAc to afford **2s** as a white solid (0.167 g, 0.320 mmol, 28%). Mp: 235–239 °C; TLC (EtOAc:Pentane 1:1): R_f = 0.4, $KMnO_4$; ^{1}H NMR (400 MHz, $CDCl_3$): δ 8.36 – 8.11 (m, 2H, Ar*H*), 7.81 – 7.55 (m, 2H, Ar*H*), 6.91 (s, 2H, Ar*H*), 3.06 – 2.91 (m, 1H, C*H*), 2.78 (s, 6H, 2 X ArC*H*$_3$), 2.25 (s, 3H, ArC*H*$_3$), 2.13 – 1.99 (m, 2H, C*H*$_2$), 1.88 – 1.73 (m, 4H, 2 X C*H*$_2$), 1.71 – 1.64 (m, 2H, C*H*$_2$); ^{13}C NMR (100 MHz, $CDCl_3$): δ 161.3, 142.1, 139.7, 135.1, 135.0, 134.5, 131.8, 131.6, 131.5, 127.0, 114.9, 114.1, 45.0, 33.8, 31.5, 25.2, 23.2, 21.0; IR ν 2966 (w), 2869 (w), 2167 (w), 1656 (m), 1605 (w), 1438 (w), 1294 (s), 1247 (w), 1136 (s), 1055 (w), 897 (w), 854 (s); HRMS (ESI) calcd. for $C_{23}H_{24}INNaO_3S^+$ $[M+Na]^+$ 544.0414; found 544.0414.

***N*-[Mesitylsulfonyl]-1-[(*t*-butyl)ethynyl]-1,2-benziodazol-3(1*H*)-one (2t)**

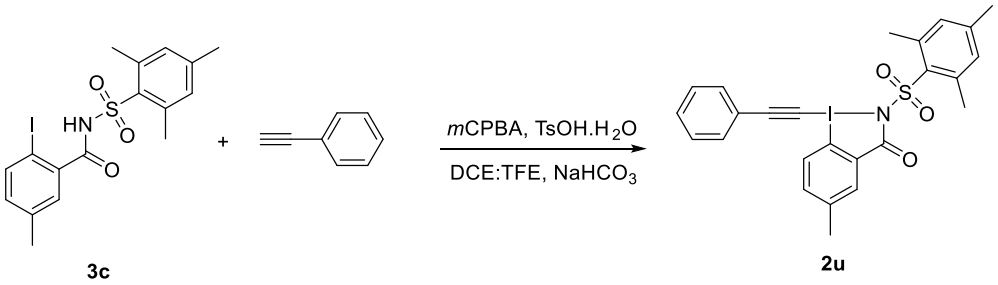


3b **2t**

In a 5 mL sealed tube, 2-iodo-*N*-(mesitylsulfonyl)benzamide (**3b**) (0.500 g, 1.17 mmol, 1.00 equiv), 4-methylbenzenesulfonic acid hydrate (0.201 g, 1.17 mmol, 1.00 equiv) and *m*CPBA (0.287 g, 77% purity, 2.56 mmol, 1.10 equiv) were suspended in DCE:TFE 1:1 (2 mL) and stirred for 1 h at 40 °C. 3,3-Dimethylbut-1-yne (0.134 g, 0.200 mL, 1.63 mmol, 1.40 equiv) was then added and the reaction mixture was stirred at 40 °C for 16 h. The solvent was evaporated and the residue was dissolved in CH_2Cl_2 (10 mL) and stirred vigorously with saturated solution of $NaHCO_3$ (10 mL). After 1 h, the reaction mixture was transferred into a separating funnel and the layers were separated. The aqueous layer was extracted with CH_2Cl_2 (2 X 10 mL). The combined organic layers were washed with saturated solution of $NaHCO_3$ (15 mL), brine (15 mL), dried over $MgSO_4$, filtered and concentrated under reduced pressure. The crude product was purified by flash chromatography using EtOAc:DCM 1:20 as mobile phase followed by washing with EtOAc (3 X 3 mL) to afford **2t** as a white solid (0.453 g, 0.888 mmol, 76%). Mp: 256–260 °C; TLC (EtOAc:DCM 1:20): R_f = 0.4, $KMnO_4$; ^{1}H NMR (400 MHz, $CDCl_3$): δ 8.27 (dd, *J* = 7.3, 2.0 Hz, 1H, Ar*H*), 8.24 (dd, *J* = 8.1, 1.0 Hz, 1H), 7.82 – 7.54 (m, 2H, Ar*H*), 6.92 (s, 2H, Ar*H*), 2.78 (s, 6H, 2 x ArC*H*$_3$), 2.25 (s, 3H, ArC*H*$_3$), 1.38 (s, 9H, *t*Bu); ^{13}C NMR (100 MHz, $CDCl_3$): δ 161.3, 142.1, 139.8, 135.0, 135.0, 134.5, 131.8, 131.6, 131.5, 126.9, 117.5, 114.9, 44.5, 30.5, 29.6, 23.2, 21.0; IR ν 2971 (w), 2927 (w), 2171 (w),

2140 (w), 1652 (m), 1604 (w), 1438 (w), 1293 (s), 1247 (w), 1135 (s), 1054 (w), 897 (m), 852 (s); HRMS (ESI) calcd. for $C_{22}H_{24}INNaO_3S^+$ $[M+Na]^+$ 532.0414; found 532.0394.

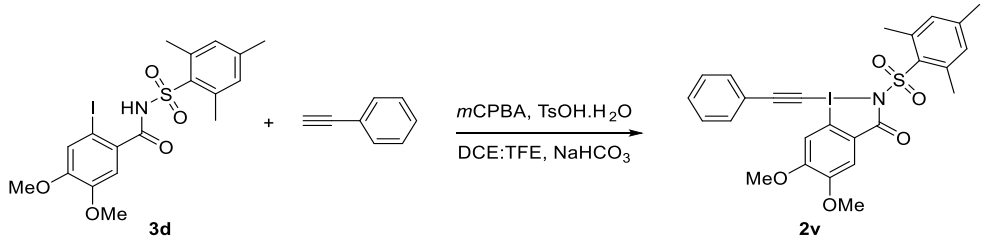
***N*-(Mesitylsulfonyl)-5-methyl-1-[phenylethynyl]-1,2-benziodazol-3(1*H*)-one (2u)**



3c **2u**

In a 5 mL sealed tube, 2-iodo-*N*-(mesitylsulfonyl)-5-methylbenzamide (**3c**) (0.700 g, 1.58 mmol, 1.00 equiv), 4-methylbenzenesulfonic acid hydrate (0.272 g, 1.58 mmol, 1.00 equiv) and *m*CPBA (0.389 g, 77% purity, 1.74 mmol, 1.10 equiv) were suspended in DCE:TFE 1:1 (2.8 mL) and stirred for 1 h at 40 °C. Ethynylbenzene (0.25 mL, 2.2 mmol, 1.4 equiv) was then added and the reaction mixture was stirred at 40 °C for 16 h. The solvent was evaporated and the residue was dissolved in CH_2Cl_2 (15 mL) and stirred vigorously with saturated solution of $NaHCO_3$ (15 mL). After 1 h, the reaction mixture was transferred into a separating funnel and the layers were separated. The aqueous layer was extracted with CH_2Cl_2 (2 X 10 mL). The combined organic layers were washed with saturated solution of $NaHCO_3$ (20 mL), brine (20 mL), dried over $MgSO_4$, filtered and concentrated under reduced pressure. The crude product was purified by flash chromatography using EtOAc:DCM 1:25 as mobile phase followed by washing with EtOAc (3 X 3 mL) to afford **2u** as a white solid (0.240 g, 0.442 mmol, 28%). Mp: 190–194 ^oC; TLC (EtOAc:DCM 1:25): R_f = 0.18, $KMnO_4$; ^1H NMR (400 MHz, $CDCl_3$): δ 8.19 (d, *J* = 8.5 Hz, 1H, Ar*H*), 8.10 (d, *J* = 2.0 Hz, 1H, Ar*H*), 7.62 – 7.57 (m, 2H, Ar*H*), 7.55 – 7.41 (m, 4H, Ar*H*), 6.92 (s, 2H, Ar*H*), 2.79 (s, 6H, 2 X ArC*H*$_3$), 2.43 (s, 3H, ArC*H*$_3$), 2.26 (s, 3H, ArC*H*$_3$); ^{13}C NMR (100 MHz, $CDCl_3$): δ 161.5, 142.5, 142.1, 139.8, 136.1, 134.9, 134.0, 132.8, 132.5, 131.6, 130.7, 128.7, 127.0, 120.6, 111.5, 106.1, 56.2, 23.2, 21.0, 20.8; IR ν 3055 (w), 2975 (w), 2936 (w), 2144 (w), 1649 (s), 1526 (w), 1452 (m), 1403 (w), 1293 (s), 1250 (m), 1215 (w), 1138 (s), 1054 (m), 1002 (w), 869 (s); HRMS (ESI) calcd. for $C_{25}H_{22}INNaO_3S^+$ $[M+Na]^+$ 566.0257; found 566.0232.

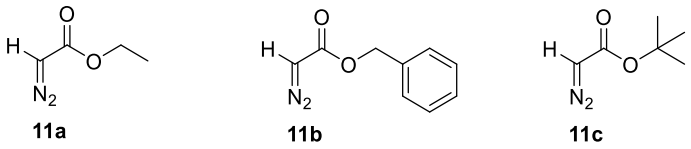
***N*-(Mesitylsulfonyl)-5,6-dimethoxy-1-[phenylethynyl]-1,2-benziodazol-3(1*H*)-one (2v)**



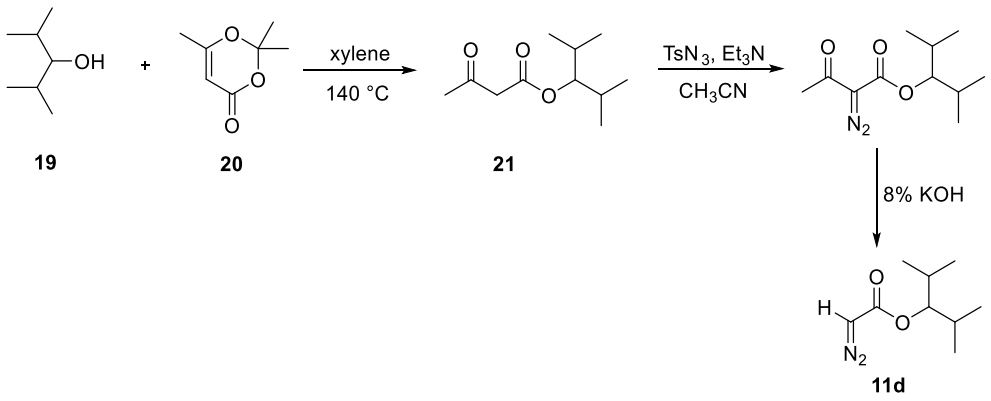
In a 5 mL sealed tube, 2-iodo-*N*-(mesitylsulfonyl)-4,5-dimethoxybenzamide (**3d**) (0.400 g, 0.817 mmol, 1.00 equiv), 4-methylbenzenesulfonic acid hydrate (0.141 g, 0.817 mmol, 1.00 equiv) and *m*CPBA (0.202 g, 77% purity, 0.899 mmol, 1.10 equiv) were suspended in DCE:TFE 1:1 (1.4 mL) and stirred for 1 h at 40 °C. Ethynylbenzene (0.130 mL, 1.15 mmol, 1.40 equiv) was then added and the reaction mixture was stirred at 40 °C for 16 h. The solvent was evaporated and the residue was dissolved in CH_2Cl_2 (10 mL) and stirred vigorously with saturated solution of $NaHCO_3$ (10 mL). After 1 h, the reaction mixture was transferred into a separating funnel and the layers were separated. The aqueous layer was extracted with CH_2Cl_2 (2 X 20 mL). The combined organic layers were washed with saturated solution of $NaHCO_3$ (15 mL), brine (15 mL), dried over $MgSO_4$, filtered and concentrated under reduced pressure. The crude product was purified by flash chromatography using EtOAc:DCM 1:25 as mobile phase followed by washing with EtOAc (3 X 3 mL) to afford **2v** as a white solid (0.155 g, 0.263 mmol, 32%). Mp: 204–206 ^oC; TLC (EtOAc:DCM 1:25): R_f = 0.31, $KMnO_4$; ^1H NMR (400 MHz, $CDCl_3$): δ 7.81 (s, 1H, Ar*H*), 7.73 (s, 1H, Ar*H*), 7.59 – 7.54 (m, 2H, Ar*H*), 7.52 – 7.40 (m, 3H Ar*H*), 6.93 (s, 2H, Ar*H* Mts), 3.94 (s, 3H, OCH_3), 3.90 (s, 3H, OCH_3), 2.79 (s, 6H, 2 X ArCH_3), 2.26 (s, 3H, ArCH_3); ^{13}C NMR (100 MHz, $CDCl_3$): δ 161.6, 154.9, 152.0, 142.2, 139.8, 135.0, 132.6, 131.7, 130.8, 128.9, 127.3, 120.5, 112.8, 108.9, 106.1, 104.6, 57.4, 56.6, 56.5, 23.2, 21.0; IR ν 2942 (w), 2141 (w), 1634 (w), 1600 (w), 1500 (m), 1443 (w), 1396 (m), 1288 (s), 1219 (w), 1182 (w), 1141 (s), 1053 (w), 1029 (w), 879 (m), 812 (w); HRMS (ESI) calcd. for $C_{26}H_{25}INO_5S^+$ $[M+H]^+$ 590.0493; found 590.0485.

3. Preparation of Diazo-compounds

Ethyl 2-diazoacetate (**11a**), benzyl 2-diazoacetate (**11b)** and *tert*-butyl 2-diazoacetate (**11c**) were directly purchased from Sigma Aldrich. The synthesis of diazo compounds (**11d-11l**) had been already described before. The procedures are taken here from the indicated publications to facilitate reproduction of the results by having all the data in the same file.



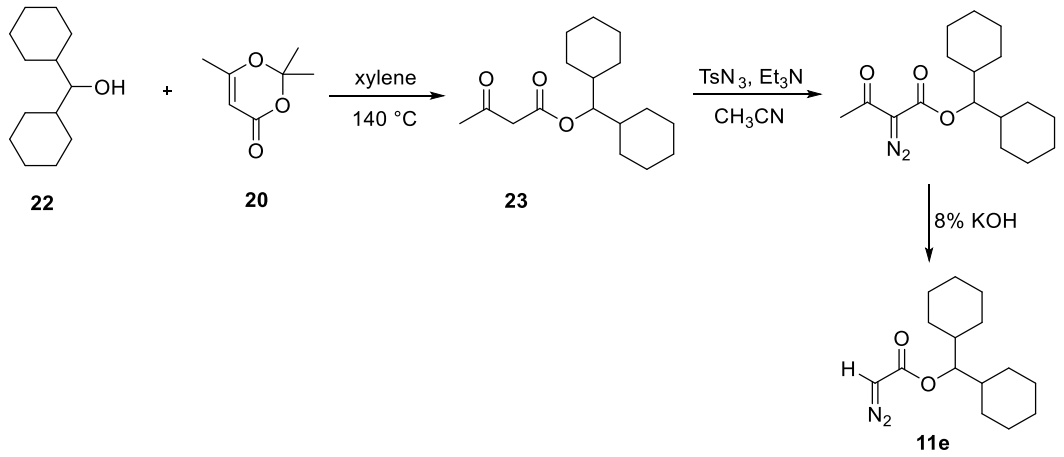
2,4-Dimethylpentan-3-yl 2-diazoacetate (11d)



Following a slightly modified procedure,[4] a mixture of 2,4-dimethylpentan-3-ol (**19**) (3.50 mL, 25.0 mmol, 1.00 equiv), 2,2,6-trimethyl-4*H*-1,3-dioxin-4-one (**20**) (3.55 g, 25.0 mmol, 1.00 equiv), and xylene (5 mL) was stirred at 140 °C for 2 h. After cooling to room temperature, the xylene was evaporated and the residue was purified by flash column chromatography using 1:50 EtOAc:pentane as mobile phase to afford 2,4-dimethylpentan-3-yl 3-oxobutanoate (**21)** as a colorless oil (4.2 g, 21 mmol, 84%). TLC (EtOAc:pentane, 1:20 v/v): R_f = 0.36, $KMnO_4$;^{1}H NMR (400 MHz, $CDCl_3$): δ 12.17 (s, 0.08H, O*H* of enol form), 4.97 (s, 0.08H, vinyl *H* of enol form), 4.60 (t, *J* = 6.1 Hz, 1H, OC*H*), 3.46 (s, 1.84H, CH_3COCH_2 of keto form), 2.26 (s, 2.76H, CH_3COCH_2 of keto form), 1.92 (s, 0.24H, CH_3 of enol form), 1.87 (dq, *J* = 13.3, 6.8 Hz, 2H, 2 X C*H*$(CH_3)_2$), 0.86 (d, *J* = 6.8 Hz, 6H, CH$(CH_3)_2$), 0.83 (d, *J* = 6.7 Hz, 6H, CH$(CH_3)_2$); ^{13}C NMR (100 MHz, $CDCl_3$): δ 200.7, 167.0, 84.0, 50.1, 30.3, 29.2, 19.4, 17.1. Enol form, ^{13}C NMR (100 MHz, $CDCl_3$): δ 175.2, 172.7, 89.6, 81.9. Some carbons of enol form were not resolved at 100 MHz. The characterization data of keto form corresponded to the reported values.[4]

Following a slightly modified procedure,[4] to a solution of 2,4-dimethylpentan-3-yl 3-oxobutanoate (**21**) (1.0 g, 5.0 mmol, 1.0 equiv) in acetonitrile (6 mL) was added triethylamine (660 mg, 6.50 mmol, 1.30 equiv). The reaction mixture was cooled in an ice bath and a solution of tosyl azide (1.1 g, 5.5 mmol, 1.1 equiv) in acetonitrile (6 mL) was added slowly. The reaction mixture was allowed to warm to room temperature. After stirring for 20 h, the solvent was removed under reduced pressure. The residue was dissolved in ether (30 mL) and washed with 8% aqueous KOH solution. The organic layer was separated, dried over $MgSO_4$, and evaporated. The crude product was re-dissolved in acetonitrile (15 mL) and 8% aqueous KOH (25 mL) solution was added at room temperature. After vigorous stirring for 4 h, water (15 mL) was added and the reaction mixture was extracted with diethyl ether (2 X 30 mL). The combined organic layers were dried over $MgSO_4$, and concentrated under reduced pressure. The crude product was purified by column chromatography using 1:20 Et_2O:pentane as mobile phase to afford 2,4-dimethylpentan-3-yl 2-diazoacetate (**11d)** as a yellow oil (800 mg, 4.35 mmol, 87%). TLC (Et_2O:pentane, 1:9 v/v): R_f = 0.55, $KMnO_4$; ^{1}H NMR (400 MHz, $CDCl_3$): δ 4.73 (br s, 1H, C*H*N_2), 4.62 (t, *J* = 6.2 Hz, 1H, OC*H*), 1.88 (dq, *J* = 13.4, 6.7 Hz, 2H, 2 X C*H*(CH_3)$_2$), 0.88 (d, *J* = 6.8 Hz, 6H, CH(C*H*$_3$)$_2$), 0.85 (d, *J* = 6.7 Hz, 6H, CH(C*H*$_3$)$_2$); ^{13}C NMR (100 MHz, $CDCl_3$): δ 167.0, 83.1, 45.8, 29.4, 19.5, 17.1. The characterization data corresponded to the reported values.[4]

Dicyclohexylmethyl 2-diazoacetate (11e)



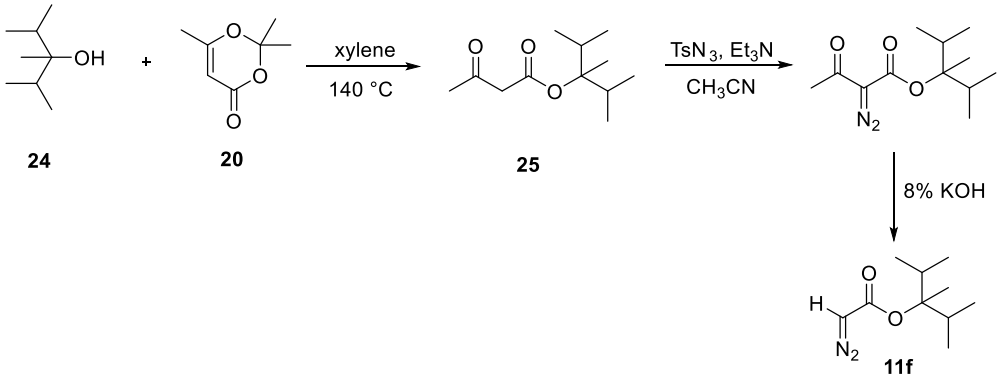
22 20 23 11e

Following a slightly modified procedure,[4] a mixture of dicyclohexylmethanol (**22**) (2.45 g, 12.5 mmol, 1.00 equiv), 2,2,6-trimethyl-4*H*-1,3-dioxin-4-one (**20**) (1.78 g, 12.5 mmol, 1.00 equiv), and xylene (2.5 mL) was stirred at 140 °C for 2 h. After cooling to room temperature, the xylene was evaporated and the residue was purified by flash column chromatography using 1:50 EtOAc:pentane as mobile phase to afford dicyclohexylmethyl 3-oxobutanoate (**23)** as a white solid (3.00 g, 10.7 mmol, 86%). Mp: 64.5–66.8 °C; TLC (EtOAc:pentane, 1:20 v/v): R_f

= 0.36, $KMnO_4$; ^{1}H NMR (400 MHz, $CDCl_3$): δ 12.20 (s, 0.09H, O*H* of enol form), 4.99 (s, 0.09H, vinyl *H* of enol form), 4.67 (t, *J* = 5.8 Hz, 1H, OC*H*), 3.47 (s, 1.8H, CH_3COCH_2 of keto form), 2.29 (s, 2.7H, CH_3COCH_2 of keto form), 1.95 (s, 0.27H, CH_3 of enol form), 1.81–1.42 (m, 12H, 2 X Cy–C*H* and 5 X Cy–CH_2), 1.34–0.83 (m, 10H, 5 X Cy–CH_2); ^{13}C NMR (100 MHz, $CDCl_3$): δ 200.9, 167.0, 82.8, 50.2, 38.2, 30.4, 29.8, 27.4, 26.3, 26.2, 26.0. Enol form, ^{13}C NMR (100 MHz, $CDCl_3$): δ 175.2, 172.8, 89.8, 80.8, 38.3, 21.2, some carbons of enol form were not resolved at 100 MHz; IR ν 2976 (s), 2928 (s), 2862 (m), 2109 (w), 1725 (m), 1646 (w), 1447 (m), 1403 (m), 1313 (m), 1246 (m), 1188 (m), 1152 (m), 1056 (s), 891 (w); HRMS (ESI) calcd. for $C_{17}H_{28}NaO_3^+$ $[M+Na]^+$ 303.1931; found 303.1928.

Following a slightly modified procedure,[4] to a solution of dicyclohexylmethyl 3-oxobutanoate (**23**) (1.4 g, 5.0 mmol, 1.0 equiv) in acetonitrile (6 mL) was added triethylamine (660 mg, 6.50 mmol, 1.30 equiv). The reaction mixture was cooled in an ice bath and a solution of tosyl azide (1.1 g, 5.5 mmol, 1.1 equiv) in acetonitrile (6 mL) was added slowly. The reaction mixture was allowed to warm to room temperature. After stirring for 20 h, the solvent was removed under reduced pressure. The residue was dissolved in ether (30 mL) and washed with 8% aqueous KOH solution. The organic layer was separated, dried over $MgSO_4$, and evaporated. The crude product was re-dissolved in acetonitrile (15 mL) and 8% aqueous KOH (25 mL) solution was added at room temperature. After vigorous stirring for 4 h, water (15 mL) was added and the reaction mixture was extracted with diethyl ether (2 X 30 mL). The combined organic layers were dried over $MgSO_4$, and concentrated under reduced pressure. The crude product was purified by column chromatography using 1:40 Et_2O:pentane as mobile phase to afford dicyclohexylmethyl 2-diazoacetate (**11e)** as a yellow solid (1.10 g, 4.16 mmol, 83%). Mp (Dec.): 81.2–83.2 °C; TLC (Et_2O:pentane, 1:25 v/v): R_f = 0.52, $KMnO_4$; ^{1}H NMR (400 MHz, $CDCl_3$):δ 4.73 (bs, 1H, C*H*N_2), 4.67 (t, *J* = 5.9 Hz, 1H, OC*H*), 1.84–1.45 (m, 12H, 2 X Cy–C*H* and 5 X Cy–CH_2), 1.31–0.88 (m, 10H, 5 X Cy–CH_2); ^{13}C NMR (100 MHz, $CDCl_3$): δ 167.0, 82.0, 45.9, 38.4, 29.8, 27.4, 26.3, 26.2, 26.0; IR ν 2929 (s), 2855 (m), 2110 (s), 1692 (s), 1451 (w), 1377 (m), 1242 (m), 1191 (s), 1099 (w), 991 (w), 931 (w); HRMS (ESI) calcd. for $C_{15}H_{24}N_2O_2$ [M+] 264.1832; found 264.1836.

2,3,4-Trimethylpentan-3-yl 2-diazoacetate (11f)

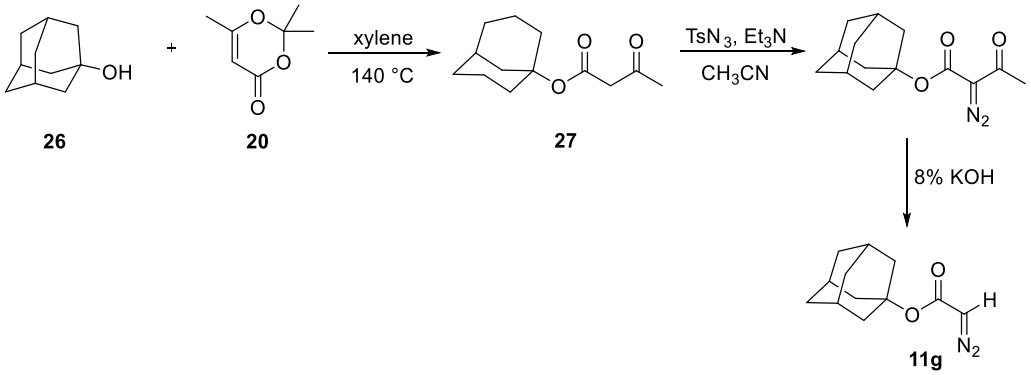


Following a slightly modified procedure,[4] a mixture of 2,3,4-trimethylpentan-3-ol (**24**) (1.63 g, 12.5 mmol, 1.00 equiv), 2,2,6-trimethyl-4H-1,3-dioxin-4-one (**20**) (1.78 g, 12.5 mmol, 1.00 equiv), and xylene (2.5 mL) was stirred at 140 °C for 2 h. After cooling to room temperature, the xylene was evaporated and the residue was purified by flash column chromatography using 1:50 EtOAc:pentane as mobile phase to afford 2,3,4-trimethylpentan-3-yl 3-oxobutanoate (**25)** as a colorless oil (1.5 g, 7.0 mmol, 56%). TLC (EtOAc:pentane, 1:20 v/v): R_f = 0.36, $KMnO_4$; ^{1}H NMR (400 MHz, $CDCl_3$): 12.28 (s, 0.05H, O*H* of enol form), 4.94 (s, 0.05H, vinyl *H* of enol form), δ 3.40 (s, 1.9H, CH_3COCH_2 of keto form), 2.33–2.21 (m, 4.85H, CH_3COCH_2 of keto form and 2 X $CH(CH_3)_2$), 1.44 (s, 2.85H, $OCCH_3$ of keto form), 1.42 (s, 0.15H, $OCCH_3$ of enol form) 0.95 (m, 12H, 2 X $CH(CH_3)_2$); ^{13}C NMR (100 MHz, $CDCl_3$): δ 201.2, 166.3, 92.8, 51.5, 34.3, 30.2, 18.0, 17.8; Enol form, ^{13}C NMR (100 MHz, $CDCl_3$): δ 174.5, 172.8, 91.2, 76.0, some carbons of enol form were not resolved at 100 MHz. The characterization data corresponded to the reported values.[5]

Following a slightly modified procedure, to a solution of 2,3,4-trimethylpentan-3-yl 3-oxobutanoate (**25**) (1.07 g, 5.00 mmol, 1.00 equiv) in acetonitrile (6 mL) was added triethylamine (660 mg, 6.50 mmol, 1.30 equiv). The reaction mixture was cooled in an ice bath and a solution of tosyl azide (1.1 g, 5.5 mmol, 1.1 equiv) in acetonitrile (6 mL) was added slowly. The reaction mixture was allowed to warm to room temperature. After stirring for 20 h, the solvent was removed under reduced pressure. The residue was dissolved in ether (30 mL) and washed with 8% aqueous KOH solution. The organic layer was separated, dried over $MgSO_4$, and evaporated. The crude product was re-dissolved in acetonitrile (15 mL) and 8% aqueous KOH (25 mL) solution was added at room temperature. After vigorous stirring for 4 h, water (15 mL) was added and the reaction mixture was extracted with diethyl ether (2 X 30 mL). The combined organic layers were dried over $MgSO_4$, and concentrated under reduced pressure. The crude product was purified by column chromatography using 1:35 Et_2O:pentane

as mobile phase to afford 2,3,4-trimethylpentan-3-yl 2-diazoacetate (**11f)** as a yellow oil (800 mg, 4.05 mmol, 81%). TLC (Et_2O:pentane, 1:25 v/v): R_f = 0.5, $KMnO_4$; ^1H NMR (400 MHz, $CDCl_3$): δ 4.60 (br s, 1H, C*H*N_2), 2.26 (hept, *J* = 6.9 Hz, 2H, 2 X C*H*$(CH_3)_2$), 1.41 (s, 3H, OCC*H*$_3$), 0.93 (m, 12H, 2 X CH(C*H*$_3)_2$); ^{13}C NMR (100 MHz, $CDCl_3$): δ 166.1, 91.9, 46.5, 34.5, 18.1, 18.0, 17.8. The ^1H NMR data corresponded to the reported values.[5]

Adamantan-1-yl 2-diazoacetate (11g)

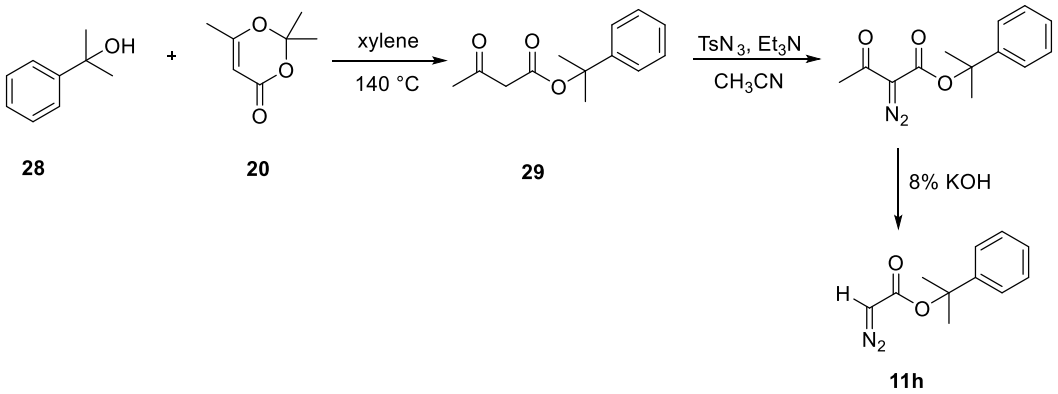


Following a slightly modified procedure,[4] a mixture of adamantan-1-ol (**26**) (3.81 g, 25.0 mmol, 1.00 equiv), 2,2,6-trimethyl-4H-1,3-dioxin-4-one (**20**) (3.55 g, 25.0 mmol, 1.00 equiv), and xylene (5 mL) was stirred at 140 °C for 2 h. After cooling to room temperature, the xylene was evaporated and the residue was purified by flash column chromatography using 1:50 EtOAc:pentane as mobile phase to afford adamantan-1-yl 3-oxobutanoate (**27)** as a colorless oil (5.2 g, 22 mmol, 88%). TLC (EtOAc:pentane, 1:20 v/v): R_f = 0.35, $KMnO_4$; ^1H NMR (400 MHz, $CDCl_3$): δ 12.20 (s, 0.07H, O*H* of enol form), 4.85 (s, 0.07H, vinyl *H* of enol form), 3.32 (s, 1.85H, CH_3COCH_2 of keto form), 2.22 (s, 2.8H, CH_3COCH_2 of keto form), 2.17-2.04 (m, 9H, 3 X C*H* and 3 X CH_2 of adamantly group), 1.87 (s, 0.2H, CH_3 of enol form), 1.69-1.55 (m, 6H, 3 X CH_2 of adamantly group); ^{13}C NMR (100 MHz, $CDCl_3$): δ 201.2, 166.0, 81.9, 51.6, 41.0, 35.9, 30.7, 29.9. Enol form,^{13}C NMR (100 MHz, $CDCl_3$): δ 174.6, 172.3, 91.1, 80.7, 41.4, 36.0, 21.1, One carbon of enol form was not resolved at 100 MHz. The characterization data corresponded to the reported values.[6]

Following a slightly modified procedure,[4] to a solution of adamantan-1-yl 3-oxobutanoate (**27**) (1.18 g, 5.00 mmol, 1.00 equiv) in acetonitrile (6 mL) was added triethylamine (660 mg, 6.50 mmol, 1.30 equiv). The reaction mixture was cooled in an ice bath and a solution of tosyl azide (1.1 g, 5.5 mmol, 1.1 equi) in acetonitrile (6 mL) was added slowly. The reaction mixture was allowed to warm to room temperature. After stirring for 20 h, the solvent was removed under reduced pressure. The residue was dissolved in ether (30 mL) and washed with 8% aqueous KOH solution. The organic layer was separated, dried over $MgSO_4$, and evaporated.

The crude product was re-dissolved in acetonitrile (15 mL) and 8% aqueous KOH (25 mL) solution was added at room temperature. After vigorous stirring for 4 h, water (15 mL) was added and the reaction mixture was extracted with diethyl ether (2 X 30 mL). The combined organic layers were dried over $MgSO_4$, and concentrated under reduced pressure. The crude product was purified by column chromatography using 1:20 Et_2O:pentane as mobile phase to afford adamantan-1-yl 2-diazoacetate (**11g)** as a yellow solid (960 mg, 4.36 mmol, 87%). TLC (Et_2O:pentane, 1:10 v/v): R_f = 0.54, $KMnO_4$; ^1H NMR (400 MHz, $CDCl_3$): δ 4.60 (s, 1H, C*H*N_2), 2.22-2.06 (m, 9H, 3 X C*H* and 3 X CH_2), 1.69-1.61 (m, 6H, 3 X CH_2); ^{13}C NMR (100 MHz, $CDCl_3$): δ 165.9, 81.5, 46.7, 41.6, 36.1, 30.8. The characterization data corresponded to the reported values.[6]

2-Phenylpropan-2-yl 2-diazoacetate (11h)



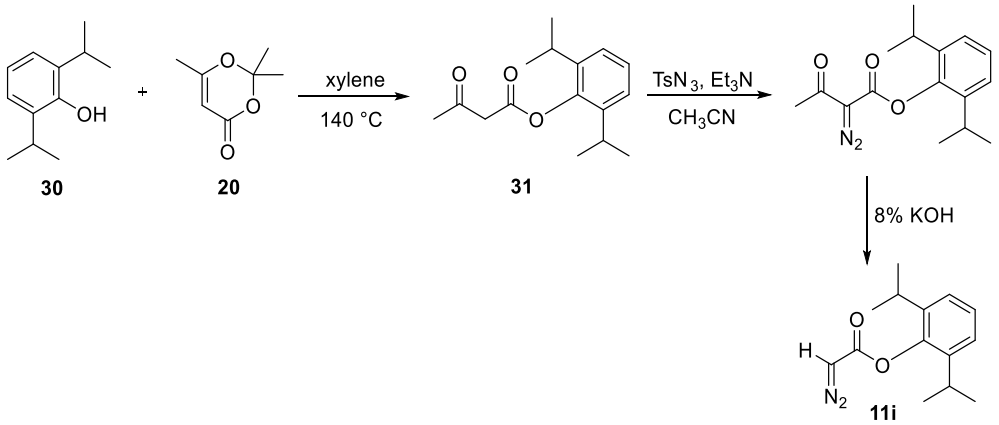
28 **20** **29** **11h**

Following a slightly modified procedure,[4] a mixture of 2-phenylpropan-2-ol (**28**) (3.4 g, 25 mmol, 1.0 equiv), 2,2,6-trimethyl-4H-1,3-dioxin-4-one (**20**) (3.55 g, 25.0 mmol, 1.00 equiv), and xylene (5 mL) was stirred at 140 °C for 2 h. After cooling to room temperature, the xylene was evaporated and the residue was purified by flash column chromatography using 1:5 EtOAc:pentane as mobile phase to afford 2-phenylpropan-2-yl 3-oxobutanoate (**29)** as a colorless oil (2.60 g, 11.8 mmol, 48%). TLC (EtOAc:pentane, 1:4 v/v): R_f = 0.4, $KMnO_4$; ^1H NMR (400 MHz, $CDCl_3$): δ 11.98 (s, 0.1H, O*H* of enol form), 7.41–7.31 (m, 4H, Ar*H*), 7.30–7.22 (m, 1H, Ar*H*), 5.06 (s, 0.1H, vinyl *H* of enol form), 3.43 (s, 1.8H, CH_3COCH_2 of keto form), 2.24 (s, 2.7H, CH_3COCH_2 of keto form), 1.93 (s, 0.3H, CH_3 of enol form), 1.80 (s, 5.4H, OC(CH_3)$_2$Ar of keto form), 1.79 (s, 0.6H, OC(CH_3)$_2$Ar of enol form); ^{13}C NMR (100 MHz, $CDCl_3$): δ 200.9, 165.5, 145.0, 128.2, 127.1, 124.2, 82.9, 51.1, 30.1, 28.3; Enol form, ^{13}C NMR (100 MHz, $CDCl_3$) δ 175.2, 171.7, 145.7, 128.1, 126.8, 123.9, 90.6, 81.5, 28.9, 21.1. The characterization data corresponded to the reported values.[7]

Following a slightly modified procedure,[4] to a solution of 2-phenylpropan-2-yl 3-oxobutanoate (**29**) (1.1 g, 5.0 mmol, 1.0 equiv) in acetonitrile (6 mL) was added triethylamine

(660 mg, 6.50 mmol, 1.30 equiv). The reaction mixture was cooled in an ice bath and a solution of tosyl azide (1.1 g, 5.5 mmol, 1.1 equiv) in acetonitrile (6 mL) was added slowly. The reaction mixture was allowed to warm to room temperature. After stirring for 20 h, the solvent was removed under reduced pressure. The residue was dissolved in ether (30 mL) and washed with 8% aqueous KOH solution. The organic layer was separated, dried over $MgSO_4$, and evaporated. The crude product was re-dissolved in acetonitrile (15 mL) and 8% aqueous KOH (25 mL) solution was added at room temperature. After vigorous stirring for 4 h, water (15 mL) was added and the reaction mixture was extracted with diethyl ether (2 X 30 mL). The combined organic layers were dried over $MgSO_4$, and concentrated under reduced pressure. The crude product was purified by column chromatography using 1:10 Et_2O:pentane as mobile phase to afford 2-phenylpropan-2-yl 2-diazoacetate (**11h)** as a yellow oil (820 mg, 4.02 mmol, 80%). TLC (Et_2O:pentane, 1:10 v/v): R_f = 0.17, $KMnO_4$; ^{1}H NMR (400 MHz, $CDCl_3$): δ 7.41–7.32 (m, 4H, Ar*H*), 7.28-7.24 (m, 1H, Ar*H*), 4.72 (br s, 1H, C*H*N_2), 1.81 (s, 6H, OC(C*H*$_3$)$_2$Ar); ^{13}C NMR (100 MHz, $CDCl_3$): δ 165.5, 145.6, 128.2, 127.0, 124.1, 82.4, 46.9, 28.9. The ^{1}H NMR data corresponded to the reported values.[7]

2,6-Di*iso*propylphenyl 2-diazoacetate (11i)

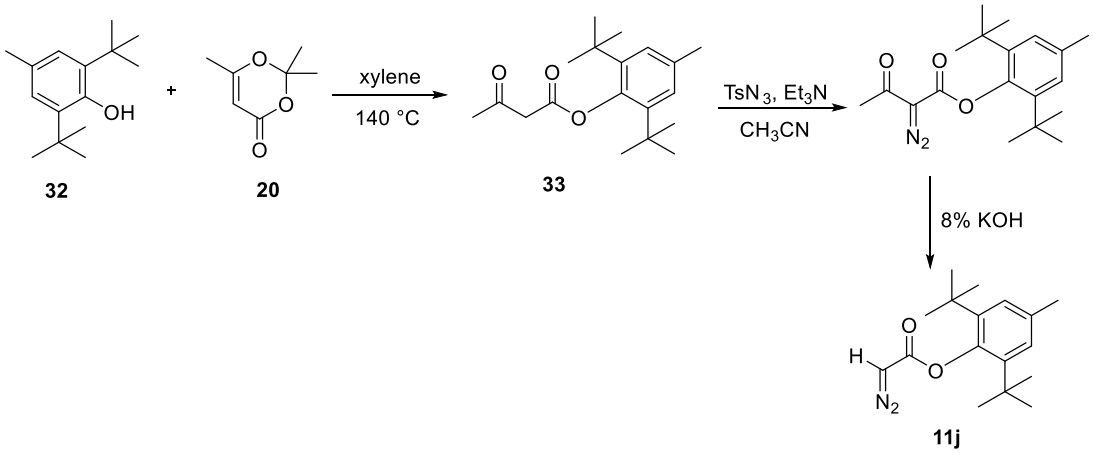


Following a slightly modified procedure,[4] a mixture of 2,6-di*iso*propylphenol (**30**) (4.46 g, 25.0 mmol, 1.00 equiv), 2,2,6-trimethyl-4H-1,3-dioxin-4-one (**20**) (3.55 g, 25.0 mmol, 1.00 equiv), and xylene (5 mL) was stirred at 140 °C for 2 h. After cooling to room temperature, the xylene was evaporated and the residue was purified by flash column chromatography using 1:50 EtOAc:pentane as mobile phase to afford 2,6-di*iso*propylphenyl 3-oxobutanoate (**31)** as a colorless oil (5.00 g, 19.1 mmol, 76%). TLC (EtOAc:pentane, 1:20 v/v): R_f = 0.35, $KMnO_4$; ^{1}H NMR (400 MHz, $CDCl_3$): δ 12.08 (s, 0.22H, O*H* of enol form), 7.31–7.24 (m, 1H, Ar*H*), 7.24–7.18 (m, 2H, Ar*H*), 3.81 (s, 1.56H, CH_3COCH_2 of keto form), 3.03 (m, 2H, 2 X C*H*$(CH_3)_2$), 2.41 (s, 2.32H, CH_3COCH_2 of keto form), 1.28-1.21 (m, 12H, 2 X CH(C*H*$_3$)$_2$); ^{13}C

NMR (100 MHz, $CDCl_3$): δ 199.9, 165.7, 145.1, 140.2, 126.8, 124.0, 49.6, 30.4, 27.4, 27.3; Enol form, ^{13}C NMR (100 MHz, $CDCl_3$): δ 177.7, 171.5, 144.5, 140.5, 126.5, 123.9, 88.7, 23.7, 22.7, 21.4; IR ν 2966 (m), 2876 (w), 1760 (m), 1723 (m), 1634 (w), 1447 (m), 1410 (w), 1360 (m), 1315 (m), 1222 (s), 1140 (s), 1102 (m), 1053 (w), 976 (w); HRMS (ESI) calcd. for $C_{16}H_{22}NaO_3^+$ $[M+Na]^+$ 285.1461; found 285.1467.

Following a slightly modified procedure,[4] to a solution of 2,6-di*iso*propylphenyl 3-oxobutanoate (**31**) (1.31 g, 5.00 mmol, 1.00 equiv) in acetonitrile (6 mL) was added triethylamine (660 mg, 6.50 mmol, 1.30 equiv). The reaction mixture was cooled in an ice bath and a solution of tosyl azide (1.1 g, 5.5 mmol, 1.1 equiv) in acetonitrile (6 mL) was added slowly. The reaction mixture was allowed to warm to room temperature. After stirring for 20 h, the solvent was removed under reduced pressure. The residue was dissolved in ether (30 mL) and washed with 8% aqueous KOH solution. The organic layer was separated, dried over $MgSO_4$, and evaporated. The crude product was re-dissolved in acetonitrile (15 mL) and 8% aqueous KOH (25 mL) solution was added at room temperature. After vigorous stirring for 4 h, water (15 mL) was added and the reaction mixture was extracted with diethyl ether (2 X 30 mL). The combined organic layers were dried over $MgSO_4$, and concentrated under reduced pressure. The crude product was purified by column chromatography using 1:30 Et_2O:pentane as mobile phase to afford 2,6-di*iso*propylphenyl 2-diazoacetate (**11i)** as a yellow oil (620 mg, 2.52 mmol, 50%). TLC (Et_2O:pentane, 1:30 v/v): R_f = 0.36, $KMnO_4$; ^1H NMR (400 MHz, $CDCl_3$): δ 7.32-7.25 (m, 1H, Ar*H*), 7.23-7.20 (m, 2H, Ar*H*), 5.09 (br s, 1H, C*H*N_2), 3.05 (sept, *J* = 6.9 Hz, 2H, 2 X C*H*$(CH_3)_2$), 1.27 (d, *J* = 6.9 Hz, 12H, 2 X CH$(CH_3)_2$); ^{13}C NMR (100 MHz, $CDCl_3$): δ 165.6, 145.1, 140.8, 126.7, 123.9, 46.3, 27.5, 23.4. The characterization data slightly differ from the reported values.[8]

2,6-Di-*tert*-butyl-4-methylphenyl 2-diazoacetate (11j)

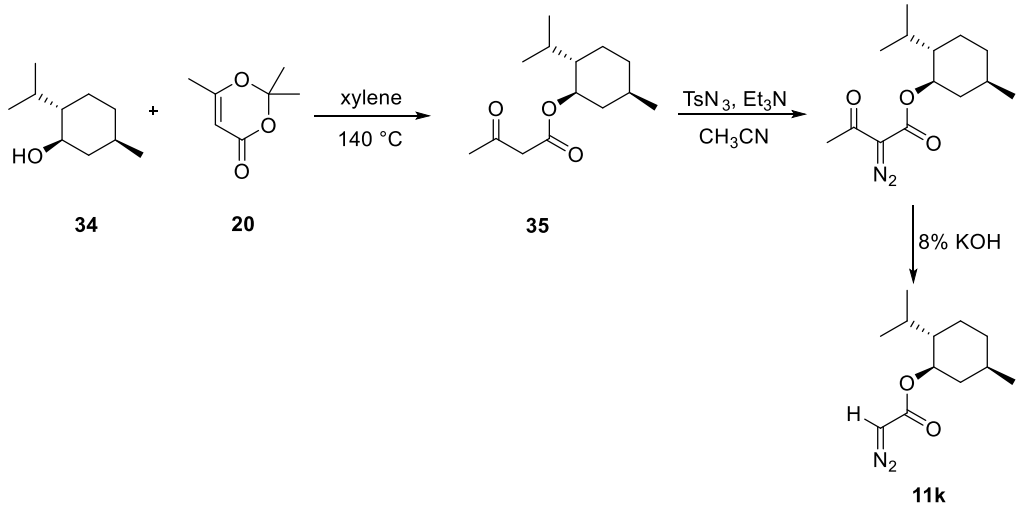


32 20 33 11j

Following a slightly modified procedure,[4] a mixture of 2,6-di-*tert*-butyl-4-methylphenol (**32**) (5.91 g, 25.0 mmol, 1.00 equiv), 2,2,6-trimethyl-4H-1,3-dioxin-4-one (**20**) (3.55 g, 25.0 mmol, 1.00 equiv), and xylene (5 mL) was stirred at 140 °C for 2 h. After cooling to room temperature, the xylene was evaporated and the residue was purified by flash column chromatography using 1:50 EtOAc:pentane as mobile phase to afford 2,6-di-*tert*-butyl-4-methylphenyl 3-oxobutanoate (**33)** as a white solid (6.40 g, 21.0 mmol, 84%). Mp: 96.5–99.6 °C; TLC (EtOAc:pentane, 1:50 v/v): R_f = 0.34, $KMnO_4$; ^{1}H NMR (400 MHz, $CDCl_3$): 12.16 (s, 0.55H, O*H* of enol form), δ 7.13 (s, 2H, Ar*H*), 5.39–5.24 (m, 0.55H, vinyl *H* of enol form), 3.73 (s, 1H, 0.9H, CH_3COCH_2 of keto form), 2.40 (s, 1H, 1.35H, CH_3COCH_2 of keto form), 2.33 (s, 3H, ArCH_3), 2.07 (s, 1.65H, CH_3 of enol form), 1.33 (s, 8.1H, $C(CH_3)_3$ of keto form), 1.32 (s, 9.9H, $C(CH_3)_3$ of enol form); ^{13}C NMR (100 MHz, $CDCl_3$): δ 200.2, 167.7, 145.3, 141.8, 135.0, 127.2, 50.7, 35.2, 31.4, 30.8, 21.5; Enol form, ^{13}C NMR (100 MHz, $CDCl_3$): δ 177.4, 173.3, 144.9, 142.2, 134.6, 126.9, 90.4, 35.2, 31.4, 21.5, 21.5; IR ν 2964 (m), 2919 (m), 2880 (w), 2110 (w), 1757 (m), 1726 (m), 1633 (s), 1408 (m), 1369 (m), 1318 (m), 1219 (s), 1199 (s), 1143 (s), 1113 (m), 1030 (w), 978 (w), 924 (w); HRMS (ESI) calcd. for $C_{19}H_{28}NaO_3^+$ $[M+Na]^+$ 327.1931; found 327.1933.

Following a slightly modified procedure,[4] to a solution of 2,6-di-*tert*-butyl-4-methylphenyl 3-oxobutanoate (**33**) (1.52 g, 5.00 mmol, 1.00 equiv) in acetonitrile (6 mL) was added triethylamine (660 mg, 6.50 mmol, 1.30 equiv). The reaction mixture was cooled in an ice bath and a solution of tosyl azide (1.1 g, 5.5 mmol, 1.1 equiv) in acetonitrile (6 mL) was added slowly. The reaction mixture was allowed to warm to room temperature. After stirring for 20 h, the solvent was removed under reduced pressure. The residue was dissolved in ether (30 mL) and washed with 8% aqueous KOH solution. The organic layer was separated, dried over $MgSO_4$, and evaporated. The crude product was re-dissolved in acetonitrile (15 mL) and 8% aqueous KOH (25 mL) solution was added at room temperature. After vigorous stirring for 4 h, water (15 mL) was added and the reaction mixture was extracted with diethyl ether (2 X 30 mL). The combined organic layers were dried over $MgSO_4$, and concentrated under reduced pressure. The crude product was purified by column chromatography using 1:30 Et_2O:pentane as mobile phase to afford 2,6-di-*tert*-butyl-4-methylphenyl 2-diazoacetate (**11j)** as a yellow solid (1.20 g, 4.16 mmol, 83%). TLC (Et_2O:pentane, 1:30 v/v): R_f = 0.36, $KMnO_4$; ^{1}H NMR (400 MHz, $CDCl_3$): δ 7.12 (s, 2H, Ar*H*), 5.00 (s, 1H, C*H*N_2), 2.32 (s, 3H, ArCH_3), 1.36 (s, 18H, 2 X $C(CH_3)_3$); ^{13}C NMR (100 MHz, $CDCl_3$): δ 166.3, 145.1, 142.4, 134.8, 127.0, 47.3, 35.3, 31.5, 21.5. The ^{1}H NMR data corresponded to the reported values.[5]

(1*R*,2*S*,5*R*)-2-*Iso*propyl-5-methylcyclohexyl 2-diazoacetate (11k)



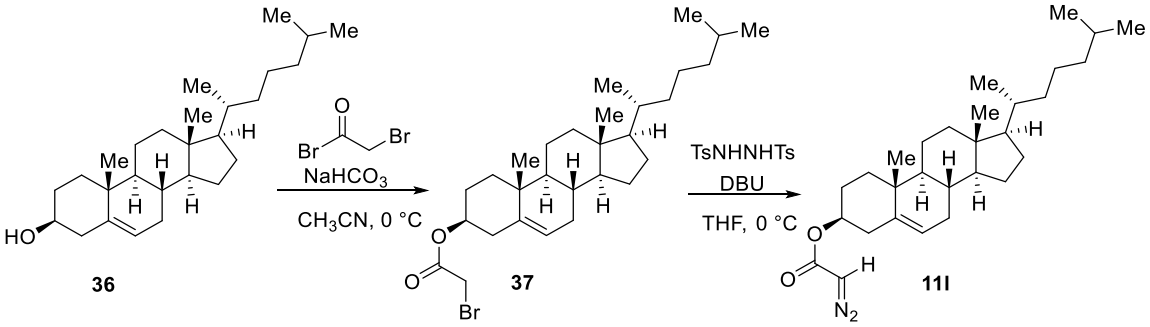
34 **20** **35** **11k**

Following a slightly modified procedure,[4] a mixture of (1*R*,2*S*,5*R*)-2-*iso*propyl-5-methylcyclohexanol (**34**) (1.95 g, 12.5 mmol, 1.00 equiv), 2,2,6-trimethyl-4H-1,3-dioxin-4-one (**20**) (1.78 g, 12.5 mmol, 1.00 equiv), and xylene (2.5 mL) was stirred at 140 °C for 2 h. After cooling to room temperature, the xylene was evaporated and the residue was purified by flash column chromatography using 1:50 EtOAc:pentane as mobile phase to afford (1*R*,2*S*,5*R*)-2-*iso*propyl-5-methylcyclohexyl 3-oxobutanoate (**35)** as a colorless liquid (1.70 g, 7.07 mmol, 57%). TLC (EtOAc:pentane, 1:25 v/v): R_f = 0.3, $KMnO_4$; ^{1}H NMR (400 MHz, $CDCl_3$): δ 12.18 (s, 0.08H, O*H* of enol form), 4.94 (s, 0.08H, vinyl *H* of enol form), 4.71 (td, *J* = 10.9, 4.4 Hz, 1H, OC*H*), 3.41 (s, 1.84H, CH_3COCH_2 of keto form), 2.24 (s, 2.75H, CH_3COCH_2 of keto form), 2.04-1.95 (m, 1H), 1.93 (s, 0.025H, CH_3 of enol form), 1.90-1.79 (m, 1H), 1.71–1.61 (m, 2H), 1.54-1.40 (m, 1H), 1.39-1.29 (m, 1H), 1.10–0.92 (m, 2H), 0.91-0.83 (m, 7H), 0.74 (d, *J* = 7.0 Hz, 3H, CH_3); ^{13}C NMR (100 MHz, $CDCl_3$): δ 200.7, 166.7, 75.4, 50.5, 46.7, 40.6, 34.0, 31.3, 30.0, 26.0, 23.1, 21.9, 20.7, 16.0; Enol form, ^{13}C NMR (100 MHz, $CDCl_3$): δ 175.2, 172.3, 90.0, 73.6, 46.9, 40.9, 34.1, 26.2, 23.4, 22.0, 21.2, 20.6, 16.3. One carbon of enol form was not resolved at 100 MHz. The ^{1}H NMR data corresponded to the reported values.[9]

Following a slightly modified procedure,[9] to a solution of (1*R*,2*S*,5*R*)-2-*iso*propyl-5-methylcyclohexyl 3-oxobutanoate (**35**) (0.72 g, 3.0 mmol, 1.0 equiv) in acetonitrile (3.0 mL) was added triethylamine (0.33 g, 3.3 mmol, 1.1 equiv). The reaction mixture was cooled in an ice bath and a solution of tosyl azide (0.77 g, 3.9 mmol, 1.3 equiv) in acetonitrile (3.0 mL) was added slowly. The reaction mixture was allowed to warm to room temperature. After stirring for 6 h, the reaction mixture was treated with a solution of $LiOH{\cdot}H_2O$ (0.38 g, 9.0 mmol, 3.0 equiv) in water (3 mL) and stirred for another 6 h. The resulting mixture was extracted with diethyl ether (2 X 15 mL). The combined organic layers were washed with brine (15 mL) and

dried over anhydrous $MgSO_4$. The solvent was removed under reduced pressure, and the residue was purified by silica gel column chromatography using 1:30 Et_2O:pentane as mobile phase to afford (1*R*,2*S*,5*R*)-2-*iso*propyl-5-methylcyclohexyl 2-diazoacetate (**11k)** as a yellow solid (0.60 g, 2.7 mmol, 89%). TLC (Et_2O:pentane, 1:30 v/v): R_f = 0.2, $KMnO_4$; ^{1}H NMR (400 MHz, $CDCl_3$): δ 4.80-4.67 (m, 2H, C*H*N_2 and OC*H*), 2.10–1.96 (m, 1H), 1.93-1.79 (m, 1H), 1.73–1.60 (m, 2H), 1.56-1.42 (m, 1H), 1.40-1.30 (m, 1H), 1.12–0.93 (m, 2H), 0.92-0.86 (m, 7H), 0.77 (d, *J* = 7.0 Hz, 3H, C*H*$_3$); ^{13}C NMR (100 MHz, $CDCl_3$): δ 166.6, 74.7, 47.1, 46.2, 41.2, 34.1, 31.4, 26.3, 23.5, 22.0, 20.7, 16.4. The characterization data corresponded to the reported values (except one peak in ^{1}H NMR at 4.67 ppm).[10]

3*S*,8*S*,9*S*,10*R*,13*R*,14*S*,17*R*)-10,13-Dimethyl-17-((*R*)-6-methylheptan-2-yl)-2,3,4,7,8,9,10,11,12,13,14,15,16,17-tetradecahydro-1*H*-cyclopenta[a]phenanthren-3-yl 2-diazoacetate (11l)



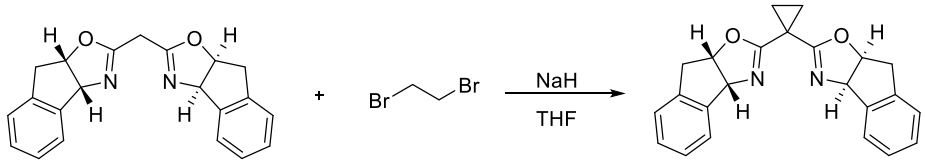
Following a reported procedure,[11] cholesterol **36** (773 mg, 2.00 mmol, 1.00 equiv) and $NaHCO_3$ (840 mg, 10.0 mmol, 5.00 equiv) were dissolved in dry CH_2Cl_2 (10 mL) and bromoacetyl bromide (0.53 mL, 6.0 mmol, 3.0 equiv) was added slowly at 0 °C and stirred for 6 h at room temperature, the reaction was quenched with H_2O (25 mL) and the solution was extracted with CH_2Cl_2 (3 x 50 mL). After washing with water (50 mL) and drying over $MgSO_4$, the solvent was evaporated and the residue was used in the next step without further purification. The resulting crude bromoacetamide **37** and *N,N′*-ditosylhydrazine (1.36 g, 4.00 mmol, 2.00 equiv) were dissolved in dry THF (10 mL) and cooled down to 0 ˚C, then DBU (1.5 mL, 10 mmol, 5.0 equiv) was added dropwise and stirred at room temperature for 1 h. After quenching with saturated solution of $NaHCO_3$ (20 mL) and extracting with diethyl ether (3 X 50 mL), the organic layer was dried over $MgSO_4$, filtered and concentrated under reduced pressure. The resulting crude product was purified by flash chromatography using Et_2O:pentane 1:20 as mobile phase to afford **11l** as a pale yellow solid (750 mg, 1.65 mmol, 82%). TLC (Et_2O:pentane, 1:20 v/v): R_f = 0.4, $KMnO_4$; ^{1}H NMR (400 MHz, $CDCl_3$): δ 5.38 (d, *J* = 5.1 Hz, 1H, olefinic *H*), 4.75–4.65 (m, 2H, N_2C*H* and OC*H*), 2.45–2.23 (m, 2H), 2.08–

1.76 (m, 5H), 1.64–0.80 (m, 33H), 0.68 (s, 3H); ^{13}C NMR (100 MHz, $CDCl_3$): δ 166.3, 139.5, 122.8, 74.6, 56.7, 56.1, 50.0, 46.3, 42.3, 39.7, 39.5, 38.3, 36.9, 36.5, 36.2, 35.8, 31.9, 31.8, 28.2, 28.0, 28.0, 24.3, 23.8, 22.8, 22.5, 21.0, 19.3, 18.7, 11.8. The characterization data corresponded to the reported values. [11]

4. Synthesis of ligands

The synthesis of ligands (**15a, 15e-i**) had been already described before. The procedures are taken here from the indicated publications to facilitate reproduction of the results by having all the data in the same file.

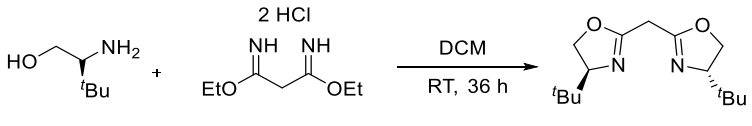
(3a*R*,3a'*R*,8a*S*,8a'*S*)-2,2'-(Cyclopropane-1,1-diyl)bis(8,8a-dihydro-3a*H*-indeno[1,2-d]oxazole) (15a)



38 **39** **15a**

Following a reported procedure,[12] to a solution of dihydrobisoxazoline **38** (330 mg, 1.00 mmol, 1.00 equiv) in THF (4 mL), was added NaH (120 mg, 60% dispersion in paraffin liquid, 3.00 mmol, 3.00 equiv) in portions at 0 °C. After complete addition, the mixture was stirred for 30 min. at that temperature. A solution of dibromoethane (**39**) (130 µL, 1.50 mmol, 1.50 equiv) in THF (1 mL) was then added dropwise at 0 °C over 10 min. After the addition, the ice bath was removed and the reaction mixture was heated to 50°C for an additional 2 h. The reaction was quenched with sat. NH_4Cl (10 mL) and extracted with CH_2Cl_2 (3 X 20 mL). The combined organic phases were dried over $MgSO_4$, and removed under reduced pressure. The crude product was purified by chromatography on silica gel using 2% MeOH/EtOAc followed by recrystallization (EtOAc/hexane, 1:4, 15 mL) to afford (3a*R*,3a'*R*,8a*S*,8a'*S*)-2,2'-(cyclopropane-1,1-diyl)bis(8,8a-dihydro-3a*H*-indeno[1,2-d]oxazole) (**15a**) (220 mg, 0.617 mmol, 62%) as a white solid. TLC (EtOAc:MeOH, 9:1 v/v): R_f = 0.50, $KMnO_4$; ^{1}H NMR (400 MHz, $CDCl_3$): δ 7.48–7.41 (m, 2H, Ar*H*), 7.25–7.17 (m, 6H, Ar*H*), 5.52 (d, *J* = 7.9 Hz, 2H, 2 x N-C*H*), 5.41–5.23 (m, 2H, 2 X O-C*H*), 3.38 (dd, *J* = 17.9, 7.0 Hz, 2H, 2 X ArCH_a), 3.19 (dd, *J* = 17.9, 1.9 Hz, 2H, 2 X ArCH_b), 1.44–1.15 (m, 4H, CH_2C*H2*); ^{13}C NMR (100 MHz, $CDCl_3$): δ 166.0, 141.9, 139.8, 128.5, 127.5, 125.7, 125.3, 83.5, 76.5, 39.8, 18.5, 16.0. The characterization data corresponded to the reported values.[13]

Bis((*S*)-4-(*tert*-butyl)-4,5-dihydrooxazol-2-yl)methane (15g)

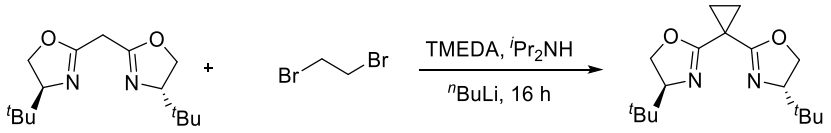


40 **41** **15g**

Following a reported procedure,[14] to a solution of (*S*)-*tert*-leucinol (**40)** (0.94 g, 8.0 mmol, 2.0 equiv) in CH_2Cl_2 (40 mL) was added imidate **41** (0.93 g, 4.0 mmol, 1.0 equiv). The resulting

cloudy solution was stirred at room temperature for 36 h. The reaction mixture was diluted with water (8 mL) and extracted with CH_2Cl_2 (3 x 20 mL). The combined organic layers were washed with brine (40 mL), dried over $MgSO_4$, and concentrated. The resulting oily residue was distilled bulb-to-bulb (Kugelrohr distillation, 150 °C at 0.2 mbar) to afford bis((*S*)-4-(*tert*-butyl)-4,5-dihydrooxazol-2-yl)methane (**15g**) (0.600 g, 2.84 mmol, 71%) as a white solid: TLC (EtOAc:pentane, 1:1 v/v): R_f = 0.16, $KMnO_4$; ^{1}H NMR (400 MHz, $CDCl_3$): δ 4.13 (dd, *J* = 10.1, 8.7 Hz, 2H, 2 X OCH_a), 4.02 (dd, *J* = 8.7, 7.7 Hz, 2H, 2 X C$(CH_3)_3$C*H*), 3.81 (ddt, *J* = 10.1, 7.8, 1.1 Hz, 2H, 2 X OCH_b), 3.27 (t, *J* = 1.2 Hz, 2H, O(C=N)CH_2), 0.82 (s, 18H, 2 X C(CH_3)$_3$); ^{13}C NMR (100 MHz, $CDCl_3$): δ 161.5, 76.0, 69.1, 34.0, 28.4, 26.0. The characterization data corresponded to the reported values.[14]

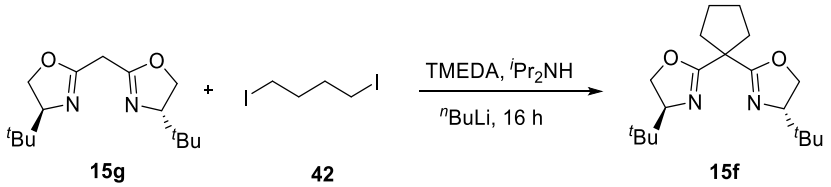
(4*S*,4'*S*)-2,2'-(Cyclopropane-1,1-diyl)bis(4-(tert-butyl)-4,5-dihydrooxazole) (15e)



15g **39** **15e**

Following a reported procedure,[14] to a solution of bis((*S*)-4-(*tert*-butyl)-4,5-dihydrooxazol-2-yl)methane (**15g**) (75 mg, 0.28 mmol, 1.0 equiv) in THF (5 mL) in a 20 mL microwave vial, was added TMEDA (85 µL, 0.56 mmol, 2.0 equiv) and *i*-Pr_2NH (40 mL, 0.28 mmol, 1.0 equiv). The solution was cooled to -78 °C and *n*-BuLi (0.38 mL, 1.5 M in hexane, 0.56 mmol, 2.0 equiv) was added. The reaction mixture was warmed to -20 °C and stirred at that temperature for 30 min. The solution was cooled back to -78 °C and 1,2 dibromoethane (**39**) (25 µL, 0.28 mmol, 2.0 equiv) was added in 10 min. After the addition, the cold bath was removed and the reaction mixture was allowed to stir at room temperature for an additional 16 h. The reaction mixture was quenched by the addition of sat. aq. NH_4Cl (2.5 mL) and diluted with water (2 mL) to dissolve the resulting salts. The mixture was extracted with diethylether (3 X 10 mL). The combined organic layers were washed with brine (10 mL), dried over $MgSO_4$, and concentrated. The resulting oily residue was purified by column chromatography using 1:2 to 1:1 EtOAc:pentane as mobile phase to afford (4*S*,4'*S*)-2,2'-(cyclopropane-1,1-diyl)bis(4-(*tert*-butyl)-4,5-dihydrooxazole) (**15e**) as a white solid. TLC (EtOAc:pentane, 1:2 v/v): R_f = 0.15, $KMnO_4$; ^{1}H NMR (400 MHz, $CDCl_3$): δ 4.18 (dd, *J* = 10.0, 8.6 Hz, 2H, 2 X OCH_a), 4.10 (dd, *J* = 8.7, 7.3 Hz, 2H, 2 X C$(CH_3)_3$C*H*), 3.82 (dd, *J* = 10.0, 7.2 Hz, 2H, 2 X OCH_b), 1.52–1.47 (m, 2H, 2 X CH_a of CyP), 1.30–1.24 (m, 2H, 2 X CH_b of CyP), 0.86 (s, 18H, 2 X C(CH_3)$_3$); ^{13}C NMR (100 MHz, $CDCl_3$): δ 165.4, 75.2, 69.1, 33.8, 25.7, 18.2, 15.1. The characterization data corresponded to the reported values.[14]

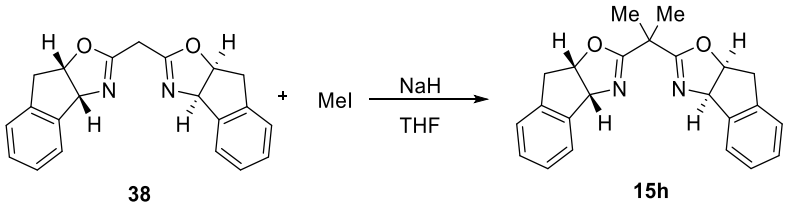
(4*S*,4'*S*)-2,2'-(Cyclopentane-1,1-diyl)bis(4-(*tert*-butyl)-4,5-dihydrooxazole) (15f)



15g 42 15f

Following a reported procedure,[14] to a solution of bis((*S*)-4-(*tert*-butyl)-4,5-dihydrooxazol-2-yl)methane (**15g**) (75 mg, 0.28 mmol, 1.0 equiv) in THF (5 mL) in a 20 mL microwave vial was added TMEDA (85 µL, 0.56 mmol, 2.0 equiv) and *i*-Pr_2NH (40 mL, 0.28 mmol, 1.0 equiv). The solution was cooled to -78 °C and *n*-BuLi (0.38 mL, 1.5 M in hexane, 0.56 mmol, 2.0 equiv) was added. The reaction mixture was warmed to -20 °C and stirred at that temperature for 30 min. The solution was cooled back to -78 °C and 1,4 diiodobutane (**42**) (37 µL, 0.28 mmol, 2.0 equiv) was added in 10 min. After the addition. the cold bath was removed and the reaction mixture was allowed to stir at room temperature for an additional 16 h. The reaction mixture was quenched by the addition of sat. aq. NH_4Cl (2.5 mL) and diluted with water (2 mL) to dissolve the resulting salts. The mixture was extracted with diethylether (3 X 10 mL). The combined organic layers were washed with brine (10 mL), dried over $MgSO_4$, and concentrated. The resulting oily residue was purified by column chromatography using 1:4 EtOAc:pentane as mobile phase to afford (4*S*,4'*S*)-2,2'-(cyclopentane-1,1-diyl)bis(4-(*ter*t-butyl)-4,5-dihydrooxazole) (**15f**) as a white solid. TLC (EtOAc:pentane, 1:2 v/v): R_f = 0.6, $KMnO_4$; ^{1}H NMR (400 MHz, $CDCl_3$): δ 4.15 (dd, *J* = 10.1, 8.6 Hz, 2H, 2 X OCH_a), 4.07 (dd, *J* = 8.7, 7.1 Hz, 2H, 2 X C$(CH_3)_3$C*H*), 3.84 (dd, *J* = 10.0, 7.1 Hz, 2H, 2 X OCH_b), 2.43-2.33 (m, 2H, 2 X CC$H_a$$CH_2$), 2.20–2.05 (m, 2H, 2 X CC$H_b$$CH_2$), 1.81–1.62 (m, 4H, 2 X CCH_2CH_2), 0.86 (s, 18H, 2 X C(CH_3)$_3$); ^{13}C NMR (100 MHz, $CDCl_3$): δ 168.0, 75.3, 69.1, 49.1, 35.4, 33.9, 25.7, 25.0. The characterization data corresponded to the reported values.[14]

(3a*R*,3a'*R*,8a*S*,8a'*S*)-2,2'-(Propane-2,2-diyl)bis(8,8a-dihydro-3a*H*-indeno[1,2-d]oxazole) (15h)

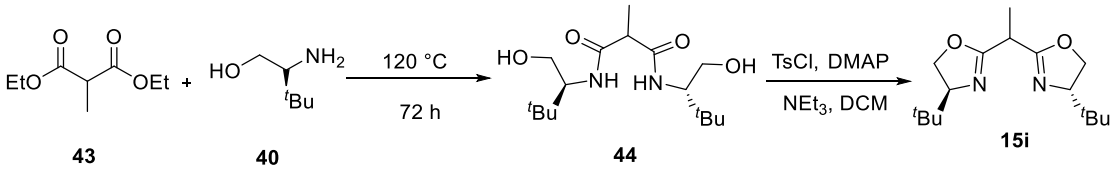


38 15h

Following a reported procedure,[15] a Schlenk tube was charged with dry THF (2 mL), TMEDA (46 µL, 0.30 mmol, 2.0 equiv) and *i*-Pr_2NH (43 µL, 0.30 mmol, 2.0 equiv). The solution was cooled to -20 °C and *n*-BuLi (0.20 mL, 1.5 M in hexane, 0.30 mmol, 2.0 equiv) was added. The reaction mixture was stirred for 1 h at that temperature and **38** (50 mg, 0.15 mmol, 1.0

equiv) in THF (2mL) was added. The mixture was stirred for 3 h. Then, MeI (38 µL, 0.6 mmol, 4.0 equiv) was added at -20 °C. After the addition, the cold bath was removed and the reaction mixture was heated to 60 °C for an additional 24 h. The solution was cooled, washed with sat. NH_4Cl (20 mL) and extracted with EtOAc (3 x 30 mL). The combined organic phases were dried over $MgSO_4$, and removed under reduced pressure, to afford (3a*R*,3a'*R*,8a*S*,8a'*S*)-2,2'-(propane-2,2-diyl)bis(8,8a-dihydro-3a*H*-indeno[1,2-d]oxazole) (**15h**) (53.5 mg, 0.15 mmol, quant.) as a white solid. No purification was needed. TLC (EtOAc:MeOH, 9:1 v/v): R_f = 0.53, $KMnO_4$; ^{1}H NMR (400 MHz, $CDCl_3$): δ 7.54–7.45 (m, 2H, Ar*H*), 7.30–7.18 (m, 6H, Ar*H*), 5.52 (d, *J* = 7.9 Hz, 2H, 2 X N-C*H*), 5.28-5.25 (m, 2H, 2 X O-C*H*), 3.30 (dd, *J* = 17.9, 7.1 Hz, 2H, 2 X ArCH_a), 2.95 (dd, *J* = 17.9, 1.9 Hz, 2H, 2 X ArCH_b), 1.42 (s, 6H, 2 X CH_3); ^{13}C NMR (100 MHz, $CDCl_3$): δ 169.1, 141.8, 139.7, 128.3, 127.3, 125.6, 125.0, 83.2, 76.5, 39.6, 38.4, 23.9. The characterization data corresponded to the reported values.[15]

(4*S*,4'*S*)-2,2'-(Ethane-1,1-diyl)bis(4-(*tert*-butyl)-4,5-dihydrooxazole) (15i)



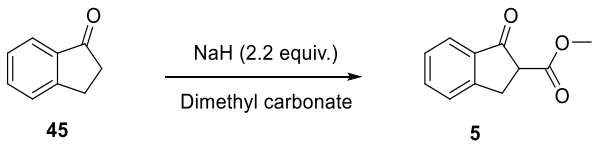
Following a reported procedure,[16] diethyl methylmalonate (**43)** (0.850 mL, 5.00 mmol, 1.00 equiv) and (*S*)-*tert*-leucinol (**40**) (1.23 g, 10.5 mmol, 2.10 equiv) were added to a Schlenk tube. The mixture was stirred for 3 days at 120 °C. The reaction mixture was cooled down to room temperature to obatine the product, which was used in the following step without further purification.

Following a reported procedure,[17] a 50 mL Schlenk flask was charged with bis((*S*)-1-hydroxy-3,3-dimethylbutan-2-yl)-2-methylmalonamide (**44**) (1.44 g, 4.54 mmol, 1.00 equiv), 4-(dimethylamino)-pyridine (0.06 g, 0.05 mmol, 0.100 equiv), and CH_2Cl_2 (40 mL). Triethylamine (3.00 mL, 21.5 mmol, 4.75 equiv) was then added. A solution of *p*-toluenesulfonyl chloride (1.88 g, 9.90 mmol, 2.10 equiv) in CH_2Cl_2 (10 mL) was added slowly. The resulting bright yellow solution was stirred at room temperature for 24 h. It was diluted with CH_2Cl_2 (10 mL) and washed with sat. NH_4Cl (15 mL). The aqueous layer was back-extracted with CH_2Cl_2 (3 X 15 mL). The combined organic extracts were washed with sat.$NaHCO_3$ (30 mL). The organic layer was dried over $MgSO_4$, filtered, and concentrated under vacuum. The crude product was purified by column chromatography using 98:2 CH_2Cl_2:MeOH to afford (4*S*,4'*S*)-2,2'-(ethane-1,1-diyl)bis(4-(*tert*-butyl)-4,5-dihydrooxazole) (**15i**) (1.00 g, 3.57 mmol, 79%) as a colorless thick liquid. TLC (EtOAc:MeOH, 9:1 v/v): R_f =

0.53, $KMnO_4$; ^{1}H NMR (400 MHz, $CDCl_3$): δ 4.21–4.13 (m, 2H, 2 X OCH_a), 4.12–4.01 (m, 2H, 2 X C(CH_3)$_3$CH), 3.97–3.76 (m, 2H, 2 X OCH_b), 3.61–3.45 (m, 1H, CH_3CH), 1.46 (d, J = 7.3 Hz, 3H, CH_3CH), 0.88 (s, 9H, C(CH_3)$_3$), 0.87 (s, 9H, C(CH_3)$_3$); ^{13}C NMR (100 MHz, $CDCl_3$): δ 165.5, 165.3, 75.4, 68.9, 34.0, 33.8, 25.7, 25.6, 15.3. The characterization data corresponded to the reported values.[17]

5. Preliminary studies of EBZ reactivity

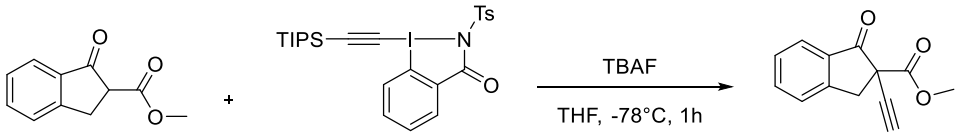
Methyl 1-oxo-2,3-dihydro-1*H*-indene-2-carboxylate (5)



45 5

Following a reported procedure,[18] a solution of 2,3-dihydro-1*H*-inden-1-one (**45**) (1.00 g, 7.57 mmol, 1.00 equiv) in dimethyl carbonate (5 mL) was added dropwise to a suspension of 60% NaH (0.666 g, 16.7 mmol, 2.20 equiv) in dimethyl carbonate (2 mL) at 0 °C. Once the addition complete, the solution was heated up to 80 °C. After 2 h the reaction mixture was cooled to room temperature, and water (35 mL) was added. The aqueous layer was extracted with DCM (3 X 100 mL). The combined organic layers were dried with Na_2SO_4 and the solvent was removed under reduced pressure. The crude product was purified by flash chromatography using EtOAc:pentane 1:9 as mobile phase to afford methyl 1-oxo-2,3-dihydro-1*H*-indene-2-carboxylate (**5)** as an orange solid (0.913 g, 4.80 mmol, 64%). ^{1}H NMR (400 MHz, $CDCl_3$): Keto-enol (6:1) δ 10.36 (br s, 0.15H, OH enol), 7.78 (d, *J* = 7.7 Hz, 1H, Ar*H*), 7.63 (t, *J* = 7.4 Hz, 1H, Ar*H*), 7.51 (d, *J* = 7.7 Hz, 1H, Ar*H*), 7.40 (t, *J* = 7.4 Hz, 1H, Ar*H*), 3.86 (s, 0.5H, OC*H*$_3$-enol), 3.80 (s, 3H, OC*H*$_3$), 3.74 (d, *J* = 8.3 Hz, 1H, C*H*CO), 3.55 (d, *J* = 4.0 Hz, 1H C*H*$_2$), 3.40 (d, *J* = 8.3 Hz, 1H, C*H*$_2$). The ^{1}H NMR data corresponds to literature data.[18]

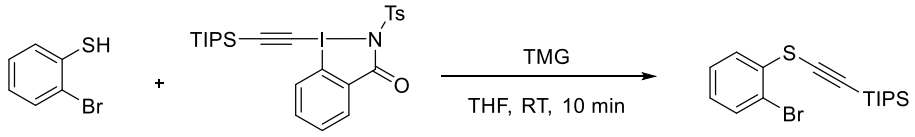
Methyl 2-ethynyl-1-oxo-2,3-dihydro-1*H*-indene-2-carboxylate (6)



5 2a 6

A solution of TIPS-Ts-EBZ **(2a)** (227 mg, 0.390 mmol, 1.30 equiv) and methyl 1-oxo-2,3-dihydro-1*H*-indene-2-carboxylate (**5**) (57.1 mg, 0.300 mmol, 1.00 equiv) was cooled down to -78 °C and stirred for 5 min. After this time, tetrabutylammonium fluoride (1 M in THF, 0.40 mL, 0.40 mmol, 1.3 equiv) was added. After 1 h, the solvent was removed under reduced pressure and the crude product was purified by flash chromatography using EtOAc:pentane 1:5 as mobile phase to afford methyl 2-ethynyl-1-oxo-2,3-dihydro-1*H*-indene-2-carboxylate (**6**) as a yellow oil (65 mg, 0.30 mmol, quant.). ^{1}H NMR (400 MHz, $CDCl_3$): δ 7.83 (d, *J* = 8.1 Hz, 1H, Ar*H*), 7.67 (td, *J* = 7.7, 1.2 Hz, 1H, Ar*H*), 7.55 – 7.48 (m, 1H, Ar*H*), 7.44 (t, *J* = 7.5 Hz, 1H, Ar*H*), 3.94 (d, *J* = 17.1 Hz, 1H, C*H*$_2$), 3.80 (s, 3H, C*H*$_3$), 3.53 (d, *J* = 17.1 Hz, 1H, C*H*$_2$), 2.43 (s, 1H, C≡C*H*). The ^{1}H NMR data corresponds to literature data.[19]

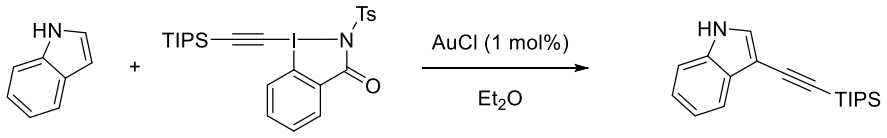
(((2-Bromophenyl)thio)ethynyl)tri*iso*propylsilane (8)



7 2a 8

In a 10 mL flask TIPS-Ts-EBZ **(2a)** (0.206 g, 0.354 mmol, 1.00 equiv) was added in one portion to a solution of 1,1,3,3-tetramethylguanidine (41 mg, 0.35 mmol, 1.0 equiv) and 2-bromobenzenethiol **(7)** (67 mg, 0.35 mmol, 1.0 equiv) in THF (2.5 ml). The solution was stirred at room temperature for 5 min. The reaction was quenched with water (5 mL). The aqueous layer was extracted with ethyl acetate (3 X 10 mL). The combined organic layers were dried with Na_2SO_4 and the solvent was removed under reduced pressure. The crude product was purified by flash chromatography using pentane as mobile phase to afford (((2-bromophenyl)thio)ethynyl)tri*iso*propylsilane (**8**) as a colourless oil (104 mg, 0.282 mmol, 79%). ^{1}H NMR (400 MHz, $CDCl_3$): δ 7.67 (dd, *J* = 8.0, 1.5 Hz, 1H, Ar*H*), 7.39 (dd, *J* = 7.9, 1.3 Hz, 1H, Ar*H*), 7.29 – 7.22 (m, 1H, Ar*H*), 6.98 (td, *J* = 7.7, 1.6 Hz, 1H, Ar*H*), 1.05 (m, 21H, TIPS). The ^{1}H NMR data corresponds to literature data.[20]

3-((Tri*iso*propylsilyl)ethynyl)-1*H*-indole (10)



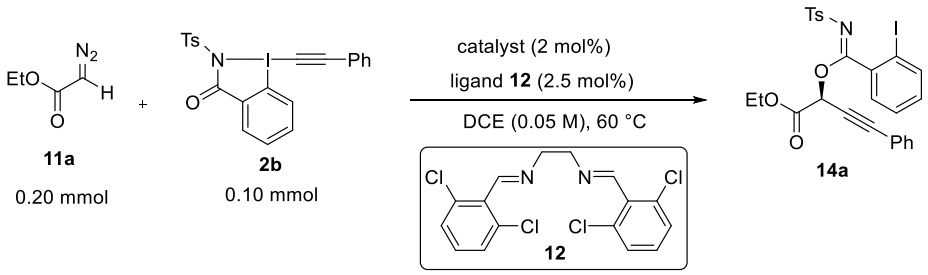
9 2a 10

In a 10 mL flask TIPS-Ts-EBZ **(2a)** (0.135 g, 0.232 mmol, 1.16 equiv) was added to a solution of gold(I) chloride (0.5 mg, 2 µmol, 0.01 equiv) and indole (**9**) (23 mg, 0.20 mmol, 1.0 equiv) in diethylether (3.3 mL). The solution was stirred at room temperature for 19 h. The reaction mixture was diluted with Et_2O (5 mL), washed with 0.1M NaOH (2 X 5 mL). The combined aqueous layers were back-extracted with Et_2O (5 mL). The combined organic layers were washed with saturated $NaHCO_3$ solution (5 mL), brine (5 mL), dried with Na_2SO_4. The solvent was removed under reduced pressure. The crude product was purified by flash chromatography using Et_2O:pentane 1:4 as mobile phase to afford 3-((tri*iso*propylsilyl)ethynyl)-1*H*-indole (**10**) as colorless oil (44 mg, 0.15 mmol, 74%). ^{1}H NMR (400 MHz, $CDCl_3$): 8.05 (s, 1H, Ar*H*), 7.79 (m, 1H, Ar*H*), 7.38 (d, *J* = 2.6 Hz, 1H, Ar*H*), 7.34 (m, 1H, Ar*H*), 7.28 - 7.24 (m, 2H, Ar*H*), 1.22 (m, 21H, TIPS). The ^{1}H NMR data corresponds to literature data.[21]

6. Optimization of the reaction conditions.

a) Screening of copper catalysts

A flame dried 5 mL microwave vial was charged under nitrogen with catalyst (2.00 µmol, 0.02 equiv), ligand **12** (2.25 µmol, 0.025 equiv) and dry DCE (0.5 mL). The resulting solution was stirred at room temperature for 30 min. To this solution was added a mixture of *N*-[tosyl]-1-[phenylethynyl]-1,2-benziodazol-3(1*H*)-one (**2b**) (0.10 mmol, 1.0 equiv) and ethyl 2-diazoacetate (**11a**) (0.20 mmol, 2.0 equiv) in dry DCE (1.5 mL) in 2 min and the resulting reaction mixture was stirred at 60 °C until the reaction was completed (monitored by TLC, EtOAc:pentane, 1:4 v/v), the solvent was evaporated under reduced pressure and the crude product was purified by column chromatography (EtOAc:pentane, 1:4 v/v) directly without any further work-up.

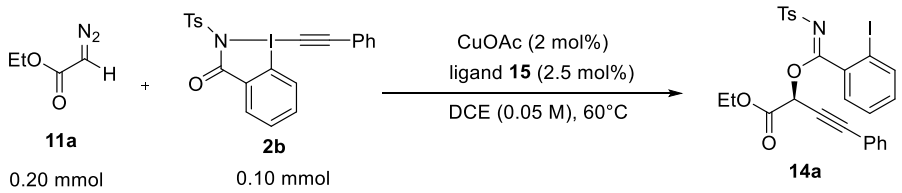


Entry	Catalyst	Time	Yield
1	$Cu(OTf)_2$	2.5 h	24%
2	CuOTf	2.5 h	27%
3	**CuOAc**	**2.0 h**	**38%**
4	$Cu(OAc)_2$	2.0 h	7%
5	CuCl	3.0 h	9%
6	$AuBr_3$	16 h	<5%
7	AuCl	18 h	<5%
8	$Rh(OAc)_2$	18 h	<5%

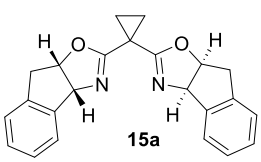
b) Screening of ligands

A flame dried 5 mL microwave vial was charged under nitrogen with CuOAc (2.00 µmol, 0.02 equiv), ligand **15** (2.25 µmol, 0.025 equiv) and dry DCE (0.5 mL). The resulting solution was stirred at room temperature for 30 min. To this solution was added a mixture of *N*-[tosyl]-1-[phenylethynyl]-1,2-benziodazol-3(1*H*)-one (**2b**) (0.10 mmol, 1.0 equiv) and ethyl 2-diazoacetate (**11a**) (0.20 mmol, 2.0 equiv) in dry DCE (1.5 mL) in 2 min and the resulting reaction mixture was stirred at 60 °C until the reaction was completed (monitored by TLC, EtOAc:pentane, 1:4 v/v), the solvent was evaporated under reduced pressure and the crude

product was purified by column chromatography (EtOAc:pentane, 1:4 v/v) directly without any further work-up.

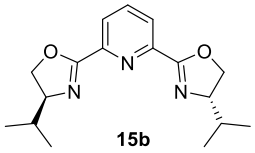


11a 0.20 mmol + **2b** 0.10 mmol → **14a**



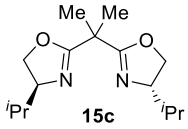
15a

1 h, 55%, 33% ee



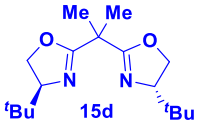
15b

15 min, 20%, 10% ee



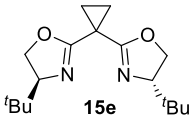
15c

3 h, 55%, 40% ee



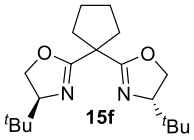
15d

0.5 h, 65%, 69% ee



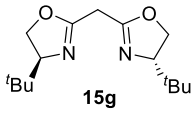
15e

5 min, 46%, 37% ee



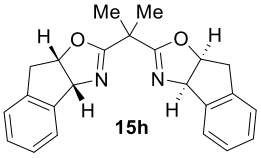
15f

5 min, 46%, 63% ee



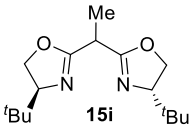
15g

1 h, 25%, <5% ee



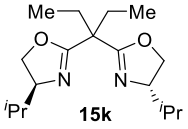
15h

2 h, 38%, 10% ee



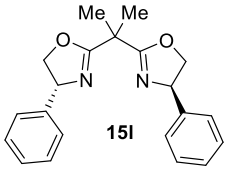
15i

5 h, 49%, 27% ee



15k

1 h, 41%, ,<5% ee

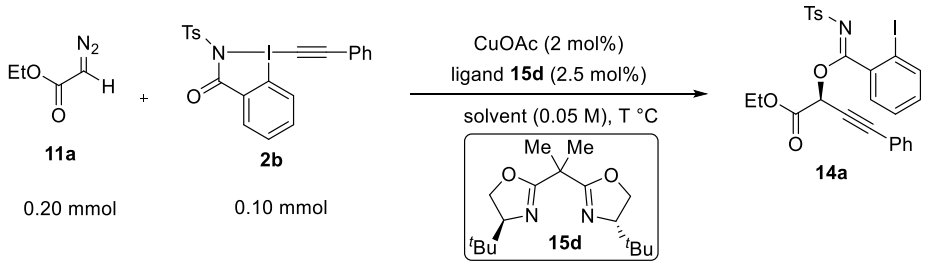


15l

1.5 h, 41%, 70% ee

c) Screening of solvents

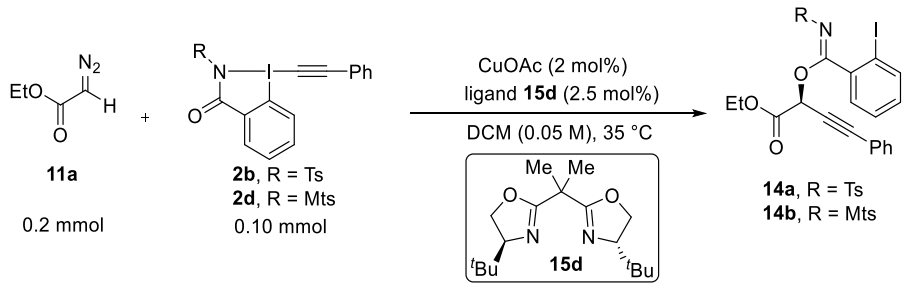
A flame dried 5 mL microwave vial was charged under nitrogen with CuOAc (2.00 µmol, 0.02 equiv), ligand **15d** (2.25 µmol, 0.025 equiv) and solvent (0.5 mL). The resulting solution was stirred at room temperature for 30 min. To this solution was added a mixture of *N*-[tosyl]-1-[phenylethynyl]-1,2-benziodazol-3(1*H*)-one (**2b**) (0.10 mmol, 1.0 equiv) and ethyl 2-diazoacetate (**11a**) (0.20 mmol, 2.0 equiv) in solvent (1.5 mL) in 2 min and the resulting reaction mixture was stirred until the reaction was completed (monitored by TLC, EtOAc:pentane, 1:4 v/v), the solvent was evaporated under reduced pressure and the crude product was purified by column chromatography (EtOAc:pentane, 1:4 v/v) directly without any further work-up.



Entry	solvent	T °C	Time	Yield (%)	ee
1	DCE	60 °C	0.5 h	65	69
2	DCM	RT	1.0 h	70	31
3	**DCM**	**35 °C**	**1.0 h**	**68**	**68**
4	$CHCl_3$	30 °C	1.0 h	43	63
5	CH_3CN	60 °C	1.0 h	<5	<5
6	xylene	60 °C	1.0 h	29	59
7	cholorobenzene	60 °C	1.0 h	49	53
8	*o*-dicholorobenzene	60 °C	1.0 h	9	<5

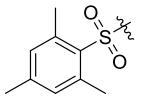
d) Replacing the tosyl group with mesitylsulfonyl group on the nitrogen atom

A flame dried 5 mL microwave vial was charged under nitrogen with CuOAc (2.00 µmol, 0.02 equiv), ligand **15d** (2.25 µmol, 0.025 equiv) and dry DCM (0.5 mL). The resulting solution was stirred at room temperature for 30 min. To this solution was added a mixture of *N*-[mesitylsulfonyl]-1-[phenylethynyl]-1,2-benziodazol-3(1*H*)-one (**2d**) (0.10 mmol, 1.0 equiv) and ethyl 2-diazoacetate (**11a**) (0.20 mmol, 2.0 equiv) in dry DCM (1.5 mL) in 2 min and the resulting reaction mixture was stirred until the reaction was completed (monitored by TLC, EtOAc:pentane, 1:7 v/v), the solvent was evaporated under reduced pressure and the crude product was purified by column chromatography (EtOAc:pentane, 1:7 v/v) directly without any further work-up.



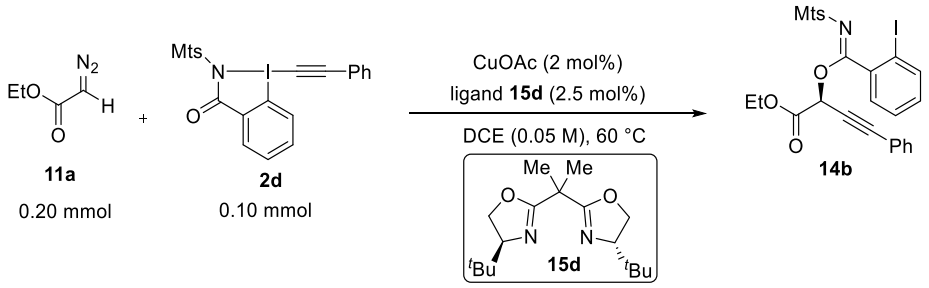
Entry	R	Time	Yield (%)	ee
1	Ts	1.0 h	68	68

2	**Mts**	**24 h**	**81**	**80**

Mts = 

e) Screening of solvents using Ph-Mts-EBZ (2d)

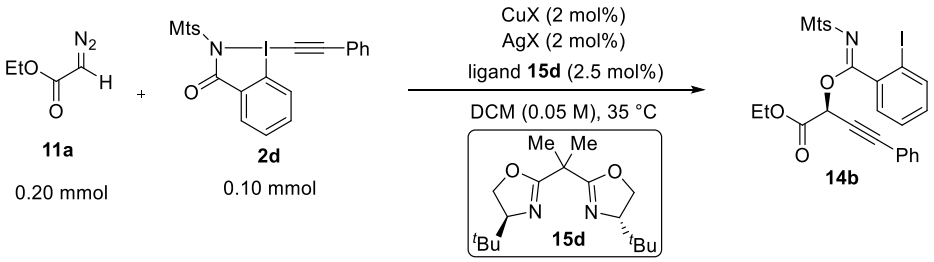
A flame dried 5 mL microwave vial was charged under nitrogen with CuOAc (2.00 µmol, 0.02 equiv), ligand **15d** (2.25 µmol, 0.025 equiv) and solvent (0.5 mL). The resulting solution was stirred at room temperature for 30 min. To this solution was added a mixture of *N*-[mesitylsulfonyl]-1-[phenylethynyl]-1,2-benziodazol-3(1*H*)-one (**2d**) (0.10 mmol, 1.0 equiv) and ethyl 2-diazoacetate (**11a**) (0.20 mmol, 2.0 equiv) in solvent (1.5 mL) in 2 min and the resulting reaction mixture was stirred until the reaction was completed (monitored by TLC, EtOAc:pentane, 1:7 v/v), the solvent was evaporated under reduced pressure and the crude product was purified by column chromatography (EtOAc:pentane, 1:7 v/v) directly without any further work-up.



Entry	Solvent	T °C	Time	Yield (%)	ee
1	DCE	60 °C	1.0 h	76	79
2	cholorobenzene	60 °C	6.0 h	25	69
3	*o*-dicholorobenzene	60 °C	3.0 h	63	72
4	**DCM**	**RT**	**24 h**	**81**	**80**

f) Screening of copper catalysts using Ph-Mts-EBZ (2d)

A flame dried 5 mL microwave vial was charged under nitrogen with catalyst (2.00 µmol, 0.02 equiv), ligand **15d** (2.25 µmol, 0.025 equiv) and dry DCM (0.5 mL). The resulting solution was stirred at room temperature for 30 min. To this solution was added a mixture of *N*-[mesitylsulfonyl]-1-[phenylethynyl]-1,2-benziodazol-3(1*H*)-one (**2d**) (0.10 mmol, 1.0 equiv) and ethyl 2-diazoacetate (**11a**) (0.20 mmol, 2.0 equiv) in dry DCM (1.5 mL) in 2 min and the resulting reaction mixture was stirred until the reaction was completed (monitored by TLC, EtOAc:pentane, 1:7 v/v), the solvent was evaporated under reduced pressure and the crude product was purified by column chromatography (EtOAc:pentane, 1:7 v/v) directly without any further work-up.

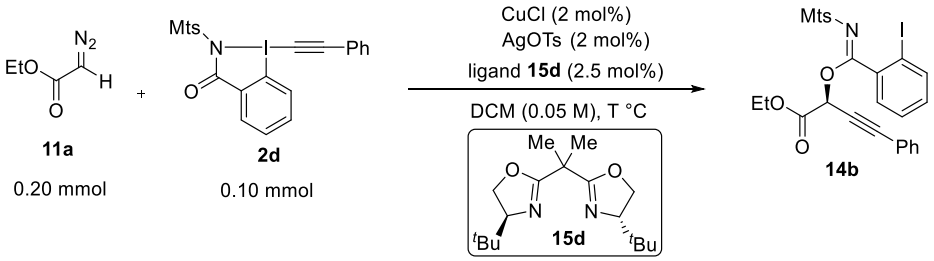


Entry	CuX/AgX	Time	Yield (%)	ee
1	CuCl/$AgNTf_2$	1.0 h	10	60
2	CuCl/AgOTf	1.0 h	10	33
3	CuCl/$AgBF_4$	0.5 h	<5	nd
4	CuCl/$AgPF_6$	0.5 h	<5	nd
5	CuCl/$AgSbF_6$	0.5 h	<5	nd
6	CuCl/$AgClO_4$	24 h	90	82
7	**CuCl/AgOTs**	**2.0 h**	**91**	**82**
8	CuBr/NaBARF	20 h	<5	nd
9	CuBr/KOPiv	18 h	76	78

g) Screening of temperatures using Ph-Mts-EBZ (2d)

A flame dried 5 mL microwave vial was charged under nitrogen with CuCl (2.00 µmol, 0.02 equiv), AgOTs (2.00 µmol, 0.02 equiv), ligand **15d** (2.25 µmol, 0.025 equiv) and dry DCM (0.5 mL). The resulting solution was stirred at room temperature for 30 min. To this solution was added a mixture of *N*-[mesitylsulfonyl]-1-[phenylethynyl]-1,2-benziodazol-3(1*H*)-one (**2d**) (0.10 mmol, 1.0 equiv) and ethyl 2-diazoacetate (**11a**) (0.20 mmol, 2.0 equiv) in dry DCM (1.5 mL) in 2 min and the resulting reaction mixture was stirred until the reaction was

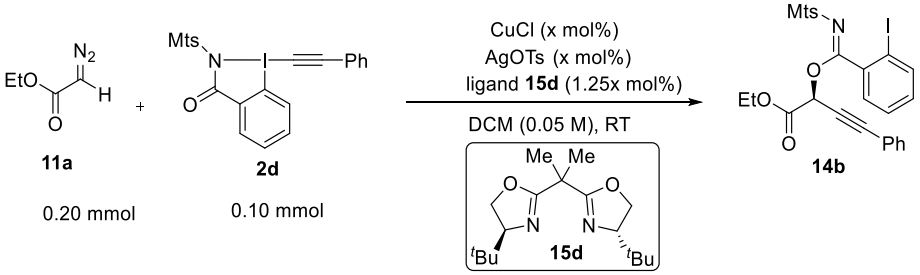
completed (monitored by TLC, EtOAc:pentane, 1:7 v/v), the solvent was evaporated under reduced pressure and the crude product was purified by column chromatography (EtOAc:pentane, 1:7 v/v) directly without any further work-up.



Entry	Temperature	Time	Yield (%)	ee
1	35 °C	2.0 h	91	82
2	**RT**	**2.0 h**	**93**	**88**
3	0 °C	20 h	90	88

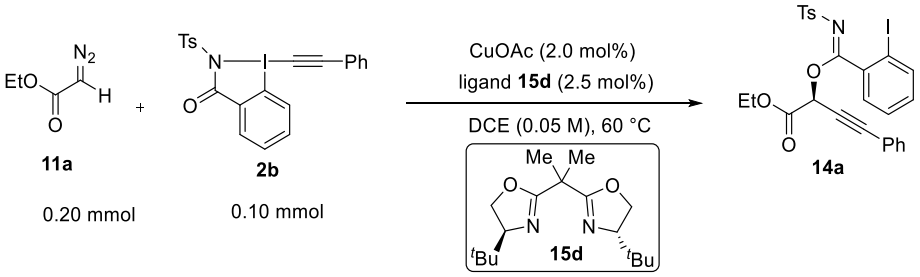
h) Screening of catalyst loading

A flame dried 5 mL microwave vial was charged under nitrogen with CuCl (x mol%), AgOTs (x mol%), ligand **15d** (2.25 µmol, 0.025 equiv) and dry DCM (0.5 mL). The resulting solution was stirred at room temperature for 30 min. To this solution was added a mixture of *N*-[mesitylsulfonyl]-1-[phenylethynyl]-1,2-benziodazol-3(1*H*)-one (**2d**) (0.10 mmol, 1.0 equiv) and ethyl 2-diazoacetate (**11a**) (0.20 mmol, 2.0 equiv) in dry DCM (1.5 mL) in 2 min and the resulting reaction mixture was stirred until the reaction was completed (monitored by TLC, EtOAc:pentane, 1:7 v/v), the solvent was evaporated under reduced pressure and the crude product was purified by column chromatography (EtOAc:pentane, 1:7 v/v) directly without any further work-up.



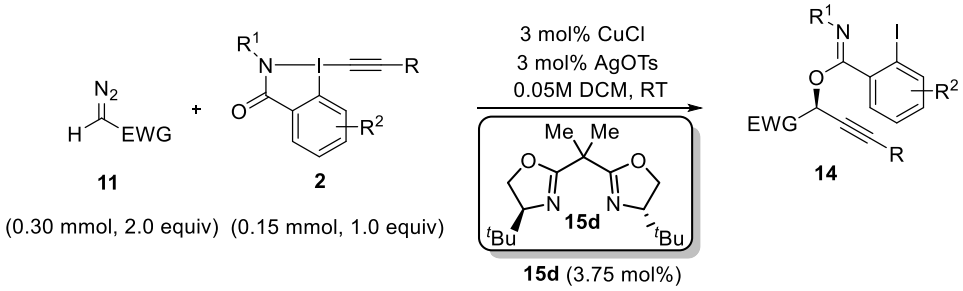
Entry	x mol%	Time	Yield (%)	ee
1	2	2.0 h	93	88
2	1	2.0 h	90	88
3	**3**	**1.0 h**	**98**	**88**

7. Copper catalyzed oxy-alkynylation using EBZ reagents



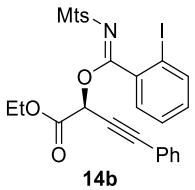
A flame dried 5 mL microwave vial was charged under nitrogen with CuOAc (0.3 mg, 2 µmol, 0.02 equiv), and ligand **15d** (0.8 mg, 3 µmol, 0.03 equiv) and dry DCE (1 mL). The resulting solution was stirred at room temperature for 1 h and then added to a mixture of Ph-Ts-EBZ **(2b)** (50 mg, 0.10 mmol, 1.0 equiv) and diazo compound **11a** (25 µL, 0.20 mmol, 2.0 equiv) in dry DCE (1 mL) in 2 min and the resulting reaction mixture was stirred 60 °C. After 1 h, the solvent was evaporated under reduced pressure and the crude product was purified by flash chromatography using EtOAc:pentane 1:4 as mobile phase to afford **14a** as a pale yellow oil (38.0 mg, 0.065mmol, 65%). TLC (EtOAc:Pentane 1:4): R_f = 0.28, $KMnO_4$; ^{1}H NMR (400 MHz, $CDCl_3$): δ 7.84 (d, *J* = 8.0 Hz, 1H, Ar*H*), 7.73 (d, *J* = 8.3 Hz, 2H, Ar*H*), 7.49 – 7.43 (m, 2H, Ar*H*), 7.43 – 7.38 (m, 2H, Ar*H*), 7.36 – 7.32 (m, 1H, Ar*H*), 7.31 (d, *J* = 7.5 Hz, 2H, Ar*H*), 7.23 (d, *J* = 8.1 Hz, 2H, Ar*H*), 7.21 – 7.15 (m, 1H, Ar*H*), 6.04 (s, 1H, C≡C*H*), 4.23 (qd, *J* = 7.2, 4.0 Hz, 2H, OC*H*$_2$CH$_3$), 2.40 (s, 3H, Ar-C*H*$_3$), 1.29 (t, *J* = 7.1 Hz, 3H, OCH$_2$C*H*$_3$); ^{13}C NMR (100 MHz, $CDCl_3$): δ 168.0, 164.6, 143.7, 138.9, 137.6, 137.2, 132.0, 131.8, 129.3, 129.2, 128.2, 127.6, 127.4, 121.2, 92.6, 88.6, 79.4, 67.4, 62.7, 21.6, 14.0; IR ν 3063 (w), 2983 (w), 2926 (w), 2867 (w), 2239 (w), 1755 (s), 1714 (w), 1626 (s), 1581 (m), 1492 (w), 1464 (m), 1334 (s), 1285 (s), 1255 (m), 1190 (m), 1168 (s), 1152 (s), 1092 (s), 1022 (m), 993 (w), 914 (w), 816 (w); HRMS (ESI) calcd. for $C_{26}H_{23}INO_5S^+$ $[M+H]^+$ 588.0336 ; found 588.0345; Chiral HPLC conditions: *ee* = 69%; Chiralpak IB 80:20 Hexane/*i*PrOH, 0.8 mL/min, 31 min. t_r (minor) = 15.4 min. and t_r (major) = 19.5 min. λ=254 cm^{-1}; $[\alpha]_D^{25.0}$ = +20.2 (c = 0.5, $CHCl_3$). One carbon was not resolved at 100 MHz.

General procedure 3 (GP3)



A flame dried 5 mL microwave vial was charged under nitrogen with CuCl (0.3 mg, 3 µmol, 0.03 equiv), AgOTs (0.9 mg, 3 µmol, 0.03 equiv), ligand **15d** (1.1 mg, 3.8 µmol, 0.0375 equiv) and dry dichloromethane (1 mL). The resulting solution was stirred at room temperature for 1 h and then added to a mixture of R-EBZ **2** (0.1 mmol, 1.0 equiv) and diazo compound **11** (0.20 mmol, 2.0 equiv) in dry dichloromethane (1 mL) in 2 min and the resulting reaction mixture was stirred at room temperature. After the reaction was completed (monitored by TLC, EtOAc;pentane or Et_2O:pentane), the solvent was evaporated under reduced pressure and the crude product was purified by column chromatography (EtOAc:pentane or Et_2O:pentane) directly without any further work-up.

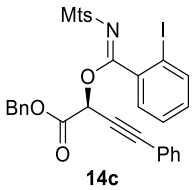
Ethyl (*S*,*E*)-2-((2-iodophenyl)((mesitylsulfonyl)imino)methoxy)-4-phenylbut-3-ynoate (14b)



14b

Following **GP3**, *N*-[mesitylsulfonyl]-1-[phenylethynyl]-1,2-benziodazol-3(1*H*)-one (**2d**) (53 mg, 0.10 mmol, 1.0 equiv) and ethyl 2-diazoacetate (**11a**) (25 µL, 0.20 mmol, 13 wt. % dichloromethane, 2.0 equiv) were stirred for 18 h. The crude reaction mixture was concentrated under reduced pressure and purified by flash chromatography using EtOAc:pentane 1:7 as mobile phase to afford **14b** as a pale yellow solid (60.0 mg, 0.097 mmol, 97%). Mp: 51.4–56.1 °C; TLC (EtOAc:Pentane 1:7): R_f = 0.35, $KMnO_4$; ^{1}H NMR (400 MHz, $CDCl_3$): δ 7.85 (d, *J* = 7.9 Hz, 1H, Ar*H*), 7.46 – 7.28 (m, 7H, Ar*H*), 7.22 – 7.13 (m, 1H, Ar*H*), 6.89 (s, 2H, Ar*H*), 6.07 (s, 1H, OC*H*), 4.29 – 4.14 (m, 2H, C*H*$_2$CH$_3$), 2.55 (s, 6H, 2 X ArC*H*$_3$), 2.28 (s, 3H, ArC*H*$_3$), 1.28 (t, *J* = 7.1 Hz, 3H, CH$_2$C*H*$_3$); ^{13}C NMR (100 MHz, $CDCl_3$): δ 168.1, 164.7, 142.5, 139.6, 139.03, 137.4, 134.9, 132.1, 131.8, 131.6, 129.6, 129.3, 128.3, 127.5, 121.2, 92.6, 88.5, 79.6, 67.1, 62.8, 22.8, 21.0, 14.0; IR ν 3059 (w), 2981 (w), 2938 (w), 2236 (w), 1763 (m), 1621 (s), 1580 (m), 1493 (w), 1464 (w), 1331 (s), 1282 (s), 1254 (m), 1194 (m), 1165 (s), 1144 (s), 1104 (w), 1017 (m), 999 (m), 952 (w); HRMS (ESI) calcd. for $C_{28}H_{26}INNaO_5S^+$ $[M+Na]^+$ 638.0469; found 638.0474; Chiral HPLC conditions: *ee* = 88%; Chiralpak IA 80:20 Hexane/*i*PrOH, 1.0 mL/min, 31 min. t_r (minor) = 13.8 min. and t_r (major) = 16.1 min. λ=250 cm^{-1}; $[\alpha]_D^{25.0}$ = +28.8 (c = 0.5, $CHCl_3$).

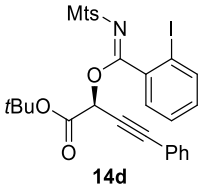
Benzyl (*S*,*E*)-2-((2-iodophenyl)((mesitylsulfonyl)imino)methoxy)-4-phenylbut-3-ynoate (14c)



14c

Following **GP3**, *N*-[mesitylsulfonyl]-1-[phenylethynyl]-1,2-benziodazol-3(1*H*)-one (**2d**) (53 mg, 0.10 mmol, 1.0 equiv) and benzyl 2-diazoacetate (**11b**) (34 µL, 0.20 mmol, 10 wt. % dichloromethane, 2.0 equiv) were stirred for 20 h. The crude reaction mixture was concentrated under reduced pressure and purified by flash chromatography using Et_2O:pentane 1:4 as mobile phase to afford **14c** as a pale yellow solid (56.0 mg, 0.083 mmol, 83%). Mp: 73.3–75.8 °C; TLC (Et_2O:Pentane 1:4): R_f = 0.17, $KMnO_4$; ^1H NMR (400 MHz, $CDCl_3$): δ 7.83 (d, *J* = 8.0 Hz, 1H, Ar*H*), 7.40 – 7.30 (m, 12H, Ar*H*), 7.16 (td, *J* = 7.8, 1.8 Hz, 1H, Ar*H*), 6.87 (s, 2H, Ar*H*), 6.13 (s, 1H, OC*H*), 5.23 (d, *J* = 12.2 Hz, 1H, C$H^a{}_2$Ph), 5.12 (d, *J* = 12.2 Hz, 1H, C$H^b{}_2$Ph), 2.55 (s, 6H, 2 X ArCH_3), 2.27 (s, 3H, ArCH_3); ^{13}C NMR (100 MHz, $CDCl_3$): δ 168.1, 164.5, 142.5, 139.5, 139.0, 137.3, 134.9, 134.6, 132.1, 131.7, 131.6, 129.6, 129.4, 128.6, 128.6, 128.3, 128.3, 127.4, 121.1, 92.6, 88.7, 79.4, 68.2, 67.0, 22.8, 21.0; IR ν 3066 (w), 3032 (w), 2938 (w), 2237 (w), 1762 (s), 1622 (s), 1580 (m), 1460 (m), 1330 (s), 1282 (s), 1254 (s), 1189 (m), 1146 (s), 1021 (m), 854 (w); HRMS (ESI) calcd. for $C_{33}H_{28}INNaO_5S^+$ $[M+Na]^+$ 700.0625; found 700.0635; Chiral HPLC conditions: *ee* = 80%; Chiralpak IB 90:10 Hexane/*i*PrOH, 1.0 mL/min, 31 min. t_r (minor) = 13.4 min. and t_r (major) = 14.4 min. λ=254 cm^{-1}; $[\alpha]_D{}^{25.0}$ = +13.2 (c = 0.5, $CHCl_3$).

***Tert*-butyl (*S*,*E*)-2-((2-iodophenyl)((mesitylsulfonyl)imino)methoxy)-4-phenylbut-3-ynoate (14d)**

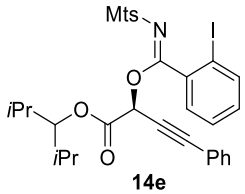


14d

Following **GP3**, *N*-[mesitylsulfonyl]-1-[phenylethynyl]-1,2-benziodazol-3(1*H*)-one (**2d**) (53 mg, 0.10 mmol, 1.0 equiv) and *tert*-butyl 2-diazoacetate (**11c**) (33 µL, 0.20 mmol, 15 wt. % dichloromethane, 2.0 equiv) were stirred for 20 h. The crude reaction mixture was concentrated under reduced pressure and purified by flash chromatography using EtOAc:pentane 1:7 as mobile phase to afford **14d** as a pale yellow solid (39 mg, 0.06 mmol, 61%). Mp: 55.2–56.8 °C; TLC (EtOAc:Pentane 1:7): R_f = 0.35, $KMnO_4$; ^1H NMR (400 MHz, $CDCl_3$): δ 7.83 (d, *J* =

8.0 Hz, 1H, Ar*H*), 7.45 – 7.39 (m, 4H, Ar*H*), 7.38 – 7.27 (m, 3H, Ar*H*), 7.17 (s, 1H, Ar*H*), 6.88 (s, 2H, Ar*H*), 5.98 (s, 1H, OC*H*), 2.56 (s, 6H, 2 X ArCH_3), 2.27 (s, 3H, ArCH_3), 1.48 (s, 9H, *t*Bu); ^{13}C NMR (100 MHz, $CDCl_3$): δ 168.1, 163.5, 142.4, 139.5, 139.0, 137.6, 135.0, 132.0, 131.7, 131.6, 129.6, 129.2, 128.3, 127.4, 121.4, 92.6, 87.9, 84.1, 67.5, 53.4, 27.8, 22.9, 21.0; IR ν 2979 (w), 2935 (w), 2237 (w), 1752 (m), 1621 (m), 1580 (w), 1462 (w), 1371 (m), 1330 (m), 1283 (m), 1254 (m), 1145 (s), 1043 (w), 1016 (w), 844 (w); HRMS (ESI) calcd. for $C_{30}H_{31}INO_5S^+$ $[M+H]^+$ 644.0962; found 644.0965; Chiral HPLC conditions: *ee* = 84%; Chiralpak IA 95:5 Hexane/*i*PrOH, 1.0 mL/min, 31 min. t_r (minor) = 18.9 min. and t_r (major) = 21.4 min. λ=254 cm^{-1}; $[\alpha]_D^{25.0}$ = +17.9 (c = 0.5, $CHCl_3$).

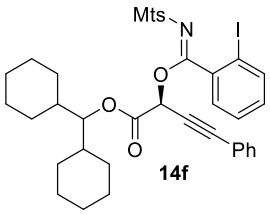
2,4-Dimethylpentan-3-yl (*S*,*E*)-2-((2-iodophenyl)((mesitylsulfonyl)imino)methoxy)-4-phenylbut-3-ynoate (14e)



14e

Following **GP3**, *N*-[mesitylsulfonyl]-1-[phenylethynyl]-1,2-benziodazol-3(1*H*)-one (**2d**) (53 mg, 0.10 mmol, 1.0 equiv) and 2,4-dimethylpentan-3-yl 2-diazoacetate (**11d**) (37 mg, 0.20 mmol, 2.0 equiv) were stirred for 18 h. The crude reaction mixture was concentrated under reduced pressure and purified by flash chromatography using Et_2O:pentane 1:12 as mobile phase to afford **14e** as a white solid (64.0 mg, 0.093 mmol, 93%). Mp: 51.4–56.8 °C; TLC (Et_2O:Pentane 1:10): R_f = 0.4, $KMnO_4$; ^{1}H NMR (400 MHz,$CDCl_3$): δ 7.83 (d, *J* = 7.8 Hz, 1H, Ar*H*), 7.45 – 7.27 (m, 7H, Ar*H*), 7.20 – 7.11 (m, 1H, Ar*H*), 6.86 (s, 2H, Ar*H*), 6.21 (s, 1H, OC*H*), 4.75 – 4.65 (m, 1H, C*H*, *i*Pr), 2.55 (s, 6H, 2 X ArCH_3), 2.27 (s, 3H, ArCH_3), 2.02 – 1.85 (m, 2H, 2 X C*H*CH_3), 0.93 (dd, *J* = 6.8, 4.2 Hz, 6H, 2 X CHCH_3), 0.83 (dd, *J* = 18.2, 6.8 Hz, 6H, 2 X CHCH_3); ^{13}C NMR (100 MHz, $CDCl_3$): δ 168.4, 164.6, 142.4, 139.4, 139.0, 137.4, 135.0, 131.9, 131.7, 131.6, 129.7, 129.3, 128.3, 127.4, 121.3, 92.7, 88.1, 86.1, 66.6, 53.4, 29.6, 29.5, 22.9, 21.0, 19.5, 19.3, 17.4, 16.8; IR ν 3059 (w), 2968 (m), 2238 (w), 1760 (s), 1620 (s), 1580 (m), 1465 (m), 1332 (s), 1283 (s), 1255 (m), 1203 (m), 1165 (m), 1148 (s), 1016 (m), 930 (w), 890 (w); HRMS (ESI) calcd. for $C_{33}H_{37}INO_5S^+$ $[M+H]^+$ 686.1432; found 686.1433; Chiral HPLC conditions: *ee* = 94%; Chiralpak IA 95:5 Hexane/*i*PrOH, 1.0 mL/min, 31 min. t_r (minor) = 16.6 min. and t_r (major) = 20.9 min. λ=254 cm^{-1}; $[\alpha]_D^{25.0}$ = +36.0 (c = 0.5, $CHCl_3$).

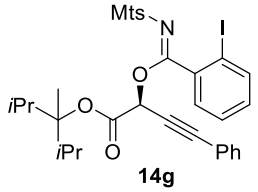
Dicyclohexylmethyl (*S*,*E*)-2-((2-iodophenyl)((mesitylsulfonyl)imino)methoxy)-4-phenylbut-3-ynoate (14f)



14f

Following **GP3**, *N*-[mesitylsulfonyl]-1-[phenylethynyl]-1,2-benziodazol-3(1*H*)-one (**2d**) (53 mg, 0.10 mmol, 1.0 equiv) and dicyclohexylmethyl 2-diazoacetate (**11e**) (53 mg, 0.20 mmol, 2.0 equiv) were stirred for 20 h. The crude reaction mixture was concentrated under reduced pressure and purified by flash chromatography using Et_2O:pentane 1:4 as mobile phase to afford **14f** as a white solid (60.0 mg, 0.078 mmol, 78%). Mp: 67.6–71.5 °C; TLC (Et_2O:Pentane 1:4): R_f = 0.4, $KMnO_4$; ^{1}H NMR (400 MHz, $CDCl_3$): δ 7.82 (d, *J* = 7.9 Hz, 1H, Ar*H*), 7.43 – 7.37 (m, 4H, Ar*H*), 7.37 – 7.27 (m, 3H, Ar*H*), 7.15 (ddd, *J* = 8.0, 6.3, 2.9 Hz, 1H, Ar*H*), 6.86 (s, 2H, Ar*H*), 6.22 (s, 1H, OC*H*), 4.75 (t, *J* = 5.9 Hz, 1H, $(Cy)_2CH$), 2.54 (s, 6H, 2 X ArCH_3), 2.27 (s, 3H, ArCH_3), 1.79 – 1.59 (m, 11H, Cy–CH_2), 1.25 – 0.95 (m, 11H, Cy–CH_2); ^{13}C NMR (100 MHz, $CDCl_3$): δ 168.4, 164.5, 142.4, 139.5, 139.0, 137.3, 135.0, 131.9, 131.6, 131.6, 129.7, 129.3, 128.3, 127.4, 121.3, 92.7, 88.2, 84.8, 80.5, 66.6, 53.4, 38.6, 38.3, 29.8, 29.6, 27.7, 26.9, 26.2, 26.2, 26.1, 26.0, 25.9, 22.9, 21.0; IR ν 3058 (w), 2929 (s), 2853 (m), 2237 (w), 1760 (s), 1620 (s), 1580 (m), 1449 (m), 1332 (s), 1283 (s), 1255 (m), 1192 (m), 1166 (s), 1148 (s), 1045 (w), 1015 (m), 935 (w), 854 (w); HRMS (ESI) calcd. for $C_{39}H_{44}INNaO_5S^+$ $[M+Na]^+$ 788.1877; found 788.1887; Chiral HPLC conditions: *ee* = 94%; Chiralpak IA 95:5 Hexane/*i*PrOH, 1.0 mL/min, 31 min. t_r (minor) = 17.8 min. and t_r (major) = 25.5 min. λ=260 cm^{-1}; $[\alpha]_D^{25.0}$ = +41.4 (c = 0.5, $CHCl_3$).

2,3,4-Trimethylpentan-3-yl (*S*,*E*)-2-((2-iodophenyl)((mesitylsulfonyl)imino)methoxy)-4-phenylbut-3-ynoate (14g)

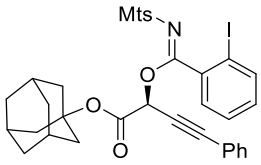


14g

Following **GP3**, *N*-[mesitylsulfonyl]-1-[phenylethynyl]-1,2-benziodazol-3(1*H*)-one (**2d**) (53 mg, 0.10 mmol, 1.0 equiv) and 2,3,4-trimethylpentan-3-yl 2-diazoacetate (**11f**) (40 mg, 0.20 mmol, 2.0 equiv) were stirred for 20 h. The crude reaction mixture was concentrated under reduced pressure and purified by flash chromatography using Et_2O:pentane 1:4 as mobile phase

to afford **14g** as a white solid (64.0 mg, 0.093 mmol, 93%). Mp: 131.5–132.9 °C; TLC (Et_2O:Pentane 1:4): R_f = 0.37, $KMnO_4$; ^1H NMR (400 MHz, $CDCl_3$): δ 7.83 (d, *J* = 7.9 Hz, 1H, Ar*H*), 7.47 – 7.27 (m, 7H, Ar*H*), 7.15 (d, *J* = 1.4 Hz, 1H, Ar*H*), 6.87 (s, 2H, Ar*H*), 6.04 (s, 1H, OC*H*), 2.56 (s, 6H, 2 X ArCH_3), 2.29 – 2.17 (m, 5H, ArCH_3 and 2 X C*H*CH_3), 1.44 (s, 3H, *i*PrCCH_3), , 0.97 (d, *J* = 6.9 Hz, 3H, CHCH_3), 0.95 (d, *J* = 7.0 Hz, 3H, CHCH_3), 0.90 (d, *J* = 6.8 Hz, 6H, 2 X CHCH_3); ^{13}C NMR (100 MHz, $CDCl_3$): δ 168.4, 163.2, 142.4, 139.4, 139.0, 137.5, 135.1, 131.9, 131.6, 131.6, 129.8, 129.2, 128.3, 127.4, 121.5, 95.0, 92.7, 87.8, 80.6, 67.2, 34.6, 34.4, 22.9, 21.0, 17.9, 17.9, 17.7, 17.6, 17.5; IR ν 2972 (m), 2237 (w), 1757 (s), 1619 (s), 1580 (m), 1465 (m), 1380 (w), 1331 (s), 1283 (s), 1251 (m), 1204 (m), 1148 (s), 1060 (m), 1015 (m), 940 (w); HRMS (ESI) calcd. for $C_{34}H_{38}INNaO_5S^+$ $[M+Na]^+$ 722.1408; found 722.1409; Chiral HPLC conditions: *ee* = 90%; Chiralpak IA 95:5 Hexane/*i*PrOH, 1.0 mL/min, 31 min. t_r (minor) = 15.1 min. and t_r (major) = 16.7 min. λ=254 cm^{-1}; $[\alpha]_D^{25.0}$ = +33.4 (c = 0.5, $CHCl_3$).

Adamantan-1-yl (*S*,*E*)-2-((2-iodophenyl)((mesitylsulfonyl)imino)methoxy)-4-phenylbut-3-ynoate (14h)

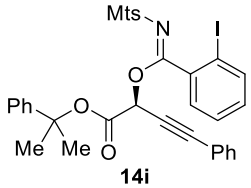


14h

Following **GP3**, *N*-[mesitylsulfonyl]-1-[phenylethynyl]-1,2-benziodazol-3(1*H*)-one (**2d**) (53 mg, 0.10 mmol, 1.0 equiv) and adamantan-1-yl 2-diazoacetate (**11g**) (44 mg, 0.20 mmol, 2.0 equiv) were stirred for 20 h. The crude reaction mixture was concentrated under reduced pressure and purified by flash chromatography using Et_2O:pentane 1:4 as mobile phase to afford **14h** as a white solid (47.0 mg, 0.065 mmol, 65%). Mp: 78.4–84.6 °C; TLC (Et_2O:Pentane 1:4): R_f = 0.32, $KMnO_4$; ^1H NMR (400 MHz, $CDCl_3$): δ 7.84 (d, *J* = 7.9 Hz, 1H, Ar*H*), 7.45 – 7.38 (m, 4H, Ar*H*), 7.37 – 7.28 (m, 3H, Ar*H*), 7.20 – 7.14 (m, 1H, Ar*H*), 6.89 (s, 2H, Ar*H*), 5.95 (s, 1H, OC*H*), 2.58 (s, 6H, 2 X ArCH_3), 2.28 (s, 3H, ArCH_3), 2.15 (s, 3H, 3 X Ad-C*H*), 2.11 – 1.99 (m, 6H, 3 X Ad-CH_2), 1.64 (s, 6H, 3 X Ad-CH_2); ^{13}C NMR (100 MHz, $CDCl_3$): δ 168.1, 163.1, 142.4, 139.6, 139.0, 137.7, 135.1, 132.0, 131.6, 131.6, 129.5, 129.2, 128.3, 127.4, 121.5, 92.7, 87.9, 84.0, 80.2, 67.6, 40.9, 35.9, 30.9, 22.9, 21.0; IR ν 3057 (w), 2914 (m), 2854 (w), 2236 (w), 1753 (m), 1620 (s), 1580 (m), 1460 (m), 1330 (s), 1283 (s), 1254 (s), 1192 (s), 1166 (s), 1147 (s), 1049 (s), 1015 (m), 856 (w); HRMS (ESI) calcd. for $C_{36}H_{37}INO_5S^+$ $[M+H]^+$ 722.1432; found 722.1427; Chiral HPLC conditions: *ee* = 94%;

Chiralpak IA 90:10 Hexane/*i*PrOH, 1.0 mL/min, 31 min. t_r (major) = 16.8 min. and t_r (minor) = 21.7 min. λ=254 cm^{-1}; $[\alpha]_D^{25.0}$ = +8.1 (c = 0.5, $CHCl_3$).

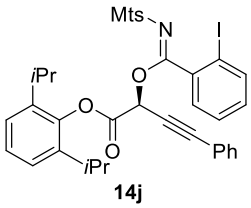
2-Phenylpropan-2-yl (*S*,*E*)-2-((2-iodophenyl)((mesitylsulfonyl)imino)methoxy)-4-phenylbut-3-ynoate (14i)



14i

Following **GP3**, *N*-[mesitylsulfonyl]-1-[phenylethynyl]-1,2-benziodazol-3(1*H*)-one (**2d**) (53 mg, 0.10 mmol, 1.0 equiv) and 2-phenylpropan-2-yl 2-diazoacetate (**11h**) (41 mg, 0.20 mmol, 2.0 equiv) were stirred for 20 h. The crude reaction mixture was concentrated under reduced pressure and purified by flash chromatography using Et_2O:pentane 1:4 as mobile phase to afford **14i** as a white solid (66.0 mg, 0.094 mmol, 94%). Mp: 86.8–87.7 °C; TLC (Et_2O:Pentane 1:2): R_f = 0.35, $KMnO_4$; ^{1}H NMR (400 MHz, $CDCl_3$): δ 7.81 (d, *J* = 8.3 Hz, 1H, Ar*H*), 7.48 – 7.27 (m, 12H, Ar*H*), 7.14 (ddd, *J* = 8.0, 6.7, 2.5 Hz, 1H, Ar*H*), 6.87 (s, 2H, Ar*H*), 6.08 (s, 1H, OC*H*), 2.55 (s, 6H, 2 X ArCH_3), 2.28 (s, 3H, ArCH_3), 1.83 (s, 3H, OCCH_3), 1.76 (s, 3H, OCCH_3); ^{13}C NMR (100 MHz, $CDCl_3$): δ 168.2, 162.6, 144.6, 142.5, 139.6, 138.9, 137.4, 135.0, 132.0, 131.6, 131.6, 129.6, 129.3, 128.4, 127.4, 124.3, 121.3, 92.6, 88.4, 85.0, 80.0, 67.4, 53.4, 29.1, 27.4, 22.9, 21.0; IR ν 3059 (w), 2981 (w), 2938 (w), 2236 (w), 1763 (m), 1621 (s), 1580 (m), 1493 (w), 1464 (w), 1331 (s), 1282 (s), 1254 (m), 1194 (m), 1165 (s), 1143 (s), 1104 (w), 1017 (m), 995 (m), 952 (w), 943 (w), 852 (w); HRMS (ESI) calcd. for $C_{35}H_{32}INNaO_5S^+$ $[M+Na]^+$ 728.0938; found 728.0948; Chiral HPLC conditions: *ee* = 94%; Chiralpak IA 90:10 Hexane/*i*PrOH, 1.0 mL/min, 31 min. t_r (minor) = 15.3 min. and t_r (major) = 17.5 min. λ=254 cm^{-1}; $[\alpha]_D^{25.0}$ = +40.8 (c = 0.5, $CHCl_3$). One carbon was not resolved at 100 MHz.

2,6-Di*iso*propylphenyl (*S*,*E*)-2-((2-iodophenyl)((mesitylsulfonyl)imino)methoxy)-4-phenylbut-3-ynoate (14j)

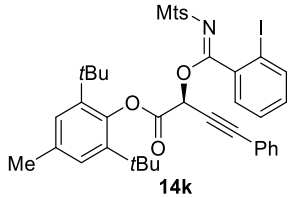


14j

Following **GP3**, *N*-[mesitylsulfonyl]-1-[phenylethynyl]-1,2-benziodazol-3(1*H*)-one (**2d**) (53 mg, 0.10 mmol, 1.0 equiv) and 2,6-di*iso*propylphenyl 2-diazoacetate (**11i**) (49.5 mg, 0.200 mmol, 2.00 equiv) were stirred for 18 h. The crude reaction mixture was concentrated under

reduced pressure and purified by flash chromatography using Et_2O:pentane 1:6 as mobile phase to afford **14j** as a white solid (76 mg, 0.10 mmol, quant.). Mp: 73.6–82.0 °C; TLC (Et_2O:Pentane 1:6): R_f = 0.21, $KMnO_4$; ^1H NMR (400 MHz, $CDCl_3$): δ 7.82 (d, *J* = 8.0 Hz, 1H, Ar*H*), 7.49 – 7.44 (m, 2H, Ar*H*), 7.43 – 7.32 (m, 5H, Ar*H*), 7.24 (d, *J* = 7.6 Hz, 1H, Ar*H*), 7.22 – 7.12 (m, 3H, Ar*H*), 6.88 (s, 2H, Ar*H*), 6.53 (s, 1H, C*H*), 3.19 – 3.03 (m, 2H, 2 X C*H*(CH_3)$_2$), 2.56 (s, 6H, 2 X ArCH_3), 2.28 (s, 3H, ArCH_3), 1.17 (d, *J* = 6.8 Hz, 12H, 2 X CH(CH_3)$_2$); ^{13}C NMR (100 MHz, $CDCl_3$): δ 168.3, 163.3, 145.0, 142.6, 140.5, 139.5, 139.0, 137.0, 134.9, 132.0, 131.8, 131.67, 129.9, 129.6, 128.4, 127.4, 127.1, 124.1, 121.1, 92.7, 89.0, 79.5, 66.4, 27.3, 23.5, 22.9, 21.0; IR ν 3062 (w), 2966 (w), 2870 (w), 2237 (w), 1779 (m), 1619 (s), 1579 (w), 1465 (w), 1332 (s), 1281 (m), 1252 (m), 1166 (s), 1142 (s), 1094 (w), 1040 (w), 1000 (m), 939 (w), 851 (w); HRMS (ESI) calcd. for $C_{38}H_{38}INNaO_5S^+$ $[M+Na]^+$ 770.1408; found 770.1421; Chiral HPLC conditions: *ee* = 80%; Chiralpak IA 80:20 Hexane/*i*PrOH, 1.0 mL/min, 31 min. t_r (minor) = 8.6 min. and t_r (major) = 17.9 min. λ=254 cm^{-1}; $[\alpha]_D^{25.0}$ = +49.9 (c = 0.5, $CHCl_3$).

2,6-Di-*tert*-butyl-4-methylphenyl (*S*,*E*)-2-((2-iodophenyl)((mesitylsulfonyl)imino)methoxy)-4-phenylbut-3-ynoate (14k)

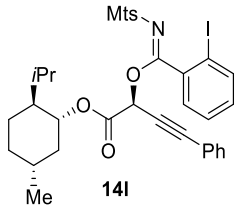


14k

Following **GP3**, *N*-[mesitylsulfonyl]-1-[phenylethynyl]-1,2-benziodazol-3(1*H*)-one (**2d**) (53 mg, 0.10 mmol, 1.0 equiv) and 2,6-di-*tert*-butyl-4-methylphenyl 2-diazoacetate (**11j**) (58 mg, 0.20 mmol, 2.0 equiv) were stirred for 18 h. The crude reaction mixture was concentrated under reduced pressure and purified by flash chromatography using Et_2O:pentane 1:6 as mobile phase to afford **14k** as a white solid (80 mg, 0.10 mmol, quant.). Mp: 84.2–89.9 °C; TLC (Et_2O:Pentane 1:5): R_f = 0.31, $KMnO_4$; ^1H NMR (400 MHz, $CDCl_3$): δ 7.83 (d, *J* = 8.0 Hz, 1H, Ar*H*), 7.46 – 7.30 (m, 7H, Ar*H*), 7.19 – 7.13 (m, 1H, Ar*H*), 7.13 – 7.08 (m, 2H, Ar*H*), 6.87 (s, 2H, Ar*H*), 6.68 (s, 1H, OC*H*), 2.57 (s, 6H, 2 X ArCH_3), 2.31 (s, 3H, ArCH_3), 2.28 (s, 3H, ArCH_3, Mts), 1.31 (s, 9H, *t*Bu), 1.27 (s, 9H, *t*Bu); ^{13}C NMR (100 MHz, $CDCl_3$): δ 168.1, 164.3, 145.6, 142.5, 142.1, 141.8, 139.6, 139.1, 137.2, 135.3, 135.0, 132.0, 131.7, 131.6, 129.7, 129.4, 128.4, 127.4, 127.3, 127.0, 121.3, 92.5, 89.9, 79.6, 67.0, 53.4, 35.3, 35.2, 31.6, 31.3, 22.9, 21.5, 21.0; IR ν 3058 (w), 2964 (m), 2238 (w), 1778 (m), 1622 (s), 1580 (m), 1464 (m), 1421 (w), 1365 (w), 1331 (s), 1279 (m), 1254 (m), 1146 (s), 1102 (m), 1038 (w), 991 (m), 904 (w), 859

(w), 838 (w); HRMS (ESI) calcd. for $C_{41}H_{45}INO_5S^+$ $[M+H]^+$ 790.2058; found 790.2063; Chiral HPLC conditions: *ee* = 74%; Chiralpak IA 95:5 Hexane/*i*PrOH, 1.0 mL/min, 31 min. t_r (minor) = 12.5 min. and t_r (major) = 15.7 min. λ=254 cm^{-1}; $[\alpha]_D^{25.0}$ = +59.8 (c = 0.5, $CHCl_3$). *t*Bu groups of BHT and Me groups of Mts were not identical and gave separate signals.

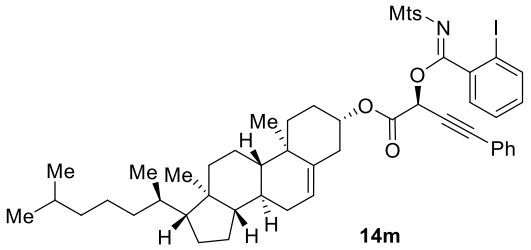
(1*R*,2*S*,5*R*)-2-isopropyl-5-methylcyclohexyl (*S*)-2-((*E*)-(2-iodophenyl)((mesitylsulfonyl)imino)methoxy)-4-phenylbut-3-ynoate (14l)



14l

Following **GP3**, *N*-[mesitylsulfonyl]-1-[phenylethynyl]-1,2-benziodazol-3(1*H*)-one (**2d**) (53 mg, 0.10 mmol, 1.0 equiv) and (1*R*,2*S*,5*R*)-2-*iso*propyl-5-methylcyclohexyl 3-oxobutanoate (**11k**) (45 mg, 0.20 mmol, 2.0 equiv) were stirred for 18 h. The crude reaction mixture was concentrated under reduced pressure and purified by flash chromatography using Et_2O:pentane 1:6 as mobile phase to afford **14l** as a white solid (60.0 mg, 0.083 mmol, 83%). Mp: 56.6–61.2 °C; TLC (Et_2O:Pentane 1:6): R_f = 0.23, $KMnO_4$; ^{1}H NMR (400 MHz, $CDCl_3$): δ 7.84 (d, *J* = 7.9 Hz, 1H, Ar*H*), 7.45 – 7.28 (m, 7H, Ar*H*), 7.17 (ddd, *J* = 8.0, 6.3, 2.8 Hz, 1H, Ar*H*), 6.88 (s, 2H, Ar*H*), 6.11 (s, 1H, OC*H*), 4.81 (td, *J* = 10.9, 4.4 Hz, 1H, OC*HC*H_2), 2.57 (s, 6H, 2 X ArCH_3), 2.28 (s, 3H, ArCH_3), 2.08 – 1.86 (m, 2H), 1.77 – 1.63 (m, 2H), 1.54 – 1.43 (m, 2H), 1.12 – 1.05 (m, 2H), 0.97 – 0.81 (m, 7H), 0.75 (d, *J* = 6.9 Hz, 3H, CH_3 of menthol); ^{13}C NMR (100 MHz, $CDCl_3$): δ 168.2, 164.2, 142.4, 139.5, 139.0, 137.5, 134.9, 132.0, 131.7, 131.6, 129.6, 129.3, 128.3, 127.4, 121.3, 92.6, 88.3, 80.0, 67.1, 47.0, 40.2, 34.1, 31.4, 26.2, 23.5, 22.9, 21.9, 21.0, 20.7, 16.3; IR ν 2957 (s), 2928 (m), 2870 (m), 2241 (w), 1751 (m), 1621 (s), 1581 (m), 1491 (w), 1461 (m), 1377 (w), 1332 (s), 1282 (s), 1255 (s), 1205 (m), 1164 (s), 1152 (s), 1053 (m), 1018 (m), 912 (m); HRMS (ESI) calcd. for $C_{36}H_{40}INNaO_5S^+$ $[M+Na]^+$ 748.1564; found 748.1571; Chiral HPLC conditions: *dr* = 2.5:97.5; Chiralpak IA 95:5 Hexane/*i*PrOH, 1.0 mL/min, 31 min. t_r (minor) = 21.0 min. and t_r (major) = 23.8 min. λ=254 cm^{-1}; $[\alpha]_D^{25.0}$ = +2.0 (c = 0.5, $CHCl_3$).

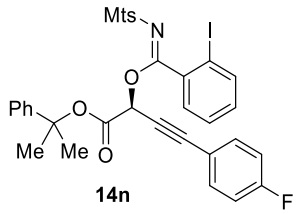
(3*S*,8*S*,9*S*,10*R*,13*R*,14*S*)-10,13-dimethyl-17-((*R*)-6-methylheptan-2-yl)-2,3,4,7,8,9,10,11,12,13,14,15,16,17-tetradecahydro-1*H*-cyclopenta[a]phenanthren-3-yl (2*S*)-2-((*E*)-(2-iodophenyl)((mesitylsulfonyl)imino)methoxy)-4-phenylbut-3-ynoate (14m)



14m

Following **GP3**, *N*-[mesitylsulfonyl]-1-[phenylethynyl]-1,2-benziodazol-3(1*H*)-one (**2d**) (53 mg, 0.10 mmol, 1.0 equiv) and (3*S*,8*S*,9*S*,10*R*,13*R*,14*S*,17*R*)-10,13-dimethyl-17-((*R*)-6-methylheptan-2-yl)-2,3,4,7,8,9,10,11,12,13,14,15,16,17-tetradecahydro-1*H*-cyclopenta[a]phenanthren-3-yl 2-diazoacetate (**11l**) (91 mg, 0.20 mmol, 2.0 equiv) were stirred for 18 h. The crude reaction mixture was concentrated under reduced pressure and purified by flash chromatography using Et_2O:pentane 1:6.5 as mobile phase to afford **14m** as a white solid (81.0 mg, 0.085 mmol, 85%). Mp: 96.4–100.4 °C;TLC (Et_2O:Pentane 1:5): R_f = 0.4, $KMnO_4$; ^1H NMR (400 MHz, $CDCl_3$): δ 7.85 (d, *J* = 8.0 Hz, 1H, Ar*H*), 7.46 – 7.39 (m, 4H, Ar*H*), 7.38 – 7.28 (m, 3H, Ar*H*), 7.18 (ddd, *J* = 9.2, 7.9, 4.2 Hz, 1H, Ar*H*), 6.88 (s, 2H, Ar*H*), 6.03 (s, 1H, OC*H*CC), 5.37 (d, *J* = 3.9 Hz, 1H, olefinic *H*), 4.63 (dtd, *J* = 12.5, 8.6, 4.5 Hz, 1H, OC*H*CH_2), 2.57 (s, 6H, 2 X ArC*H*$_3$), 2.39 – 2.31 (m, 2H), 2.28 (s, 3H, ArC*H*$_3$), 2.05 – 1.95 (m, 2H), 1.89 – 1.74 (m, 3H), 1.64 – 0.97 (m, 24H), 0.93 (d, *J* = 6.5 Hz, 3H), 0.88 (d, *J* = 1.8 Hz, 3H), 0.86 (d, *J* = 1.9 Hz, 3H), 0.69 (s, 3H); ^{13}C NMR (100 MHz, $CDCl_3$): δ 168.1, 164.2, 142.4, 139.5, 139.0, 137.5, 135.0, 132.1, 131.7, 131.6, 129.5, 129.3, 128.3, 127.4, 123.2, 121.3, 92.7, 88.4, 79.7, 76.8, 67.2, 56.7, 56.1, 50.0, 42.3, 39.7, 39.5, 37.5, 36.9, 36.5, 36.2, 35.8, 31.9, 31.8, 28.2, 28.0, 27.3, 24.3, 23.8, 22.9, 22.8, 22.6, 21.0, 19.3, 18.7, 11.9; IR ν 2942 (s), 2868 (m), 2238 (w), 1759 (m), 1623 (s), 1580 (m), 1465 (m), 1333 (s), 1283 (s), 1255 (s), 1193 (m), 1147 (s), 1016 (m), 852 (w); HRMS (ESI) calcd. for $C_{53}H_{66}INNaO_5S^+$ $[M+Na]^+$ 978.3599; found 978.3599; Chiral HPLC conditions: *dr* = 7:93; Chiralpak IA 80:20 Hexane/*i*PrOH, 1.0 mL/min, 31 min. t_r (minor) = 10.5 min. and t_r (major) = 14.8 min. λ = 254 cm^{-1}; $[\alpha]_D^{25.0}$ = +5.7 (c = 0.5, $CHCl_3$). One carbon was not resolved at 100 MHz.

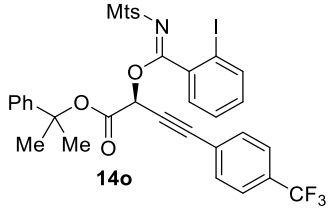
2-Phenylpropan-2-yl (*S*,*E*)-4-(4-fluorophenyl)-2-((2-iodophenyl)((mesitylsulfonyl)imino)methoxy)but-3-ynoate (14n)



14n

Following **GP3**, *N*-[mesitylsulfonyl]-1-[(4-fluorophenyl)ethynyl]-1,2-benziodazol-3(1*H*)-one (**2h**) (55 mg, 0.10 mmol, 1.0 equiv) and 2-phenylpropan-2-yl 2-diazoacetate (**11h**) (41 mg, 0.20 mmol, 2.0 equiv) were stirred for 20 h. The crude reaction mixture was concentrated under reduced pressure and purified by flash chromatography using Et_2O:pentane 1:5 as mobile phase to afford **14n** as a white solid (66.0 mg, 0.091 mmol, 91%). Mp: 96.8–98.9 °C; TLC (Et_2O:Pentane 1:4): R_f = 0.33, $KMnO_4$; ^1H NMR (400 MHz, $CDCl_3$): δ 7.81 (dd, *J* = 8.0, 0.9 Hz, 1H, Ar*H*), 7.47 – 7.26 (m, 9H, Ar*H*), 7.15 (ddd, *J* = 8.0, 7.0, 2.2 Hz, 1H, Ar*H*), 7.07 – 7.00 (m, 2H, Ar*H*), 6.88 (s, 2H, Ar*H*), 6.06 (s, 1H, OC*H*), 2.55 (s, 6H, 2 X ArC*H*$_3$), 2.28 (s, 3H, ArC*H*$_3$), 1.83 (s, 3H, OCC*H*$_3$), 1.76 (s, 3H, OCC*H*$_3$); ^{13}C NMR (100 MHz, $CDCl_3$): δ 168.2, 163.1 (d, *J* = 251.5 Hz), 162.6, 144.6, 142.5, 139.6, 138.9, 137.3, 134.9, 134.1 (d, $J_{C\text{-}F}$ = 8.6 Hz), 131.7, 131.6, 129.6, 128.4, 127.4, 127.4, 124.3, 117.4 (d, $J_{C\text{-}F}$ = 3.5 Hz), 115.8 (d, $J_{C\text{-}F}$ = 22.2 Hz), 92.6, 87.4, 85.1, 79.8, 67.3, 29.1, 27.4, 22.9, 21.0; IR ν 3063 (w), 2982 (w), 2938 (w), 2240 (w), 1763 (m), 1622 (s), 1508 (m), 1464 (w), 1331 (s), 1284 (s), 1238 (s), 1145 (s), 1017 (m), 841 (m); HRMS (ESI) calcd. for $C_{35}H_{31}FINNaO_5S^+$ $[M+Na]^+$ 746.0844; found 746.0839; Chiral HPLC conditions: *ee* = 92%; Chiralpak IB 90:10 Hexane/*i*PrOH, 1.0 mL/min, 31 min. t_r (minor) = 10.6 min. and t_r (major) = 16.5 min. λ = 254 cm^{-1}; $[\alpha]_D^{25.0}$ = +32.5 (c = 0.5, $CHCl_3$).

2-Phenylpropan-2-yl (*S*,*E*)-2-((2-iodophenyl)((mesitylsulfonyl)imino)methoxy)-4-(4-(trifluoromethyl)phenyl)but-3-ynoate (14o)

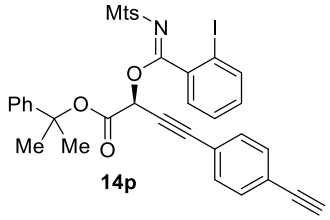


14o

Following **GP3**, *N*-[mesitylsulfonyl]-1-[(4-(trifluoromethyl)phenyl)ethynyl]-1,2-benziodazol-3(1*H*)-one (**2i**) (60 mg, 0.10 mmol, 1.0 equiv) and 2-phenylpropan-2-yl 2-diazoacetate (**11h**) (41 mg, 0.20 mmol, 2.0 equiv) were stirred for 20 h. The crude reaction mixture was concentrated under reduced pressure and purified by flash chromatography using Et_2O:pentane

1:4 as mobile phase to afford **14o** as a white solid (58.0 mg, 0.075 mmol, 75%). Mp: 65.7–71.9 °C; TLC (Et_2O:Pentane 1:4): R_f = 0.23, $KMnO_4$; ^1H NMR (400 MHz, $CDCl_3$): δ 7.82 (dd, *J* = 8.0, 1.0 Hz, 1H, Ar*H*), 7.60 (d, *J* = 8.2 Hz, 2H, Ar*H*), 7.54 (d, *J* = 8.2 Hz, 2H, Ar*H*), 7.42 – 7.27 (m, 7H, Ar*H*), 7.16 (ddd, *J* = 8.0, 7.0, 2.1 Hz, 1H, Ar*H*), 6.87 (s, 2H, Ar*H*), 6.09 (s, 1H, OC*H*), 2.55 (s, 6H, 2 X ArCH_3), 2.27 (s, 3H, ArCH_3), 1.84 (s, 3H, OCCH_3), 1.78 (s, 3H, OCCH_3); ^{13}C NMR (100 MHz, $CDCl_3$): δ 168.0, 162.3, 144.4, 142.6, 139.6, 139.0, 137.3, 134.9, 132.2, 131.8, 131.6, 131.3 (d, $J_{C\text{-}F}$ = 33.3 Hz), 129.6, 128.4, 127.5, 127.4, 125.3 (q, $J_{C\text{-}F}$ = 3.6 Hz), 125.1, 124.3, 92.6, 86.8, 85.3, 82.4, 67.1, 29.0, 27.4, 22.9, 21.0; IR ν 3061 (w), 2982 (w), 2938 (w), 1763 (m), 1620 (s), 1580 (w), 1464 (w), 1325 (s), 1282 (m), 1255 (m), 1167 (s), 1132 (s), 1069 (w), 1016 (m), 953 (w), 846 (m); HRMS (ESI) calcd. for $C_{36}H_{31}F_3INNaO_5S^+$ $[M+Na]^+$ 796.0812; found 796.0818; Chiral HPLC conditions: *ee* = 85%; Chiralpak IB 90:10 Hexane/*i*PrOH, 1.0 mL/min, 31 min. t_r (minor) = 8.8 min. and t_r (major) = 16.1 min. λ = 254 cm^{-1}; $[\alpha]_D^{25.0}$ = +27.6 (c = 0.5, $CHCl_3$). CF_3 carbon was not resolved at 100 MHz.

2-Phenylpropan-2-yl (*S*,*E*)-4-(4-ethynylphenyl)-2-((2-iodophenyl)((mesitylsulfonyl)imino)methoxy)but-3-ynoate (14p)

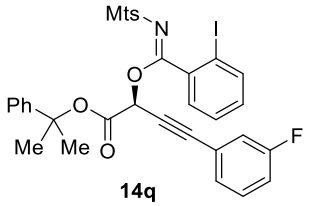


14p

Following **GP3**, *N*-[mesitylsulfonyl]-1-[(4-ethynylphenyl)ethynyl]-1,2-benziodazol-3(1*H*)-one (**2j**) (55 mg, 0.10 mmol, 1.0 equiv) and 2-phenylpropan-2-yl 2-diazoacetate (**11h**) (41 mg, 0.20 mmol, 2.0 equiv) were stirred for 20 h. The crude reaction mixture was concentrated under reduced pressure and purified by flash chromatography using Et_2O:pentane 1:4 as mobile phase to afford **14p** as a white solid (44 mg, 0.06 mmol, 60%). Mp: 68.5–71.8 °C; TLC (Et_2O:Pentane 1:3): R_f = 0.29, $KMnO_4$; ^1H NMR (400 MHz, $CDCl_3$): δ 7.82 (d, *J* = 7.9 Hz, 1H, Ar*H*), 7.48 – 7.26 (m, 11H, Ar*H*), 7.15 (ddd, *J* = 8.0, 6.9, 2.3 Hz, 1H,. Ar*H*), 6.87 (s, 2H, Ar*H*), 6.07 (s, 1H, OC*H*), 3.19 (s, 1H, CC*H*), 2.55 (s, 6H, 2 X ArCH_3), 2.28 (s, 3H, ArCH_3), 1.83 (s, 3H, OCCH_3), 1.77 (s, 3H, OCCH_3); ^{13}C NMR (100 MHz, $CDCl_3$): δ 168.1, 162.5, 144.6, 142.5, 139.6, 138.9, 137.3, 134.9, 132.1, 131.9, 131.7, 131.6, 129.6, 128.4, 127.4, 127.4, 124.3, 123.1, 121.7, 92.6, 87.7, 85.2, 82.9, 81.9, 79.5, 67.3, 29.0, 27.4, 22.9, 21.0; IR ν 3290 (w), 3058 (w), 3035 (w), 2927 (w), 2853 (w), 2241 (w), 1762 (m), 1622 (s), 1581 (m), 1500 (w), 1464 (m), 1445 (w), 1368 (w), 1331 (s), 1284 (s), 1257 (m), 1194 (m), 1164 (s), 1145 (s), 1105 (w), 1018 (m), 997

(m), 953 (w), 913 (m); HRMS (ESI) calcd. for $C_{37}H_{32}INNaO_5S^+$ $[M+Na]^+$ 752.0938; found 752.0950; Chiral HPLC conditions: *ee* = 93%; Chiralpak IA 90:10 Hexane/*i*PrOH, 1.0 mL/min, 31 min. t_r (minor) = 18.4 min. and t_r (major) = 21.2 min. λ = 254 cm^{-1}; $[\alpha]_D^{25.0}$ = +50.9 (c = 0.5, $CHCl_3$).

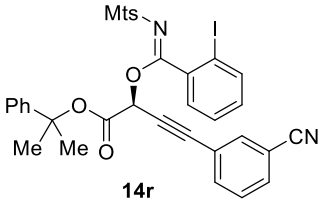
2-Phenylpropan-2-yl (*S*,*E*)-4-(3-fluorophenyl)-2-((2-iodophenyl)((mesitylsulfonyl)imino)methoxy)but-3-ynoate (14q)



14q

Following **GP3**, *N*-[mesitylsulfonyl]-1-[(3-fluorophenyl)ethynyl]-1,2-benziodazol-3(1*H*)-one (**2k**) (55 mg, 0.10 mmol, 1.0 equiv) and 2-phenylpropan-2-yl 2-diazoacetate (**11h**) (41 mg, 0.20 mmol, 2.0 equiv) were stirred for 20 h. The crude reaction mixture was concentrated under reduced pressure and purified by flash chromatography using Et_2O:pentane 1:5 as mobile phase to afford **14q** as a white solid (60.0 mg, 0.083 mmol, 83%). Mp: 63.8–66.1 °C; TLC (Et_2O:Pentane 1:4): R_f = 0.34, $KMnO_4$; ^1H NMR (400 MHz, $CDCl_3$): δ 7.82 (dd, *J* = 8.0, 1.0 Hz, 1H, Ar*H*), 7.43 – 7.27 (m, 8H, Ar*H*), 7.22 (dt, *J* = 7.7, 1.3 Hz, 1H, Ar*H*), 7.18 – 7.06 (m, 3H, Ar*H*), 6.88 (s, 2H, Ar*H*), 6.07 (s, 1H, OC*H*), 2.55 (s, 6H, 2 X ArCH_3), 2.28 (s, 3H, ArCH_3), 1.83 (s, 3H, OCCH_3), 1.77 (s, 3H, OCCH_3); ^{13}C NMR (100 MHz, $CDCl_3$): δ 168.1, 162.4, 162.2 (d, *J* = 247.3 Hz), 144.5, 142.6, 139.6, 138.9, 137.3, 134.9, 131.7, 131.6, 130.0 (d, *J* = 8.7 Hz), 129.6, 128.4, 127.9 (d, *J* = 3.2 Hz), 127.5, 127.4, 124.3, 123.1 (d, *J* = 9.6 Hz), 118.8 (d, *J* = 23.1 Hz), 116.8 (d, *J* = 21.3 Hz), 92.6, 87.0 (d, *J* = 3.3 Hz), 85.2, 80.9, 67.2, 29.0, 27.4, 22.9, 21.0; IR ν 3064 (w), 2934 (w), 2851 (w), 2242 (w), 1763 (m), 1624 (s), 1469 (w), 1435 (m), 1332 (s), 1289 (s), 1250 (s), 1148 (s), 1001 (w), 945 (w), 873 (w); HRMS (ESI) calcd. for $C_{35}H_{31}FINNaO_5S^+$ $[M+Na]^+$ 746.0844; found 746.0857; Chiral HPLC conditions: *ee* = 92%; Chiralpak IB 90:10 Hexane/*i*PrOH, 1.0 mL/min, 31 min. t_r (minor) = 10.6 min. and t_r (major) = 15.9 min. λ = 230 cm^{-1}; $[\alpha]_D^{25.0}$ = +29.6 (c = 0.5, $CHCl_3$).

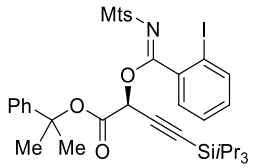
2-Phenylpropan-2-yl (*S*,*E*)-4-(3-cyanophenyl)-2-((2-iodophenyl)((mesitylsulfonyl)imino)methoxy)but-3-ynoate (14r)



14r

Following **GP3**, *N*-[mesitylsulfonyl]-1-[(3-cyanophenyl)ethynyl]-1,2-benziodazol-3(1*H*)-one (**2l**) (55.5 mg, 0.100 mmol, 1.00 equiv) and 2-phenylpropan-2-yl 2-diazoacetate (**11h**) (41 mg, 0.20 mmol, 2.0 equiv) were stirred for 20 h. The crude reaction mixture was concentrated under reduced pressure and purified by flash chromatography using Et_2O:pentane 1:2 as mobile phase to afford **14r** as a white solid (59.0 mg, 0.081 mmol, 81%). Mp: 83.9–85.6 °C; TLC (Et_2O:Pentane 1:2): R_f = 0.18, $KMnO_4$; ^1H NMR (400 MHz, $CDCl_3$): δ 7.85 (dd, *J* = 8.0, 1.0 Hz, 1H, Ar*H*), 7.72 – 7.64 (m, 3H, Ar*H*), 7.49 (td, *J* = 7.8, 0.7 Hz, 1H, Ar*H*), 7.45 – 7.29 (m, 7H, Ar*H*), 7.19 (ddd, *J* = 8.0, 7.2, 2.0 Hz, 1H, Ar*H*), 6.93 – 6.87 (m, 2H, Ar*H*), 6.09 (s, 1H, OC*H*), 2.57 (s, 6H, 2 X ArCH_3), 2.31 (s, 3H, ArCH_3), 1.86 (s, 3H, OCCH_3), 1.81 (s, 3H, OCCH_3); ^{13}C NMR (100 MHz, $CDCl_3$): δ 168.0, 162.2, 144.4, 142.7, 139.6, 139.0, 137.2, 136.0, 135.2, 134.8, 132.5, 131.8, 131.6, 129.6, 129.4, 128.4, 127.6, 127.5, 124.3, 123.0, 117.7, 113.1, 92.5, 85.7, 85.4, 82.6, 67.0, 28.9, 27.5, 22.9, 21.0; IR ν 2984 (m), 2904 (m), 2233 (w), 1763 (m), 1625 (s), 1580 (w), 1464 (w), 1408 (w), 1385 (w), 1332 (s), 1279 (m), 1253 (s), 1165 (s), 1147 (s), 1061 (s), 907 (w); HRMS (ESI) calcd. for $C_{36}H_{31}IN_2NaO_5S^+$ $[M+Na]^+$ 753.0891; found 753.0892; Chiral HPLC conditions: *ee* = 87%; Chiralpak IA 80:20 Hexane/*i*PrOH, 1.0 mL/min, 40 min. t_r (minor) = 22.9 min. and t_r (major) = 29.2 min. λ=254 cm^{-1}; $[\alpha]_D^{25.0}$ = +31.8 (c = 0.5, $CHCl_3$).

2-Phenylpropan-2-yl (*S*,*E*)-2-((2-iodophenyl)((mesitylsulfonyl)imino)methoxy)-4-(tri*iso*propylsilyl)but-3-ynoate (14s)

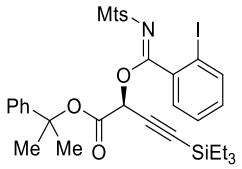


14s

Following **GP3**, *N*-[mesitylsulfonyl]-1-[(tri*iso*propylsilyl)ethynyl]-1,2-benziodazol-3(1*H*)-one (**2c**) (61 mg, 0.10 mmol, 1.0 equiv) and 2-phenylpropan-2-yl 2-diazoacetate (**11h**) (41 mg, 0.20 mmol, 2.0 equiv) were stirred for 20 h. The crude reaction mixture was concentrated under reduced pressure and purified by flash chromatography using Et_2O:pentane 1:7 as mobile phase to afford **14s** as a white solid (56.0 mg, 0.071 mmol, 71%). Mp: 116.4–121.6 °C; TLC (Et_2O:Pentane 1:5): R_f = 0.25, $KMnO_4$; ^1H NMR (400 MHz,$CDCl_3$): δ 7.81 (dd, *J* = 8.0, 1.1 Hz, 1H, Ar*H*), 7.40 – 7.26 (m, 7H, Ar*H*), 7.13 (ddd, *J* = 8.0, 7.3, 1.9 Hz, 1H, Ar*H*), 6.88 (s, 2H, Ar*H*), 6.02 (s, 1H, OC*H*), 2.52 (s, 6H, 2 X ArCH_3), 2.28 (s, 3H, ArCH_3), 1.81 (s, 3H, OCCH_3), 1.75 (s, 3H, OCCH_3), 1.08 (s, 21H, TIPS); ^{13}C NMR (100 MHz, $CDCl_3$): δ 168.4, 162.5, 144.7, 142.4, 139.5, 138.9, 137.4, 135.1, 131.6, 131.6, 129.6, 128.4, 127.3, 124.1, 97.0, 92.6, 91.1, 84.9, 66.8, 28.9, 27.6, 22.9, 21.0, 18.6, 11.1; IR ν 2943 (m), 2866 (m), 1764 (m),

1620 (s), 1580 (w), 1464 (m), 1385 (w), 1332 (s), 1274 (s), 1252 (s), 1194 (m), 1144 (s), 1104 (w), 1059 (m), 1016 (m), 930 (w), 885 (w), 809 (w); HRMS (ESI) calcd. for $C_{38}H_{48}INNaO_5SSi^+$ $[M+Na]^+$ 808.1959; found 808.1924; Chiral HPLC conditions: *ee* = 90%; Chiralpak IA 95:5 Hexane/*i*PrOH, 1.0 mL/min, 31 min. t_r (minor) = 9.9 min. and t_r (major) = 16.4 min. λ = 254 cm^{-1}; $[\alpha]_D^{25.0}$ = +34.0 (c = 0.5, $CHCl_3$). One carbon was not resolved at 100 MHz.

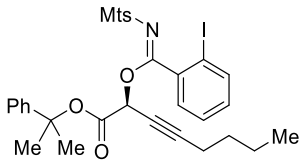
2-Phenylpropan-2-yl (*S*,*E*)-2-((2-iodophenyl)((mesitylsulfonyl)imino)methoxy)-4-(triethylsilyl)but-3-ynoate (14t)



14t

Following **GP3**, *N*-[mesitylsulfonyl]-1-[(triethylsilyl)ethynyl]-1,2-benziodazol-3(1*H*)-one (**2m**) (57 mg, 0.10 mmol, 1.0 equiv) and 2-phenylpropan-2-yl 2-diazoacetate (**11h**) (41 mg, 0.20 mmol, 2.0 equiv) were stirred for 18 h. The crude reaction mixture was concentrated under reduced pressure and purified by flash chromatography using Et_2O:pentane 1:6.5 as mobile phase to afford **14t** as a white solid (52 mg, 0.07 mmol, 70%). Mp: 123.0–126.6 °C; TLC (Et_2O:Pentane 1:6.5): R_f = 0.17, $KMnO_4$; ^1H NMR (400 MHz, $CDCl_3$): δ 7.82 – 7.79 (m, 1H, Ar*H*), 7.42 – 7.26 (m, 7H, Ar*H*), 7.13 (ddd, *J* = 8.0, 7.1, 2.1 Hz, 1H, Ar*H*), 6.88 (s, 2H, Ar*H*), 5.95 (s, 1H, OC*H*), 2.53 (s, 6H, 2 X ArCH_3), 2.28 (s, 3H, ArCH_3), 1.80 (s, 3H, OCCH_3), 1.74 (s, 3H, OCCH_3), 0.99 (t, *J* = 7.9 Hz, 9H, 3 X CH_2CH_3), 0.63 (q, *J* = 7.9 Hz, 6H, 2 X CH_3CH_2); ^{13}C NMR (100 MHz, $CDCl_3$): δ 168.3, 162.5, 144.7, 142.5, 139.5, 138.9, 137.4, 135.0, 131.6, 131.6, 129.6, 128.3, 127.3, 124.1, 96.3, 92.6, 92.2, 84.9, 67.0, 29.0, 27.5, 22.9, 21.0, 7.4, 4.0; IR ν 3061 (w), 2955 (w), 2876 (w), 1766 (m), 1623 (s), 1581 (w), 1465 (w), 1334 (s), 1276 (m), 1253 (m), 1194 (w), 1166 (m), 1145 (s), 1105 (w), 1059 (w), 1017 (m); HRMS (ESI) calcd. for $C_{35}H_{42}INNaO_5SSi^+$ $[M+Na]^+$ 766.1490; found 766.1496; Chiral HPLC conditions: *ee* = 92%; Chiralpak IA 95:5 Hexane/*i*PrOH, 1.0 mL/min, 31 min. t_r (minor) = 10.8 min. and t_r (major) = 15.8 min. λ = 254 cm^{-1}; $[\alpha]_D^{25.0}$ = +24.7 (c = 0.5, $CHCl_3$). One carbon was not resolved at 100 MHz.

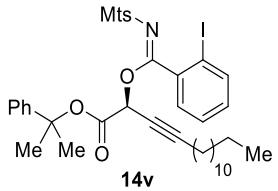
2-Phenylpropan-2-yl (*S*,*E*)-2-((2-iodophenyl)((mesitylsulfonyl)imino)methoxy)oct-3-ynoate (14u)



14u

Following **GP3**, *N*-[mesitylsulfonyl]-1-[(butyl)ethynyl]-1,2-benziodazol-3(1*H*)-one (**2n**) (51 mg, 0.10 mmol, 1.0 equiv) and 2-phenylpropan-2-yl 2-diazoacetate (**11h**) (41 mg, 0.20 mmol, 2.0 equiv) were stirred for 20 h. The crude reaction mixture was concentrated under reduced pressure and purified by flash chromatography using Et_2O:pentane 1:4 as mobile phase to afford **14u** as a thick colourless gel (48 mg, 0.07 mmol, 70%). TLC (Et_2O:Pentane 1:4): R_f = 0.37, $KMnO_4$; ^1H NMR (400 MHz, $CDCl_3$): δ 7.82 – 7.77 (m, 1H, Ar*H*), 7.41 – 7.27 (m, 7H, Ar*H*), 7.13 (ddd, *J* = 7.9, 7.3, 2.0 Hz, 1H, Ar*H*), 6.87 (s, 2H, Ar*H*), 5.84 (t, *J* = 2.3 Hz, 1H, OC*H*), 2.53 (s, 6H, 2 X ArCH_3), 2.29 – 2.22 (m, 5H, ArCH_3 and CCCH_2), 1.79 (s, 3H, OCCH_3), 1.74 (s, 3H, OCCH_3), 1.56 – 1.47 (m, 2H, CCCH_2CH_2), 1.47 – 1.36 (m, 2H, CH_2CH_3), 0.90 (t, *J* = 7.2 Hz, 3H, CH_2CH_3); ^{13}C NMR (100 MHz, $CDCl_3$): δ 168.3, 163.1, 144.8, 142.4, 139.5, 138.9, 137.5, 135.0, 131.6, 129.6, 128.3, 127.3, 127.3, 124.2, 92.6, 90.1, 84.7, 71.2, 67.4, 30.1, 28.9, 27.4, 22.9, 21.9, 21.0, 18.5, 13.5; IR ν 3061 (w), 2936 (w), 2869 (w), 2241 (w), 1764 (m), 1622 (s), 1580 (w), 1464 (w), 1333 (s), 1278 (s), 1255 (m), 1203 (m), 1150 (s), 1105 (w), 1016 (w), 854 (w); HRMS (ESI) calcd for $C_{33}H_{36}INNaO_5S^+$ $[M+Na]^+$ 708.1251; found 708.1235; Chiral HPLC conditions: *ee* = 93%; Chiralpak IA 90:10 Hexane/*i*PrOH, 1.0 mL/min, 31 min. t_r (minor) = 11.3 min. and t_r (major) = 13.9 min. λ = 254 cm^{-1}; $[\alpha]_D^{25.0}$ = -5.1 (c = 0.5, $CHCl_3$). One carbon was not resolved at 100 MHz.

2-Phenylpropan-2-yl (*S*,*E*)-2-((2-iodophenyl)((mesitylsulfonyl)imino)methoxy)octadec-3-ynoate (14v)

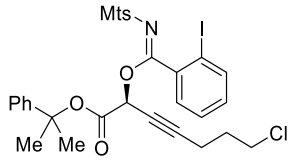


14v

Following **GP3**, *N*-[mesitylsulfonyl]-1-[(dodecyl)ethynyl]-1,2-benziodazol-3(1*H*)-one (**2o**) (63 mg, 0.10 mmol, 1.0 equiv) and 2-phenylpropan-2-yl 2-diazoacetate (**11h**) (41 mg, 0.20 mmol, 2.0 equiv) were stirred for 18 h. The crude reaction mixture was concentrated under reduced pressure and purified by flash chromatography using Et_2O:pentane 1:5 as mobile phase to afford **14v** as a colourless thick gel (60.0 mg, 0.075 mmol, 75%). TLC (Et_2O:Pentane 1:5):

R_f = 0.3, $KMnO_4$; ^{1}H NMR (400 MHz,$CDCl_3$): δ 7.80 (d, *J* = 7.9 Hz, 1H, Ar*H*), 7.40 – 7.27 (m, 7H, Ar*H*), 7.13 (td, *J* = 7.6, 2.0 Hz, 1H, Ar*H*), 6.88 (s, 2H, Ar*H*), 5.84 (t, *J* = 2.3 Hz, 1H, OC*H*), 2.54 (s, 6H, 2 X ArCH_3), 2.29 – 2.22 (m, 5H, ArCH_3 and CCCH_2), 1.79 (s, 3H, OCCH_3), 1.74 (s, 3H, OCCH_3), 1.56 – 1.48 (m, 2H, CCCH_2CH_2CH_2), 1.42 – 1.33 (m, 2H, CH_2), 1.31 – 1.21 (m, 16H), 0.88 (t, *J* = 6.8 Hz, 3H, CH_2CH_3); ^{13}C NMR (100 MHz,$CDCl_3$): δ 168.3, 163.1, 144.8, 142.4, 139.5, 138.8, 137.5, 135.0, 131.5, 130.1, 129.6, 128.3, 127.3, 127.3, 124.2, 92.6, 90.2, 84.7, 71.1, 67.4, 31.9, 29.6, 29.6, 29.5, 29.3, 29.1, 28.9, 28.9, 28.3, 28.1, 27.4, 22.9, 22.7, 21.0, 18.8, 14.1; IR ν 2927 (m), 2854 (w), 2244 (w), 1764 (m), 1622 (s), 1580 (w), 1464 (m), 1334 (s), 1278 (s), 1255 (m), 1204 (m), 1150 (s), 1000 (w), 951 (w); HRMS (ESI) calcd. for $C_{41}H_{52}INNaO_5S^+$ $[M+Na]^+$ 820.2503; found 820.2510; Chiral HPLC conditions: *ee* = 93%; Chiralpak IA 95:5 Hexane/*i*PrOH, 1.0 mL/min, 31 min. t_r (minor) = 12.3 min. and t_r (major) = 15.7 min. λ = 254 cm^{-1}; $[\alpha]_D^{25.0}$ = -1.2 (c = 0.5, $CHCl_3$).

2-Phenylpropan-2-yl (*S*,*E*)-7-chloro-2-((2-iodophenyl)((mesitylsulfonyl)imino)methoxy)hept-3-ynoate (14w)

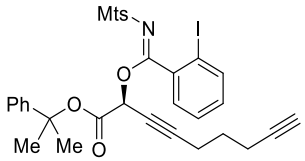


14w

Following **GP3**, *N*-[mesitylsulfonyl]-1-[(3-chloropropyl)ethynyl]-1,2-benziodazol-3(1*H*)-one (**2p**) (53 mg, 0.10 mmol, 1.0 equiv) and 2-phenylpropan-2-yl 2-diazoacetate (**11h**) (41 mg, 0.20 mmol, 2.0 equiv) were stirred for 20 h. The crude reaction mixture was concentrated under reduced pressure and purified by flash chromatography using Et_2O:pentane 1:4 as mobile phase to afford **14w** as a white solid (37.0 mg, 0.052 mmol, 52%). Mp: 42.8–47.3 °C; TLC (Et_2O:Pentane 1:4): R_f = 0.37, $KMnO_4$; ^{1}H NMR (400 MHz,$CDCl_3$): δ 7.81 (dd, *J* = 8.0, 1.0 Hz, 1H, Ar*H*), 7.40 – 7.26 (m, 7H, Ar*H*), 7.14 (td, *J* = 7.6, 1.9 Hz, 1H, Ar*H*), 6.88 (s, 2H, Ar*H*), 5.85 (t, *J* = 2.2 Hz, 1H, OC*H*), 3.62 (t, *J* = 6.3 Hz, 2H, CH_2CH_2Cl), 2.54 (s, 6H, 2 X ArCH_3), 2.47 (td, *J* = 6.8, 2.3 Hz, 2H, CCCH_2), 2.28 (s, 3H, ArCH_3), 1.97 (p, *J* = 6.6 Hz, 2H, CH_2CH_2CH_2Cl), 1.80 (s, 3H, OCCH_3), 1.75 (s, 3H, OCCH_3); ^{13}C NMR (100 MHz,$CDCl_3$): δ 168.2, 162.9, 144.6, 142.5, 139.5, 138.9, 137.4, 135.0, 131.6, 131.6, 129.6, 128.3, 127.4, 127.4, 124.2, 92.6, 87.9, 84.9, 72.3, 67.1, 43.4, 30.7, 28.8, 27.4, 22.9, 21.0, 16.2; IR ν 3060 (w), 2981 (w), 2939 (w), 2245 (w), 1761 (m), 1619 (s), 1580 (m), 1460 (m), 1329 (s), 1276 (s), 1254 (s), 1203 (m), 1140 (s), 1104 (m), 1000 (m), 853 (w); HRMS (ESI) calcd. for $C_{32}H_{33}ClINNaO_5S^+$ $[M+Na]^+$ 728.0705; found 728.0698; Chiral HPLC conditions: *ee* = 90%;

Chiralpak IA 90:10 Hexane/*i*PrOH, 1.0 mL/min, 31 min. t_r (minor) = 17.9 min. and t_r (major) = 23.2 min. λ = 254 cm^{-1}; $[\alpha]_D^{25.0}$ = -1.9 (c = 0.5, $CHCl_3$).

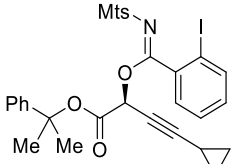
2-Phenylpropan-2-yl (*S*,*E*)-2-((2-iodophenyl)((mesitylsulfonyl)imino)methoxy)nona-3,8-diynoate (14x)



14x

Following **GP3**, *N*-[mesitylsulfonyl]-1-[hepta-1,6-diynyl]-1,2-benziodazol-3(1*H*)-one (**2q**) (52 mg, 0.10 mmol, 1.0 equiv) and 2-phenylpropan-2-yl 2-diazoacetate (**11h**) (41 mg, 0.20 mmol, 2.0 equiv) were stirred for 20 h. The crude reaction mixture was concentrated under reduced pressure and purified by flash chromatography using Et_2O:pentane 1:3 as mobile phase to afford **14x** as a white semi-solid (45.0 mg, 0.065 mmol, 65%). TLC (Et_2O:Pentane 1:3): R_f = 0.18, $KMnO_4$; ^{1}H NMR (400 MHz,$CDCl_3$): δ 7.80 (dd, *J* = 8.0, 1.0 Hz, 1H, Ar*H*), 7.41 – 7.27 (m, 7H, Ar*H*), 7.13 (td, *J* = 7.6, 1.9 Hz, 1H, Ar*H*), 6.88 (s, 2H, Ar*H*), 5.84 (t, *J* = 2.3 Hz, 1H, OC*H*), 2.53 (s, 6H, 2 X ArCH_3), 2.41 (td, *J* = 7.0, 2.3 Hz, 2H, OCHCCCH_2), 2.33 – 2.26 (m, 5H, CHCCH_2 and ArCH_3), 1.97 (t, *J* = 2.7 Hz, 1H, CC*H*), 1.79 (s, 3H, OCCH_3), 1.78 – 1.71 (m, 5H, OCCH_3 and $CH_2CH_2CH_2$); ^{13}C NMR (100 MHz, $CDCl_3$): δ 168.3, 163.0, 144.7, 142.5, 139.5, 138.9, 137.5, 135.0, 131.6, 129.6, 128.4, 127.4, 124.3, 92.6, 88.7, 84.8, 83.1, 72.0, 69.2, 67.2, 28.9, 27.5, 27.0, 22.9, 21.0, 17.8, 17.6; IR ν 3300 (w), 2982 (w), 2939 (w), 2244 (w), 1761 (m), 1619 (s), 1463 (w), 1329 (s), 1274 (s), 1203 (m), 1144 (s), 1104 (m), 999 (m), 854 (w); HRMS (ESI) calcd. for $C_{34}H_{35}INO_5S^+$ $[M+H]^+$ 696.1275; found 696.1276; Chiral HPLC conditions: *ee* = 90%; Chiralpak IA 90:10 Hexane/*i*PrOH, 1.0 mL/min, 31 min. t_r (minor) = 16.8 min. and t_r (major) = 20.4 min. λ = 254 cm^{-1}; $[\alpha]_D^{25.0}$ = -3.6 (c = 0.5, $CHCl_3$). Two carbons were not resolved at 100 MHz.

2-Phenylpropan-2-yl (*S*,*E*)-4-cyclopropyl-2-((2-iodophenyl)((mesitylsulfonyl)imino)methoxy)but-3-ynoate (14y)

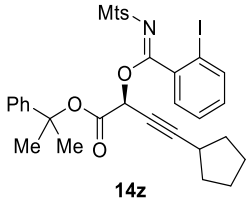


14y

Following **GP3**, *N*-[mesitylsulfonyl]-1-[(cyclopropyl)ethynyl]-1,2-benziodazol-3(1*H*)-one (**2r**) (49.5 mg, 0.100 mmol, 1.00 equiv) and 2-phenylpropan-2-yl 2-diazoacetate (**11h**) (41 mg, 0.20 mmol, 2.0 equiv) were stirred for 20 h. The crude reaction mixture was concentrated under

reduced pressure and purified by flash chromatography using Et_2O:pentane 1:3 as mobile phase to afford **14y** as a white solid (59.0 mg, 0.088 mmol, 88%). Mp: 51.4–56.8 °C; TLC (Et_2O:Pentane 1:3): R_f = 0.22, $KMnO_4$; ^1H NMR (400 MHz, $CDCl_3$): δ 7.80 (dd, *J* = 7.9, 1.0 Hz, 1H, Ar*H*), 7.40 – 7.27 (m, 7H, Ar*H*), 7.13 (ddd, *J* = 8.0, 7.2, 1.9 Hz, 1H, Ar*H*), 6.88 (s, 2H, Ar*H*), 5.79 (d, *J* = 2.1 Hz, 1H, OC*H*), 2.53 (s, 6H, 2 X ArCH_3), 2.28 (s, 3H, ArCH_3), 1.78 (s, 3H, OCCH_3), 1.72 (s, 3H, OCCH_3), 1.34 – 1.26 (m, 1H, CC*H*$(CH_2)_2$), 0.86 – 0.78 (m, 2H, CH_2), 0.78 – 0.71 (m, 2H, CH_2); ^{13}C NMR (100 MHz, $CDCl_3$): δ 168.3, 163.0, 144.8, 142.4, 139.5, 138.8, 137.5, 135.0, 131.6, 129.5, 128.3, 127.3, 124.2, 93.2, 92.6, 84.6, 67.5, 66.3, 53.4, 29.1, 27.4, 22.9, 21.0, 8.4, 8.4, -0.5; IR ν 2981 (w), 2936 (w), 2245 (w), 1762 (m), 1620 (s), 1580 (w), 1465 (w), 1330 (s), 1277 (s), 1255 (m), 1191 (w), 1145 (s), 1000 (w), 891 (w), 817 (w); HRMS (ESI) calcd for $C_{32}H_{32}INNaO_5S^+$ $[M+Na]^+$ 692.0938; found 692.0944; Chiral HPLC conditions: *ee* = 94%; Chiralpak IA 90:10 Hexane/*i*PrOH, 1.0 mL/min, 31 min. t_r (minor) = 14.5 min. and t_r (major) = 17.6 min. λ = 254 cm^{-1}; $[\alpha]_D^{25.0}$ = +2.9 (c = 0.5, $CHCl_3$). One carbon was not resolved at 100 MHz.

2-Phenylpropan-2-yl (*S*,*E*)-4-cyclopentyl-2-((2-iodophenyl)((mesitylsulfonyl)imino)methoxy)but-3-ynoate (14z)

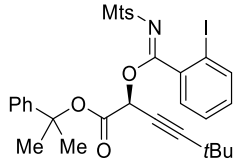


14z

Following **GP3**, *N*-[mesitylsulfonyl]-1-[(cyclopentyl)ethynyl]-1,2-benziodazol-3(1*H*)-one (**2s**) (52 mg, 0.10 mmol, 1.0 equiv) and 2-phenylpropan-2-yl 2-diazoacetate (**11h**) (41 mg, 0.20 mmol, 2.0 equiv) were stirred for 20 h. The crude reaction mixture was concentrated under reduced pressure and purified by flash chromatography using Et_2O:pentane 1:4 as mobile phase to afford **14z** as a white solid (49 mg, 0.07 mmol, 70%). Mp: 54.4–57.8 °C; TLC (Et_2O:Pentane 1:4): R_f = 0.21, $KMnO_4$; ^1H NMR (400 MHz, $CDCl_3$): δ 7.80 (dd, *J* = 8.0, 1.0 Hz, 1H, Ar*H*), 7.41 – 7.26 (m, 7H, Ar*H*), 7.13 (ddd, *J* = 8.0, 7.1, 2.1 Hz, 1H, Ar*H*), 6.88 (s, 2H, Ar*H*), 5.85 (d, *J* = 2.1 Hz, 1H, C*H*), 2.68 (pd, *J* = 7.4, 2.1 Hz, 1H, CCC*H*), 2.54 (s, 6H, 2 X ArCH_3), 2.28 (s, 3H, ArCH_3), 1.97 – 1.87 (m, 2H, CH_2), 1.78 (s, 3H, OCCH_3), 1.73 (s, 3H, OCCH_3), 1.70 – 1.51 (m, 6H, 3 X CH_2); ^{13}C NMR (100 MHz, $CDCl_3$): δ 168.3, 163.1, 144.8, 142.4, 139.5, 138.9, 137.6, 135.1, 131.6, 129.6, 128.3, 127.3, 127.3, 124.2, 94.2, 92.6, 84.5, 70.7, 67.4, 33.4, 33.3, 30.1, 29.1, 27.4, 25.0, 22.9, 21.0; IR ν 3061 (w), 2958 (w), 2870 (w), 2243 (w), 1764 (m), 1622 (s), 1580 (w), 1464 (w), 1333 (s), 1280 (m), 1255 (m), 1201 (w), 1148 (s), 1001 (w), 954

(w), 837 (w); HRMS (ESI) calcd. for $C_{34}H_{36}INNaO_5S^+$ $[M+Na]^+$ 720.1251; found 720.1256; Chiral HPLC conditions: *ee* = 92%; Chiralpak IA 90:10 Hexane/*i*PrOH, 1.0 mL/min, 31 min. t_r (minor) = 11.8 min. and t_r (major) = 14.6 min. λ = 254 cm^{-1}; $[\alpha]_D^{25.0}$ = +1.6 (c = 0.5, $CHCl_3$).

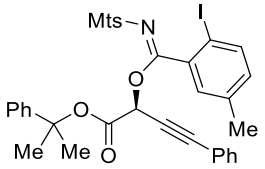
2-Phenylpropan-2-yl (*S*,*E*)-2-((2-iodophenyl)((mesitylsulfonyl)imino)methoxy)-5,5-dimethylhex-3-ynoate (14aa)



14aa

Following **GP3**, *N*-[mesitylsulfonyl]-1-[(*t*-butyl)ethynyl]-1,2-benziodazol-3(1*H*)-one (**2t**) (51 mg, 0.10 mmol, 1.0 equiv) and 2-phenylpropan-2-yl 2-diazoacetate (**11h**) (41 mg, 0.20 mmol, 2.0 equiv) were stirred for 20 h. The crude reaction mixture was concentrated under reduced pressure and purified by flash chromatography using Et_2O:pentane 1:4 as mobile phase to afford **14aa** as a colourless thick gel (43.0 mg, 0.063 mmol, 63%). TLC (Et_2O:Pentane 1:4): R_f = 0.22, $KMnO_4$; ^1H NMR (400 MHz,$CDCl_3$): δ 7.81 (dd, *J* = 8.0, 1.0 Hz, 1H, Ar*H*), 7.43 – 7.26 (m, 7H, Ar*H*), 7.13 (ddd, *J* = 8.0, 7.0, 2.2 Hz, 1H, Ar*H*), 6.88 (s, 2H, Ar*H*), 5.86 (s, 1H, OC*H*), 2.54 (s, 6H, 2 X ArCH_3), 2.28 (s, 3H, ArCH_3), 1.78 (s, 3H, OCCH_3), 1.72 (s, 3H, OCCH_3), 1.24 (s, 9H, tBu); ^{13}C NMR (100 MHz, $CDCl_3$): δ 168.3, 163.1, 144.8, 142.4, 139.5, 138.9, 137.6, 135.1, 131.6, 129.6, 128.3, 127.3, 127.3, 124.1, 97.6, 92.6, 84.5, 69.9, 67.2, 53.4, 30.5, 29.1, 27.6, 27.4, 22.9, 21.0; IR ν 3061 (w), 2975 (w), 2250 (w), 1765 (m), 1621 (s), 1581 (w), 1463 (w), 1333 (s), 1280 (s), 1256 (m), 1203 (w), 1146 (s), 1015 (w), 862 (w); HRMS (ESI) calcd. for $C_{33}H_{36}INNaO_5S^+$ $[M+Na]^+$ 708.1251; found 708.1257; Chiral HPLC conditions: *ee* = 86%; Chiralpak IA 90:10 Hexane/*i*PrOH, 1.0 mL/min, 31 min. t_r (minor) = 9.5 min. and t_r (major) = 12.7 min. λ = 254 cm^{-1}; $[\alpha]_D^{25.0}$ = +4.5 (c = 0.5, $CHCl_3$).

2-Phenylpropan-2-yl(*S*,*E*)-2-((2-iodo-5-methylphenyl)((mesitylsulfonyl)imino)methoxy)-4-phenylbut-3-ynoate (14ab)

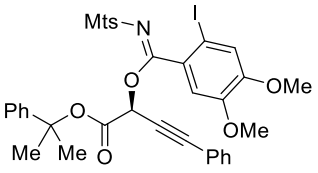


14ab

Following **GP3**, *N*-(mesitylsulfonyl)-5-methyl-1-[phenylethynyl]-1,2-benziodazol-3(1*H*)-one (**2u**) (54.5 mg, 0.100 mmol, 1.00 equiv) and 2-phenylpropan-2-yl 2-diazoacetate (**11h**) (41 mg, 0.20 mmol, 2.0 equiv) were stirred for 18 h. The crude reaction mixture was concentrated under

reduced pressure and purified by flash chromatography using Et_2O:pentane 1:5 as mobile phase to afford **14ab** as a white solid (62.0 mg, 0.086 mmol, 86%). Mp: 61.2–66.8 °C; TLC (Et_2O:Pentane 1:5): R_f = 0.25, $KMnO_4$; ^1H NMR (400 MHz, $CDCl_3$): δ 7.65 (d, *J* = 8.1 Hz, 1H, Ar*H*), 7.48 – 7.26 (m, 10H, Ar*H*), 6.98 (d, *J* = 2.2 Hz, 1H, Ar*H*), 6.95 – 6.90 (m, 1H, Ar*H*), 6.86 (s, 2H, Ar*H*), 6.11 (s, 1H, OC*H*), 2.52 (s, 6H, 2 X ArCH_3), 2.27 (s, 3H, ArCH_3), 2.22 (s, 3H, ArCH_3), 1.86 (s, 3H, OCCH_3), 1.77 (s, 3H, OCCH_3); ^{13}C NMR (100 MHz, $CDCl_3$): δ 168.4, 162.7, 144.7, 142.4, 139.6, 138.7, 137.6, 137.0, 135.0, 132.6, 132.0, 131.5, 130.0, 129.3, 128.4, 127.4, 124.3, 121.4, 88.6, 88.3, 85.0, 80.0, 67.3, 29.2, 27.4, 22.9, 21.0, 20.9; IR ν 3058 (w), 2981 (w), 2940 (w), 2235 (w), 1762 (m), 1620 (s), 1566 (w), 1493 (w), 1464 (m), 1448 (m), 1387 (w), 1330 (s), 1288 (s), 1253 (s), 1206 (s), 1162 (s), 1136 (s), 1104 (m), 1016 (m), 1000 (m), 964 (w), 849 (m), 817 (m); HRMS (ESI) calcd. for $C_{36}H_{35}INO_5S^+$ $[M+H]^+$ 720.1275; found 720.1281; Chiral HPLC conditions: *ee* = 93%; Chiralpak IB 95:5 Hexane/*i*PrOH, 1.0 mL/min, 31 min. t_r (minor) = 11.7 min. and t_r (major) = 16.5 min. λ=254 cm^{-1}; $[\alpha]_D^{25.0}$ = +34.6 (c = 0.5, $CHCl_3$). One carbon was not resolved at 100 MHz.

2-Phenylpropan-2-yl (*S*,*E*)-2-((2-iodo-4,5-dimethoxyphenyl) ((mesitylsulfonyl)imino)methoxy)-4-phenylbut-3-ynoate (14ac)



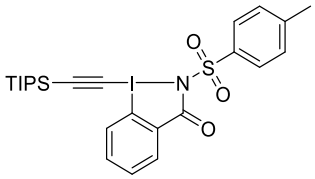
14ac

Following **GP3**, *N*-(mesitylsulfonyl)-5,6-dimethoxy-1-[phenylethynyl]-1,2-benziodazol-3(1*H*)-one (**2v**) (59 mg, 0.10 mmol, 1.0 equiv) and 2-phenylpropan-2-yl 2-diazoacetate (**11h**) (41 mg, 0.20 mmol, 2.0 equiv) were stirred for 18 h. The crude reaction mixture was concentrated under reduced pressure and purified by flash chromatography using Et_2O:pentane 1:1 as mobile phase to afford **14ac** as a whitesolid (65.0 mg, 0.085 mmol, 85%). Mp: 73.5–76.3 °C; TLC (Et_2O:Pentane 1:1): R_f = 0.3, $KMnO_4$; ^1H NMR (400 MHz, $CDCl_3$): δ 7.47 – 7.44 (m, 2H, Ar*H*), 7.43 – 7.40 (m, 5H, Ar*H*), 7.39 – 7.35 (m, 2H, Ar*H*), 7.29 – 7.27 (m, 1H, Ar*H*), 7.18 (s, 1H, Ar*H*), 6.88 (s, 2H, Ar*H*), 6.80 (s, 1H, Ar*H*), 6.05 (s, 1H, CC*H*), 3.87 (s, 3H, OCH_3), 3.77 (s, 3H, OCH_3), 2.56 (s, 6H, 2 X ArCH_3), 2.27 (s, 3H, ArCH_3), 1.83 (s, 3H, OCCH_3), 1.75 (s, 3H, OCCH_3); ^{13}C NMR (100 MHz, $CDCl_3$): δ 168.2, 162.7, 150.9, 148.5, 144.7, 142.4, 139.5, 135.2, 132.0, 131.6, 129.4, 129.3, 128.4, 127.4, 124.2, 121.4, 121.2, 112.8, 88.3, 85.0, 81.8, 80.1, 67.4, 56.2, 56.0, 29.2, 27.4, 22.9, 21.0; IR ν 2976 (w), 2938 (w), 2237 (w), 1764 (m), 1619 (s), 1566 (w), 1508 (m), 1464 (w), 1445 (m), 1380 (m), 1334 (s), 1268 (s),

1213 (s), 1183 (m), 1163 (m), 1142 (m), 1102 (w), 1079 (w), 1022 (m), 976 (w), 944 (w); HRMS (ESI) calcd. for $C_{37}H_{36}INNaO_7S^+$ $[M+Na]^+$ 788.1149; found 788.1142; Chiral HPLC conditions: *ee* = 94%; Chiralpak IB 90:10 Hexane/*i*PrOH, 1.0 mL/min, 31 min. t_r (minor) = 19.2 min. and t_r (major) = 21.7 min. $\lambda = 254\ cm^{-1}$; $[\alpha]_D^{25.0}$ = +29.8 (c = 0.5, $CHCl_3$). One carbon was not resolved at 100 MHz.

8. Crystal Data

N-[Tolylsulfonyl]-1-[tri*iso*propylsilylethynyl]-1,2-benziodazol-3(1*H*)-one (2a)



2a

Table S1. Crystal data and structure refinement for **2a**.

Identification code	ls01-022	
Empirical formula	$C_{25}H_{32}INO_3SSi$	
Formula weight	581.56	
Temperature	100(2) K	
Wavelength	0.71073 Å	
Crystal system	Monoclinic	
Space group	$P2_1/c$	
Unit cell dimensions	a = 16.4417(18) Å	□= 90°.
	b = 7.7306(5) Å	□= 94.776(8)°.
	c = 20.8819(15) Å	□ = 90°.
Volume	2645.0(4) Å^3	
Z	4	
Density (calculated)	1.460 Mg/m^3	
Absorption coefficient	1.361 mm^{-1}	
F(000)	1184	
Crystal size	0.412 x 0.341 x 0.236 mm^3	
□ range for data collection	1.243 to 27.499°.	
Index ranges	-21 ≤ h ≤ 21, -10 ≤ k ≤ 10, -27 ≤ l ≤ 24	
Reflections collected	32240	
Independent reflections	6050 [R_{int} = 0.0740]	
Completeness to □ = 25.242°	99.9 %	
Absorption correction	Semi-empirical from equivalents	
Max. and min. transmission	0.7456 and 0.3507	
Refinement method	Full-matrix least-squares on F^2	
Data / restraints / parameters	6050 / 577 / 393	
Goodness-of-fit on F^2	1.101	
Final R indices [I > 2□(I)]	R_1 = 0.0848, wR_2 = 0.2155	
R indices (all data)	R_1 = 0.1081, wR_2 = 0.2482	
Largest diff. peak and hole	4.365 and -2.428 e.Å^{-3}	

Table S2. Atomic coordinates (x 10^4) and equivalent isotropic displacement parameters ($Å^2$x 10^3) for **2a**. U(eq) is defined as one third of the trace of the orthogonalized U^{ij} tensor.

	x	y	z	U(eq)
I(1)	772(1)	-566(1)	6527(1)	31(1)
S(1)	-991(1)	-1693(2)	7250(1)	34(1)
Si(1)	3257(7)	2524(14)	5810(5)	57(2)
Si(2)	3408(7)	2513(16)	6022(5)	67(2)
O(1)	-1603(4)	-3051(8)	5943(3)	55(2)
O(2)	-1438(4)	-3211(8)	7414(3)	50(1)
O(3)	-379(3)	-1052(8)	7724(2)	40(1)
N(1)	-511(4)	-1953(7)	6613(3)	34(1)
C(1)	443(5)	-1704(9)	5610(3)	38(1)
C(2)	970(7)	-1635(11)	5134(4)	51(2)
C(3)	703(8)	-2395(11)	4533(4)	60(2)
C(4)	-53(8)	-3099(11)	4425(4)	62(2)
C(5)	-577(7)	-3133(9)	4906(4)	49(2)
C(6)	-327(6)	-2435(9)	5519(3)	41(2)
C(7)	-909(5)	-2530(8)	6036(4)	38(2)
C(8)	-1712(5)	-15(11)	7059(4)	37(2)
C(9)	-1433(5)	1647(10)	7046(4)	37(2)
C(10)	-1984(6)	2985(11)	6868(4)	50(2)
C(11)	-2803(7)	2626(13)	6698(5)	64(2)
C(12)	-3054(8)	947(17)	6728(8)	95(5)
C(13)	-2517(6)	-420(12)	6901(6)	63(3)
C(14)	-3374(10)	4046(19)	6495(8)	101(5)
C(15)	1818(5)	496(11)	6214(4)	44(2)
C(16)	2427(6)	1262(12)	6102(5)	53(2)
C(17)	2936(15)	4900(30)	5775(11)	78(3)
C(18)	2316(19)	5310(40)	6216(15)	79(5)
C(19)	2770(20)	5630(40)	5136(12)	106(7)
C(20)	4131(12)	2260(40)	6473(10)	81(3)
C(21)	3850(18)	2690(50)	7106(13)	101(5)
C(22)	4859(17)	3270(50)	6349(16)	115(7)
C(23)	3460(14)	1580(30)	4993(11)	66(3)

C(24)	3479(16)	-360(20)	5028(14)	73(5)
C(25)	4195(14)	2220(30)	4717(15)	76(5)
C(26)	3259(12)	4650(20)	6424(13)	81(3)
C(27)	2495(12)	5610(30)	6186(18)	77(5)
C(28)	3978(13)	5870(40)	6450(20)	117(8)
C(29)	4301(13)	1370(30)	6484(10)	85(3)
C(30)	4280(18)	1500(40)	7198(10)	99(5)
C(31)	4390(18)	-460(30)	6297(13)	102(6)
C(32)	3558(11)	2630(30)	5137(8)	71(3)
C(33)	3310(16)	1010(30)	4798(14)	85(5)
C(34)	4398(13)	3140(40)	4986(14)	89(5)

Table S3. Bond lengths [Å] and angles [°] for **2a**.

I(1)-C(15)	2.060(9)
I(1)-C(1)	2.135(7)
I(1)-N(1)	2.387(6)
S(1)-O(2)	1.441(6)
S(1)-O(3)	1.441(5)
S(1)-N(1)	1.614(7)
S(1)-C(8)	1.779(8)
Si(1)-C(16)	1.823(15)
Si(1)-C(23)	1.911(18)
Si(1)-C(17)	1.914(17)
Si(1)-C(20)	1.921(17)
Si(2)-C(26)	1.877(18)
Si(2)-C(32)	1.886(16)
Si(2)-C(16)	1.901(16)
Si(2)-C(29)	1.906(17)
O(1)-C(7)	1.210(10)
N(1)-C(7)	1.396(9)
C(1)-C(2)	1.372(11)
C(1)-C(6)	1.386(13)
C(2)-C(3)	1.422(13)
C(2)-H(2)	0.9500
C(3)-C(4)	1.359(16)
C(3)-H(3)	0.9500
C(4)-C(5)	1.378(14)
C(4)-H(4)	0.9500
C(5)-C(6)	1.418(10)
C(5)-H(5)	0.9500
C(6)-C(7)	1.502(12)
C(8)-C(9)	1.365(11)
C(8)-C(13)	1.375(12)
C(9)-C(10)	1.405(12)
C(9)-H(9)	0.9500
C(10)-C(11)	1.391(15)
C(10)-H(10)	0.9500
C(11)-C(12)	1.365(17)
C(11)-C(14)	1.483(15)

C(12)-C(13)	1.404(14)
C(12)-H(12)	0.9500
C(13)-H(13)	0.9500
C(14)-H(14A)	0.9800
C(14)-H(14B)	0.9800
C(14)-H(14C)	0.9800
C(15)-C(16)	1.203(13)
C(17)-C(19)	1.451(17)
C(17)-C(18)	1.463(16)
C(17)-H(17)	1.0000
C(18)-H(18A)	0.9800
C(18)-H(18B)	0.9800
C(18)-H(18C)	0.9800
C(19)-H(19A)	0.9800
C(19)-H(19B)	0.9800
C(19)-H(19C)	0.9800
C(20)-C(22)	1.469(18)
C(20)-C(21)	1.473(18)
C(20)-H(20)	1.0000
C(21)-H(21A)	0.9800
C(21)-H(21B)	0.9800
C(21)-H(21C)	0.9800
C(22)-H(22A)	0.9800
C(22)-H(22B)	0.9800
C(22)-H(22C)	0.9800
C(23)-C(25)	1.469(17)
C(23)-C(24)	1.498(17)
C(23)-H(23)	1.0000
C(24)-H(24A)	0.9800
C(24)-H(24B)	0.9800
C(24)-H(24C)	0.9800
C(25)-H(25A)	0.9800
C(25)-H(25B)	0.9800
C(25)-H(25C)	0.9800
C(26)-C(27)	1.509(13)
C(26)-C(28)	1.510(13)
C(26)-H(26)	1.0000
C(27)-H(27A)	0.9800

C(27)-H(27B)	0.9800
C(27)-H(27C)	0.9800
C(28)-H(28A)	0.9800
C(28)-H(28B)	0.9800
C(28)-H(28C)	0.9800
C(29)-C(31)	1.479(16)
C(29)-C(30)	1.498(16)
C(29)-H(29)	1.0000
C(30)-H(30A)	0.9800
C(30)-H(30B)	0.9800
C(30)-H(30C)	0.9800
C(31)-H(31A)	0.9800
C(31)-H(31B)	0.9800
C(31)-H(31C)	0.9800
C(32)-C(33)	1.484(16)
C(32)-C(34)	1.495(15)
C(32)-H(32)	1.0000
C(33)-H(33A)	0.9800
C(33)-H(33B)	0.9800
C(33)-H(33C)	0.9800
C(34)-H(34A)	0.9800
C(34)-H(34B)	0.9800
C(34)-H(34C)	0.9800

C(15)-I(1)-C(1)	92.1(3)
C(15)-I(1)-N(1)	165.8(3)
C(1)-I(1)-N(1)	73.9(3)
O(2)-S(1)-O(3)	117.2(3)
O(2)-S(1)-N(1)	112.9(4)
O(3)-S(1)-N(1)	104.3(3)
O(2)-S(1)-C(8)	107.7(4)
O(3)-S(1)-C(8)	108.5(4)
N(1)-S(1)-C(8)	105.6(3)
C(16)-Si(1)-C(23)	106.5(8)
C(16)-Si(1)-C(17)	108.4(9)
C(23)-Si(1)-C(17)	113.7(11)
C(16)-Si(1)-C(20)	103.8(9)
C(23)-Si(1)-C(20)	115.3(12)

C(17)-Si(1)-C(20)	108.4(12)
C(26)-Si(2)-C(32)	115.3(12)
C(26)-Si(2)-C(16)	105.4(8)
C(32)-Si(2)-C(16)	107.0(8)
C(26)-Si(2)-C(29)	107.8(11)
C(32)-Si(2)-C(29)	111.2(10)
C(16)-Si(2)-C(29)	110.0(10)
C(7)-N(1)-S(1)	121.6(6)
C(7)-N(1)-I(1)	115.6(5)
S(1)-N(1)-I(1)	120.2(3)
C(2)-C(1)-C(6)	122.8(8)
C(2)-C(1)-I(1)	120.3(7)
C(6)-C(1)-I(1)	116.8(5)
C(1)-C(2)-C(3)	117.2(10)
C(1)-C(2)-H(2)	121.4
C(3)-C(2)-H(2)	121.4
C(4)-C(3)-C(2)	121.5(9)
C(4)-C(3)-H(3)	119.2
C(2)-C(3)-H(3)	119.2
C(3)-C(4)-C(5)	120.3(8)
C(3)-C(4)-H(4)	119.8
C(5)-C(4)-H(4)	119.8
C(4)-C(5)-C(6)	120.0(10)
C(4)-C(5)-H(5)	120.0
C(6)-C(5)-H(5)	120.0
C(1)-C(6)-C(5)	118.1(8)
C(1)-C(6)-C(7)	123.5(6)
C(5)-C(6)-C(7)	118.4(8)
O(1)-C(7)-N(1)	127.8(8)
O(1)-C(7)-C(6)	123.3(7)
N(1)-C(7)-C(6)	108.9(7)
C(9)-C(8)-C(13)	121.8(8)
C(9)-C(8)-S(1)	118.2(6)
C(13)-C(8)-S(1)	119.9(6)
C(8)-C(9)-C(10)	119.3(8)
C(8)-C(9)-H(9)	120.4
C(10)-C(9)-H(9)	120.4
C(11)-C(10)-C(9)	120.6(8)

C(11)-C(10)-H(10)	119.7
C(9)-C(10)-H(10)	119.7
C(12)-C(11)-C(10)	117.9(9)
C(12)-C(11)-C(14)	122.0(12)
C(10)-C(11)-C(14)	120.1(11)
C(11)-C(12)-C(13)	122.8(11)
C(11)-C(12)-H(12)	118.6
C(13)-C(12)-H(12)	118.6
C(8)-C(13)-C(12)	117.5(9)
C(8)-C(13)-H(13)	121.2
C(12)-C(13)-H(13)	121.2
C(11)-C(14)-H(14A)	109.5
C(11)-C(14)-H(14B)	109.5
H(14A)-C(14)-H(14B)	109.5
C(11)-C(14)-H(14C)	109.5
H(14A)-C(14)-H(14C)	109.5
H(14B)-C(14)-H(14C)	109.5
C(16)-C(15)-I(1)	171.2(8)
C(15)-C(16)-Si(1)	170.8(9)
C(15)-C(16)-Si(2)	173.8(10)
C(19)-C(17)-C(18)	114.1(17)
C(19)-C(17)-Si(1)	115.8(18)
C(18)-C(17)-Si(1)	112.6(14)
C(19)-C(17)-H(17)	104.2
C(18)-C(17)-H(17)	104.2
Si(1)-C(17)-H(17)	104.2
C(17)-C(18)-H(18A)	109.5
C(17)-C(18)-H(18B)	109.5
H(18A)-C(18)-H(18B)	109.5
C(17)-C(18)-H(18C)	109.5
H(18A)-C(18)-H(18C)	109.5
H(18B)-C(18)-H(18C)	109.5
C(17)-C(19)-H(19A)	109.5
C(17)-C(19)-H(19B)	109.5
H(19A)-C(19)-H(19B)	109.5
C(17)-C(19)-H(19C)	109.5
H(19A)-C(19)-H(19C)	109.5
H(19B)-C(19)-H(19C)	109.5

C(22)-C(20)-C(21)	111.2(19)
C(22)-C(20)-Si(1)	112.9(19)
C(21)-C(20)-Si(1)	110.5(19)
C(22)-C(20)-H(20)	107.3
C(21)-C(20)-H(20)	107.3
Si(1)-C(20)-H(20)	107.3
C(20)-C(21)-H(21A)	109.5
C(20)-C(21)-H(21B)	109.5
H(21A)-C(21)-H(21B)	109.5
C(20)-C(21)-H(21C)	109.5
H(21A)-C(21)-H(21C)	109.5
H(21B)-C(21)-H(21C)	109.5
C(20)-C(22)-H(22A)	109.5
C(20)-C(22)-H(22B)	109.5
H(22A)-C(22)-H(22B)	109.5
C(20)-C(22)-H(22C)	109.5
H(22A)-C(22)-H(22C)	109.5
H(22B)-C(22)-H(22C)	109.5
C(25)-C(23)-C(24)	110.1(16)
C(25)-C(23)-Si(1)	115.5(18)
C(24)-C(23)-Si(1)	110.1(16)
C(25)-C(23)-H(23)	106.9
C(24)-C(23)-H(23)	106.9
Si(1)-C(23)-H(23)	106.9
C(23)-C(24)-H(24A)	109.5
C(23)-C(24)-H(24B)	109.5
H(24A)-C(24)-H(24B)	109.5
C(23)-C(24)-H(24C)	109.5
H(24A)-C(24)-H(24C)	109.5
H(24B)-C(24)-H(24C)	109.5
C(23)-C(25)-H(25A)	109.5
C(23)-C(25)-H(25B)	109.5
H(25A)-C(25)-H(25B)	109.5
C(23)-C(25)-H(25C)	109.5
H(25A)-C(25)-H(25C)	109.5
H(25B)-C(25)-H(25C)	109.5
C(27)-C(26)-C(28)	109.3(13)
C(27)-C(26)-Si(2)	114.9(17)

C(28)-C(26)-Si(2)	116(2)
C(27)-C(26)-H(26)	105.3
C(28)-C(26)-H(26)	105.3
Si(2)-C(26)-H(26)	105.3
C(26)-C(27)-H(27A)	109.5
C(26)-C(27)-H(27B)	109.5
H(27A)-C(27)-H(27B)	109.5
C(26)-C(27)-H(27C)	109.5
H(27A)-C(27)-H(27C)	109.5
H(27B)-C(27)-H(27C)	109.5
C(26)-C(28)-H(28A)	109.5
C(26)-C(28)-H(28B)	109.5
H(28A)-C(28)-H(28B)	109.5
C(26)-C(28)-H(28C)	109.5
H(28A)-C(28)-H(28C)	109.5
H(28B)-C(28)-H(28C)	109.5
C(31)-C(29)-C(30)	110.0(16)
C(31)-C(29)-Si(2)	113.6(16)
C(30)-C(29)-Si(2)	113.0(16)
C(31)-C(29)-H(29)	106.6
C(30)-C(29)-H(29)	106.6
Si(2)-C(29)-H(29)	106.6
C(29)-C(30)-H(30A)	109.5
C(29)-C(30)-H(30B)	109.5
H(30A)-C(30)-H(30B)	109.5
C(29)-C(30)-H(30C)	109.5
H(30A)-C(30)-H(30C)	109.5
H(30B)-C(30)-H(30C)	109.5
C(29)-C(31)-H(31A)	109.5
C(29)-C(31)-H(31B)	109.5
H(31A)-C(31)-H(31B)	109.5
C(29)-C(31)-H(31C)	109.5
H(31A)-C(31)-H(31C)	109.5
H(31B)-C(31)-H(31C)	109.5
C(33)-C(32)-C(34)	110.1(15)
C(33)-C(32)-Si(2)	111.9(16)
C(34)-C(32)-Si(2)	114.7(16)
C(33)-C(32)-H(32)	106.5

C(34)-C(32)-H(32)	106.5
Si(2)-C(32)-H(32)	106.5
C(32)-C(33)-H(33A)	109.5
C(32)-C(33)-H(33B)	109.5
H(33A)-C(33)-H(33B)	109.5
C(32)-C(33)-H(33C)	109.5
H(33A)-C(33)-H(33C)	109.5
H(33B)-C(33)-H(33C)	109.5
C(32)-C(34)-H(34A)	109.5
C(32)-C(34)-H(34B)	109.5
H(34A)-C(34)-H(34B)	109.5
C(32)-C(34)-H(34C)	109.5
H(34A)-C(34)-H(34C)	109.5
H(34B)-C(34)-H(34C)	109.5

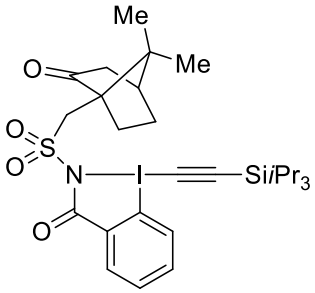
Symmetry transformations used to generate equivalent atoms:

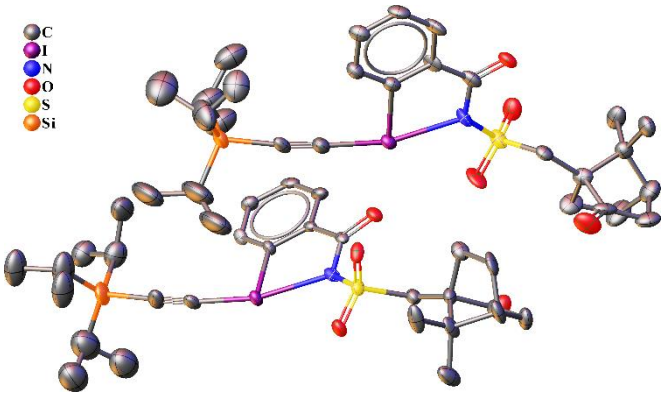
Table S4. Anisotropic displacement parameters ($Å^2 x\ 10^3$) for **2a**. The anisotropic displacement factor exponent takes the form: $-2\pi^2[h^2 a^{*2} U^{11} + ... + 2\ h\ k\ a^*\ b^*\ U^{12}]$

	U^{11}	U^{22}	U^{33}	U^{23}	U^{13}	U^{12}
I(1)	37(1)	29(1)	26(1)	2(1)	5(1)	3(1)
S(1)	34(1)	37(1)	32(1)	9(1)	-2(1)	-4(1)
Si(1)	48(4)	42(3)	87(5)	12(4)	33(4)	2(3)
Si(2)	44(4)	71(3)	87(5)	36(4)	20(3)	-1(3)
O(1)	58(3)	45(3)	59(4)	-5(3)	-24(3)	-4(3)
O(2)	47(3)	42(3)	60(4)	20(3)	3(3)	-9(3)
O(3)	36(3)	58(3)	25(2)	5(2)	-1(2)	-3(2)
N(1)	42(3)	29(3)	31(3)	3(2)	-7(2)	-1(2)
C(1)	72(4)	24(3)	17(3)	2(2)	9(3)	16(3)
C(2)	81(6)	43(4)	31(4)	9(3)	13(3)	24(4)
C(3)	110(6)	41(4)	31(4)	6(3)	16(4)	36(4)
C(4)	125(7)	33(4)	25(4)	-3(3)	-5(4)	24(4)
C(5)	95(6)	20(3)	28(3)	1(3)	-17(3)	16(4)
C(6)	70(4)	26(3)	23(3)	-1(2)	-10(3)	10(3)
C(7)	51(4)	27(3)	33(3)	3(3)	-10(3)	6(3)
C(8)	42(4)	34(3)	33(4)	0(3)	-2(3)	-2(3)
C(9)	43(4)	35(3)	35(4)	-7(3)	9(3)	-1(3)
C(10)	79(5)	38(4)	34(4)	0(3)	11(4)	8(4)
C(11)	76(5)	53(4)	60(6)	-5(4)	-5(5)	21(4)
C(12)	58(6)	66(5)	153(14)	-13(7)	-43(8)	15(4)
C(13)	44(4)	39(4)	104(9)	-2(5)	-10(5)	-3(3)
C(14)	116(11)	77(7)	107(11)	-10(8)	-16(9)	48(8)
C(15)	47(4)	49(4)	37(4)	3(3)	16(3)	7(3)
C(16)	53(4)	49(4)	59(5)	12(4)	23(4)	8(3)
C(17)	76(7)	56(6)	105(7)	15(6)	31(6)	8(6)
C(18)	79(10)	57(10)	104(10)	16(9)	26(9)	10(9)
C(19)	120(17)	86(15)	116(12)	25(12)	33(12)	34(13)
C(20)	63(6)	82(6)	100(6)	23(6)	17(5)	3(5)
C(21)	85(11)	117(12)	101(10)	18(10)	12(9)	9(10)
C(22)	85(11)	124(13)	137(14)	17(13)	16(11)	-17(10)
C(23)	55(6)	61(6)	87(7)	10(6)	30(6)	2(6)

C(24)	70(11)	64(8)	88(12)	-1(9)	36(10)	11(8)
C(25)	65(8)	75(9)	92(10)	15(9)	37(8)	4(8)
C(26)	70(6)	67(6)	106(7)	17(6)	13(6)	-4(5)
C(27)	76(9)	49(9)	107(11)	11(8)	18(9)	-2(8)
C(28)	89(12)	97(14)	161(18)	19(15)	-5(14)	-26(11)
C(29)	63(6)	94(7)	100(7)	34(7)	16(6)	-1(6)
C(30)	84(11)	111(11)	102(8)	35(9)	5(9)	12(10)
C(31)	81(13)	99(10)	123(14)	40(10)	-8(13)	24(11)
C(32)	57(5)	73(5)	88(6)	25(5)	29(5)	4(5)
C(33)	80(9)	85(9)	93(10)	15(8)	26(9)	7(8)
C(34)	68(8)	103(11)	100(11)	23(10)	33(9)	-3(8)

2-((((1*S*,4*S*)-7,7-dimethyl-2-oxobicyclo[2.2.1]heptan-1-yl)methyl)sulfonyl)-1-((triisopropylsilyl)ethynyl)- 1,2-benziodazol-3(1*H*)-one (2e)





Experimental. Single colourless prism-shaped crystals of **2e** were obtained by recrystallisation from **SOLVENT** at **TEMPERATURE**. A suitable crystal of 0.85×0.19×0.10 mm^3 was selected and mounted on a suitable support on a Bruker P4 diffractometer. The crystal was kept at a steady T = 100(2) K during data collection. The structure was solved with the **ShelXT** (Sheldrick, 2015) structure solution program using the dual solution method and by using **Olex2** (Dolomanov et al., 2009) as the graphical interface. The model was refined with version 2018/3 of **ShelXL** (Sheldrick, 2015) using full matrix least squares on $|\boldsymbol{F}|^2$ minimisation.

Crystal Data. $C_{28}H_{40}INO_4SSi$, M_r = 641.66, orthorhombic, $P2_12_12_1$ (No. 19), a = 12.8506(17) Å, b = 15.8182(15) Å, c = 31.718(4) Å, □ = □ = □ = 90°, V = 6447.4(14) Å^3, T = 100(2) K, Z = 8, Z' = 2, □(MoK□) = 1.125, 74240 reflections measured, 11585 unique (R_{int} = 0.1052) which were used in all calculations. The final wR_2 was 0.1420 (all data) and R_1 was 0.0634 (I > 2(I)).

Compound	**2e**
Formula	$C_{28}H_{40}INO_4SSi$
$D_{calc.}$/ g cm^{-3}	1.322
□/mm^{-1}	1.125
Formula Weight	641.66
Colour	colourless
Shape	prism
Size/mm^3	0.85×0.19×0.10
T/K	100(2)
Crystal System	orthorhombic
Flack Parameter	0.09(4)
Hooft Parameter	0.083(13)
Space Group	$P2_12_12_1$
a/Å	12.8506(17)
b/Å	15.8182(15)
c/Å	31.718(4)
□/°	90
□/°	90
□/°	90
V/Å^3	6447.4(14)
Z	8
Z'	2
Wavelength/Å	0.71073
Radiation type	MoK□
□$_{min}$/°	1.710
□$_{max}$/°	25.200
Measured Refl.	74240
Independent Refl.	11585
Reflections with I > 2(I)	9479
R_{int}	0.1052
Parameters	666
Restraints	682
Largest Peak/e Å^{-3}	0.911
Deepest Hole/e Å^{-3}	-1.007
GooF	1.109
wR_2 (all data)	0.1420
wR_2	0.1334
R_1 (all data)	0.0811
R_1	0.0634

A colourless prism-shaped crystal with dimensions of 0.85×0.19×0.10 mm^3 was mounted on a suitable support. Data were collected using a Bruker P4 diffractometer operating at T = 100(2) K.

Data were measured using □ scans using MoK□ radiation. The total number of runs and images was based on the strategy calculation from the program **XS** (Sheldrick, 2008). The maximum resolution achieved was □ = 25.200° (0.83 Å).

The diffraction pattern was indexed. The total number of runs and images was based on the strategy calculation from the program **XS** (Sheldrick, 2008) and the unit cell was refined using EvalCCD (Duisenberg & Schreurs, 1990-2000) on 179 reflections, 0%% of the observed reflections.

Data reduction, scaling and absorption corrections were performed using EvalCCD (Duisenberg & Schreurs, 1990-2000). The final completeness is 99.80% % out to 25.200° in □. A multi-scan absorption correction was performed using **SADABS**-2008/1 (Bruker,2008) was used for absorption correction. wR_2(int) was 0.1094 before and 0.0953 after correction. The Ratio of minimum to maximum transmission is 0.6779. The □/2 correction factor is 0.0015. The absorption coefficient □ of this material is 1.125 mm^{-1} at this wavelength (□ = 0.711Å) and the minimum and maximum transmissions are 0.505 and 0.745.

The structure was solved and the space group $P2_12_12_1$ (# 19) determined by the **ShelXT** (Sheldrick, 2015) structure solution program using dual and refined by full matrix least squares on $|\boldsymbol{F}|^2$ using version 2018/3 of **ShelXL** (Sheldrick, 2015). All non-hydrogen atoms were refined anisotropically. Hydrogen atom positions were calculated geometrically and refined using the riding model. Hydrogen atom positions were calculated geometrically and refined using the riding model.

The structure was refined as a 2-component inversion twin.

The value of Z' is 2. This means that there are two independent molecules in the asymmetric unit.

The Flack parameter was refined to 0.09(4). Determination of absolute structure using Bayesian statistics on Bijvoet differences using the Olex2 results in 0.083(13). Note: The Flack parameter is used to determine chirality of the crystal studied, the value should be near 0, a value of 1 means that the stereochemistry is wrong and the model should be inverted. A value of 0.5 means that the crystal consists of a racemic mixture of the two enantiomers.

Table S5: Fractional Atomic Coordinates ($\times 10^4$) and Equivalent Isotropic Displacement Parameters ($Å^2 \times 10^3$) for **2e**. U_{eq} is defined as 1/3 of the trace of the orthogonalised U_{ij}.

Atom	x	y	z	U_{eq}
I1	3420.0(6)	6202.8(4)	7335.8(2)	24.34(19)
S1	1648(3)	5243.4(19)	6628.0(10)	31.5(7)
Si1	6032(3)	6838(3)	8517.1(13)	37.1(10)
O1	41(6)	6388(6)	7017(3)	32(2)
O2	914(8)	4635(6)	6769(3)	42(2)
O3	2709(7)	4975(6)	6543(3)	45(3)
O4	1687(9)	6368(7)	5358(3)	58(3)
N1	1785(7)	6010(6)	6966(3)	30(2)
C1	2308(9)	7003(8)	7645(4)	28(3)
C2	2627(10)	7538(8)	7964(4)	30(3)
C3	1874(9)	8088(8)	8146(4)	32(3)
C4	861(10)	8077(8)	8003(4)	34(3)
C5	571(9)	7551(8)	7679(5)	39(3)
C6	1280(9)	6982(7)	7494(4)	27(3)
C7	963(9)	6428(8)	7147(4)	32(3)
C8	1143(10)	5761(8)	6173(4)	27(3)
C9	968(10)	5209(8)	5778(4)	30(3)
C10	1170(10)	5707(9)	5371(4)	36(3)
C11	694(12)	5249(9)	5022(4)	45(3)
C12	182(13)	4505(10)	5244(4)	48(3)
C13	-153(10)	4886(8)	5679(4)	32(3)
C14	-965(10)	5581(9)	5629(5)	42(3)
C15	-584(12)	4224(9)	5994(4)	47(4)
C16	1100(14)	3899(10)	5362(5)	62(5)
C17	1677(13)	4400(8)	5729(4)	44(3)
C18	4558(10)	6504(9)	7776(4)	35(3)

Atom	x	y	z	U_{eq}
C19	5168(9)	6654(8)	8049(4)	31(3)
C20	5592(16)	6056(12)	8915(6)	86(4)
C21	5794(18)	5160(12)	8740(6)	87(4)
C22	4431(15)	6189(14)	9035(6)	86(4)
C23	5833(14)	7993(14)	8718(6)	88(6)
C24	4784(14)	8387(11)	8658(6)	78(6)
C25	6030(20)	8013(16)	9199(6)	115(9)
C26	7378(14)	6732(18)	8330(7)	113(5)
C27	7602(15)	7323(16)	7964(7)	113(6)
C28	8194(14)	6856(17)	8670(7)	114(6)
I2	8369.9(6)	5363.3(4)	7298.4(2)	22.51(19)
S2	6514(2)	6296.4(18)	6579.6(9)	23.4(6)
Si2	10788(3)	4417(3)	8490.8(14)	51.5(13)
O5	4986(6)	5197(5)	7018(2)	27.4(19)
O6	5881(7)	6940(5)	6776(3)	29(2)
O7	7531(6)	6531(6)	6428(3)	29(2)
O8	4614(8)	5113(6)	5502(3)	47(3)
N2	6727(7)	5500(6)	6901(3)	23(2)
C29	7287(8)	4515(7)	7595(4)	20(2)
C30	7574(9)	3982(7)	7904(4)	20(2)
C31	6852(9)	3445(8)	8097(4)	28(3)
C32	5837(10)	3447(8)	7945(4)	26(3)
C33	5540(9)	3987(8)	7626(4)	29(3)
C34	6259(8)	4527(7)	7443(3)	18(2)
C35	5925(9)	5109(7)	7101(3)	18(2)
C36	5805(9)	5819(8)	6152(4)	27(3)
C37	5193(9)	6406(8)	5855(4)	28(2)
C38	4704(10)	5850(9)	5498(4)	32(3)
C39	4379(11)	6506(9)	5157(4)	42(3)

Atom	x	y	z	U_{eq}
C40	4663(10)	7313(9)	5344(5)	40(3)
C41	5697(10)	7120(9)	5595(4)	37(3)
C42	6618(12)	6802(10)	5305(5)	55(4)
C43	6081(12)	7903(9)	5849(5)	52(4)
C44	3896(10)	7520(9)	5700(5)	43(3)
C45	4199(10)	6858(8)	6053(4)	33(3)
C46	9475(9)	5066(8)	7751(4)	30(3)
C47	10009(11)	4864(10)	8039(4)	42(4)
C48	10959(17)	5257(12)	8872(6)	90(4)
C49	11281(17)	6109(12)	8693(6)	91(4)
C50	11696(17)	5066(13)	9243(6)	90(4)
C51	11996(16)	3867(14)	8306(7)	99(4)
C52	12741(16)	4515(14)	8138(7)	99(4)
C53	11735(17)	3246(14)	7949(6)	99(4)
C54	9912(13)	3530(10)	8715(5)	63(4)
C55	10431(14)	2882(11)	8989(5)	67(5)
C56	8981(13)	3870(13)	8945(5)	75(5)

Table S6: Anisotropic Displacement Parameters ($\times 10^4$) **2e**. The anisotropic displacement factor exponent takes the form: $-2\pi^2[h^2a^{*2} \times U_{11} + ... + 2hka^* \times b^* \times U_{12}]$

Atom	U_{11}	U_{22}	U_{33}	U_{23}	U_{13}	U_{12}
I1	18.1(4)	25.0(4)	30.0(4)	2.6(3)	0.5(4)	2.6(3)
S1	23.0(15)	23.9(16)	47.5(18)	-1.1(14)	-4.6(16)	0.0(16)
Si1	20.5(19)	51(3)	40(2)	7(2)	-5.8(17)	-5.4(18)
O1	17(4)	35(5)	44(5)	1(4)	3(4)	-2(4)
O2	47(6)	33(5)	45(6)	3(5)	-8(5)	-14(5)
O3	20(5)	41(6)	73(7)	-17(5)	-5(5)	16(4)
O4	46(6)	53(6)	73(7)	23(5)	13(6)	-10(5)
N1	15(5)	28(5)	46(6)	1(4)	-6(4)	-2(4)

Atom	U_{11}	U_{22}	U_{33}	U_{23}	U_{13}	U_{12}
C1	23(5)	29(6)	33(6)	2(5)	4(5)	1(5)
C2	23(6)	29(7)	39(7)	0(5)	-1(5)	1(5)
C3	30(6)	21(6)	45(8)	0(5)	8(5)	-3(5)
C4	27(6)	28(7)	48(8)	-3(6)	15(6)	5(6)
C5	18(6)	33(7)	68(9)	-6(7)	10(6)	-8(5)
C6	23(6)	13(6)	45(7)	1(5)	3(4)	-12(4)
C7	20(5)	23(7)	52(7)	5(5)	5(5)	-4(5)
C8	20(6)	23(7)	37(6)	0(5)	2(5)	5(5)
C9	35(6)	16(6)	40(6)	-3(5)	6(5)	-2(5)
C10	31(7)	35(6)	43(7)	9(5)	20(5)	11(5)
C11	52(9)	41(8)	43(7)	-4(6)	20(6)	12(6)
C12	63(9)	43(8)	39(7)	-10(6)	-3(6)	0(6)
C13	32(6)	29(7)	35(6)	3(5)	1(5)	-4(5)
C14	32(7)	44(8)	48(9)	-4(7)	-8(6)	-9(6)
C15	56(10)	44(9)	40(8)	5(6)	-5(7)	-27(7)
C16	95(12)	43(9)	48(9)	-19(7)	-4(8)	23(8)
C17	55(8)	27(7)	50(8)	-4(5)	3(7)	19(7)
C18	24(6)	47(9)	35(7)	3(6)	2(5)	-1(6)
C19	19(6)	36(8)	37(7)	14(6)	1(5)	-1(6)
C20	119(10)	79(8)	60(7)	2(6)	16(7)	11(8)
C21	120(11)	79(8)	61(7)	2(7)	15(7)	12(8)
C22	118(11)	80(8)	60(7)	3(7)	17(7)	10(8)
C23	65(11)	89(13)	111(14)	-39(12)	-23(11)	-4(10)
C24	100(13)	44(11)	89(14)	-5(10)	-19(11)	8(10)
C25	130(20)	100(20)	111(14)	-18(16)	-15(14)	37(17)
C26	41(7)	167(15)	131(13)	-33(11)	21(7)	-23(8)
C27	43(7)	167(15)	131(13)	-33(11)	23(7)	-22(8)
C28	41(7)	169(15)	132(13)	-32(11)	19(7)	-22(8)
I2	15.7(3)	24.6(4)	27.3(4)	4.7(3)	-3.5(4)	-1.9(3)

Atom	U_{11}	U_{22}	U_{33}	U_{23}	U_{13}	U_{12}
S2	21.7(15)	23.2(15)	25.4(14)	0.2(12)	-5.2(14)	3.1(15)
Si2	33(2)	77(4)	44(2)	11(2)	-18.7(19)	7(2)
O5	18(4)	31(5)	33(5)	-4(4)	1(4)	4(4)
O6	37(5)	19(5)	32(5)	-7(4)	-15(4)	8(4)
O7	19(4)	34(5)	34(5)	5(4)	-4(4)	-6(4)
O8	68(7)	37(5)	37(5)	0(4)	-9(5)	-7(5)
N2	17(5)	20(5)	32(5)	1(4)	2(4)	3(4)
C29	14(5)	21(6)	27(6)	0(4)	-3(4)	-1(4)
C30	19(6)	7(5)	32(6)	-4(4)	-4(5)	-1(4)
C31	33(6)	24(6)	25(6)	1(5)	5(5)	-3(5)
C32	26(6)	24(7)	26(6)	-8(5)	13(5)	-1(5)
C33	25(6)	37(7)	25(6)	-5(5)	8(5)	-7(5)
C34	16(5)	19(6)	17(5)	-6(4)	4(4)	-3(4)
C35	16(5)	18(6)	21(6)	-8(4)	2(4)	3(4)
C36	20(6)	30(7)	30(6)	-4(5)	-1(5)	2(5)
C37	22(6)	35(6)	27(6)	0(4)	-7(4)	3(5)
C38	26(7)	44(6)	25(6)	-3(5)	-2(5)	-1(5)
C39	36(8)	52(8)	37(7)	6(5)	-14(6)	-18(6)
C40	23(6)	44(7)	52(7)	18(6)	-18(5)	-8(6)
C41	21(6)	41(7)	48(8)	23(5)	-12(5)	2(5)
C42	29(7)	75(11)	61(9)	30(7)	1(7)	9(8)
C43	45(9)	44(8)	66(10)	28(7)	-28(7)	-26(7)
C44	25(7)	48(9)	56(8)	-5(6)	-24(6)	9(6)
C45	30(7)	26(7)	45(7)	-5(5)	-3(5)	7(5)
C46	18(6)	40(8)	33(7)	10(6)	4(5)	-5(5)
C47	29(7)	62(10)	35(7)	13(7)	-4(5)	-20(7)
C48	108(10)	84(8)	77(8)	38(7)	-44(7)	-27(8)
C49	108(10)	86(9)	78(8)	38(7)	-45(7)	-27(8)
C50	108(10)	84(9)	77(8)	38(7)	-43(7)	-28(8)

Atom	U_{11}	U_{22}	U_{33}	U_{23}	U_{13}	U_{12}
C51	79(8)	122(12)	95(10)	27(8)	-5(8)	-3(8)
C52	80(9)	122(12)	96(10)	27(8)	-3(8)	-5(8)
C53	80(9)	122(12)	95(10)	27(8)	-5(8)	-2(8)
C54	77(11)	57(10)	54(10)	10(8)	-11(8)	-2(8)
C55	79(13)	65(12)	57(11)	5(9)	-6(9)	3(9)
C56	61(11)	115(17)	49(10)	23(11)	-5(8)	-4(10)

Table S7: Bond Lengths in Å for **2e**.

Atom	Atom	Length/Å
I1	N1	2.426(10)
I1	C1	2.145(12)
I1	C18	2.077(13)
S1	O2	1.420(10)
S1	O3	1.453(9)
S1	N1	1.627(11)
S1	C8	1.781(13)
Si1	C19	1.877(14)
Si1	C20	1.85(2)
Si1	C23	1.95(2)
Si1	C26	1.84(2)
O1	C7	1.256(14)
O4	C10	1.240(16)
N1	C7	1.372(16)
C1	C2	1.381(18)
C1	C6	1.405(17)
C2	C3	1.424(17)
C3	C4	1.378(18)
C4	C5	1.374(19)
C5	C6	1.409(17)
C6	C7	1.466(18)

Atom	Atom	Length/Å
C8	C9	1.544(17)
C9	C10	1.532(18)
C9	C13	1.561(18)
C9	C17	1.580(17)
C10	C11	1.46(2)
C11	C12	1.52(2)
C12	C13	1.565(19)
C12	C16	1.57(2)
C13	C14	1.524(19)
C13	C15	1.550(18)
C16	C17	1.59(2)
C18	C19	1.192(17)
C20	C21	1.544(17)
C20	C22	1.555(17)
C23	C24	1.497(17)
C23	C25	1.546(18)
C26	C27	1.519(18)
C26	C28	1.517(17)
I2	N2	2.469(9)
I2	C29	2.150(11)
I2	C46	2.074(12)
S2	O6	1.445(9)
S2	O7	1.441(9)
S2	N2	1.642(9)
S2	C36	1.800(12)
Si2	C47	1.884(14)
Si2	C48	1.81(2)
Si2	C51	1.87(2)
Si2	C54	1.935(18)

Atom	Atom	Length/Å
O5	C35	1.242(13)
O8	C38	1.172(16)
N2	C35	1.359(14)
C29	C30	1.345(16)
C29	C34	1.406(15)
C30	C31	1.398(16)
C31	C32	1.391(17)
C32	C33	1.377(17)
C33	C34	1.386(16)
C34	C35	1.486(16)
C36	C37	1.538(17)
C37	C38	1.566(17)
C37	C41	1.541(18)
C37	C45	1.592(17)
C38	C39	1.555(19)
C39	C40	1.45(2)
C40	C41	1.578(16)
C40	C44	1.53(2)
C41	C42	1.58(2)
C41	C43	1.56(2)
C44	C45	1.582(18)
C46	C47	1.187(17)
C48	C49	1.519(17)
C48	C50	1.541(16)
C51	C52	1.501(17)
C51	C53	1.535(18)
C54	C55	1.500(16)
C54	C56	1.501(16)

Atom	Atom	Atom	Angle/°
C1	I1	N1	73.6(4)
C18	I1	N1	164.5(4)
C18	I1	C1	91.5(5)
O2	S1	O3	119.0(6)
O2	S1	N1	111.6(6)
O2	S1	C8	108.9(6)
O3	S1	N1	103.8(5)
O3	S1	C8	109.0(6)
N1	S1	C8	103.3(6)
C19	Si1	C23	109.0(7)
C20	Si1	C19	104.7(8)
C20	Si1	C23	111.2(9)
C26	Si1	C19	106.7(8)
C26	Si1	C20	116.5(10)
C26	Si1	C23	108.3(11)
S1	N1	I1	120.4(5)
C7	N1	I1	113.8(8)
C7	N1	S1	123.5(8)
C2	C1	I1	119.9(9)
C2	C1	C6	122.8(12)
C6	C1	I1	117.2(9)
C1	C2	C3	118.1(12)
C4	C3	C2	120.1(13)
C5	C4	C3	120.6(13)
C4	C5	C6	121.5(12)
C1	C6	C5	116.9(12)
C1	C6	C7	122.0(11)
C5	C6	C7	121.0(11)

Atom	Atom	Atom	Angle/°
O1	C7	N1	124.4(12)
O1	C7	C6	122.6(12)
N1	C7	C6	112.9(11)
C9	C8	S1	116.9(9)
C8	C9	C13	118.8(11)
C8	C9	C17	117.0(11)
C10	C9	C8	111.7(10)
C10	C9	C13	98.9(10)
C10	C9	C17	103.7(10)
C13	C9	C17	104.3(10)
O4	C10	C9	123.6(13)
O4	C10	C11	128.1(13)
C11	C10	C9	108.3(12)
C10	C11	C12	102.2(11)
C11	C12	C13	103.3(11)
C11	C12	C16	105.0(13)
C13	C12	C16	103.4(11)
C9	C13	C12	92.8(10)
C14	C13	C9	114.6(11)
C14	C13	C12	112.0(11)
C14	C13	C15	108.1(12)
C15	C13	C9	115.0(11)
C15	C13	C12	113.9(12)
C12	C16	C17	102.8(11)
C9	C17	C16	101.9(11)
C19	C18	I1	175.6(12)
C18	C19	Si1	174.1(12)
C21	C20	Si1	108.5(13)
C21	C20	C22	111.9(18)

Atom	Atom	Atom	Angle/°
C22	C20	Si1	111.7(14)
C24	C23	Si1	117.8(13)
C24	C23	C25	105.3(17)
C25	C23	Si1	108.7(15)
C27	C26	Si1	111.7(15)
C28	C26	Si1	114.2(15)
C28	C26	C27	109.5(19)
C29	I2	N2	74.0(4)
C46	I2	N2	163.6(4)
C46	I2	C29	89.9(4)
O6	S2	N2	111.4(5)
O6	S2	C36	109.6(5)
O7	S2	O6	118.2(5)
O7	S2	N2	104.7(5)
O7	S2	C36	108.4(6)
N2	S2	C36	103.3(6)
C47	Si2	C54	104.0(6)
C48	Si2	C47	107.3(8)
C48	Si2	C51	116.7(10)
C48	Si2	C54	110.9(8)
C51	Si2	C47	112.1(8)
C51	Si2	C54	105.1(8)
S2	N2	I2	121.8(5)
C35	N2	I2	111.7(7)
C35	N2	S2	120.9(8)
C30	C29	I2	122.2(8)
C30	C29	C34	121.1(11)
C34	C29	I2	116.7(8)
C29	C30	C31	121.1(11)

Atom	Atom	Atom	Angle/°
C32	C31	C30	118.0(12)
C33	C32	C31	121.0(12)
C32	C33	C34	120.3(11)
C29	C34	C35	122.0(10)
C33	C34	C29	118.3(11)
C33	C34	C35	119.7(10)
O5	C35	N2	125.9(11)
O5	C35	C34	120.2(10)
N2	C35	C34	113.8(9)
C37	C36	S2	117.9(9)
C36	C37	C38	108.1(10)
C36	C37	C41	123.7(10)
C36	C37	C45	116.0(10)
C38	C37	C45	102.5(10)
C41	C37	C38	101.1(10)
C41	C37	C45	102.6(10)
O8	C38	C37	126.1(12)
O8	C38	C39	130.2(12)
C39	C38	C37	103.7(11)
C40	C39	C38	103.6(11)
C39	C40	C41	104.3(12)
C39	C40	C44	109.0(12)
C44	C40	C41	102.2(11)
C37	C41	C40	93.4(10)
C37	C41	C42	113.1(11)
C37	C41	C43	116.1(11)
C40	C41	C42	113.5(11)
C43	C41	C40	111.9(12)
C43	C41	C42	108.4(12)

Atom	Atom	Atom	Angle/°
C40	C44	C45	102.8(10)
C44	C45	C37	102.5(10)
C47	C46	I2	172.1(11)
C46	C47	Si2	173.3(14)
C49	C48	Si2	115.8(14)
C49	C48	C50	107.0(15)
C50	C48	Si2	116.2(15)
C52	C51	Si2	108.8(16)
C52	C51	C53	108.3(19)
C53	C51	Si2	110.3(15)
C55	C54	Si2	116.8(12)
C55	C54	C56	108.6(14)
C56	C54	Si2	112.5(12)

Table S8: Hydrogen Fractional Atomic Coordinates ($\times 10^4$) and Equivalent Isotropic Displacement Parameters ($Å^2 \times 10^3$) for **2e**. U_{eq} is defined as 1/3 of the trace of the orthogonalised U_{ij}.

Atom	x	y	z	U_{eq}
H2	3327.91	7539.6	8058.61	36
H3	2069.63	8462.67	8365.91	38
H4	358.37	8437.24	8130.13	41
H5	-123.96	7571.91	7577.58	47
H8A	469.79	6022.56	6250.46	32
H8B	1624.99	6224.07	6096.85	32
H11A	1223.86	5056.36	4816.86	55

Table S8: Hydrogen Fractional Atomic Coordinates ($\times 10^4$) and Equivalent Isotropic Displacement Parameters ($Å^2 \times 10^3$) for **2e**. U_{eq} is defined as 1/3 of the trace of the orthogonalised U_{ij}.

Atom	**x**	**y**	**z**	U_{eq}
H11B	172.38	5602.46	4874.13	55
H12	-394.43	4231.56	5082.28	58
H14A	-1148.67	5805.92	5907.51	63
H14B	-1587.74	5348.65	5494.09	63
H14C	-680.08	6036.76	5454.44	63
H15A	-87.19	3756.95	6020.89	70
H15B	-1249.98	4005.23	5889.37	70
H15C	-688.36	4489.44	6269.48	70
H16A	1567.04	3805.84	5118.8	74
H16B	837.43	3346.63	5463.56	74
H17A	1697.42	4065.78	5992.85	53
H17B	2395.83	4553.28	5646.56	53
H20	6022.77	6131.9	9174.69	103
H21A	5410.46	5085.55	8475.84	130
H21B	5560.13	4739.39	8946.04	130
H21C	6540.48	5087.65	8687.88	130
H22A	4275.18	6795.01	9042.85	129
H22B	4299.34	5941.76	9313.77	129
H22C	3985.51	5912.62	8825.72	129
H23	6362.66	8362.55	8578.85	106
H24A	4658.6	8476.83	8356.35	117
H24B	4759.79	8931.3	8805.25	117

Table S8: Hydrogen Fractional Atomic Coordinates ($\times 10^4$) and Equivalent Isotropic Displacement Parameters ($Å^2 \times 10^3$) for **2e**. U_{eq} is defined as 1/3 of the trace of the orthogonalised U_{ij}.

Atom	**x**	**y**	**z**	U_{eq}
H24C	4247.77	8011.44	8772.27	117
H25A	5594.05	7585.97	9336.86	173
H25B	5853.66	8573.91	9309.34	173
H25C	6763.89	7891.98	9255.36	173
H26	7457.87	6141.63	8221.96	136
H27A	7138.65	7186.9	7727.79	170
H27B	8327.33	7254.72	7874.39	170
H27C	7484.83	7908.88	8052.23	170
H28A	8280.36	7460.8	8726.22	171
H28B	8858.16	6617.67	8574.66	171
H28C	7972.4	6568.34	8928.46	171
H30	8279.86	3969.55	7993.02	23
H31	7048.84	3089.94	8324.65	33
H32	5340.1	3070.01	8062.47	31
H33	4838.9	3989.21	7530.89	35
H36A	6305.54	5493.79	5979.25	32
H36B	5308.1	5408.74	6274.59	32
H39A	4760.23	6410.56	4890.18	50
H39B	3622.02	6478.63	5101.2	50
H40	4739.24	7778.77	5132.98	48
H42A	7282.65	6894.66	5449.76	82
H42B	6612.42	7117.35	5039.26	82

Table S8: Hydrogen Fractional Atomic Coordinates ($\times 10^4$) and Equivalent Isotropic Displacement Parameters ($Å^2 \times 10^3$) for **2e**. U_{eq} is defined as 1/3 of the trace of the orthogonalised U_{ij}.

Atom	x	y	z	U_{eq}
H42C	6530.92	6197.87	5247.13	82
H43A	5481.42	8202.38	5968.36	77
H43B	6464.73	8284.01	5661.44	77
H43C	6539.67	7716.49	6078.02	77
H44A	3167.27	7441.26	5606.58	51
H44B	3988.37	8106.9	5801.05	51
H45A	3629.28	6448.97	6102.73	40
H45B	4373.67	7143.62	6321.54	40
H48	10258.11	5348.39	9000.59	107
H49A	11930.89	6046.68	8534.8	136
H49B	11385.05	6510.88	8924.76	136
H49C	10734.03	6319.87	8505.33	136
H50A	11386.96	4628.17	9422.44	135
H50B	11802.59	5581.49	9409.14	135
H50C	12366.17	4867.09	9134.38	135
H51	12323.2	3555.98	8546.37	118
H52A	12863.67	4410.15	7837.22	149
H52B	13400.64	4477.32	8291.23	149
H52C	12443.82	5081.03	8174.41	149
H53A	11102.54	2931.38	8021.89	148
H53B	12313.59	2850.23	7911.49	148
H53C	11620.85	3560.58	7687.21	148

Table S8: Hydrogen Fractional Atomic Coordinates ($\times 10^4$) and Equivalent Isotropic Displacement Parameters ($Å^2 \times 10^3$) for **2e**. U_{eq} is defined as 1/3 of the trace of the orthogonalised U_{ij}.

Atom	**x**	**y**	**z**	U_{eq}
H54	9634.43	3215.79	8466.16	75
H55A	10992.71	2608.36	8831.47	100
H55B	9919.26	2456.89	9075.85	100
H55C	10719.29	3158.83	9240.05	100
H56A	9212.04	4227.05	9179.67	112
H56B	8565.84	3399.45	9054.46	112
H56C	8556.96	4207.19	8750.68	112

Table S9: Solvent masking (Olex2) information for **ls01-205**.

No	**x**	**y**	**z**	**V**	**e**	**Content**
1	0.495	0.250	0.500	392.3	107.4	?
2	0.208	0.750	0.000	392.3	107.5	?

2-Phenylpropan-2-yl (*S*,*E*)-4-(4-fluorophenyl)-2-((2-iodophenyl)((mesitylsulfonyl)imino)methoxy)but-3-ynoate (14n)

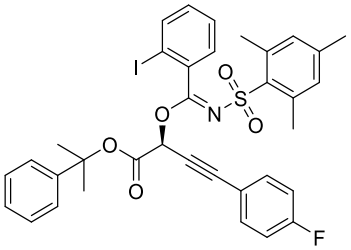


Table S10. Crystal data and structure refinement for **14n**.

Identification code	ps-097	
Empirical formula	$C_{35}H_{31}FINO_5S$	
Formula weight	723.57	
Temperature	100.00(10) K	
Wavelength	1.54184 Å	
Crystal system	Orthorhombic	
Space group	$P2_12_12_1$	
Unit cell dimensions	a = 9.45135(4) Å	□= 90°.
	b = 14.02781(6) Å	□= 90°.
	c = 24.20130(9) Å	□ = 90°.
Volume	3208.65(2) Å^3	
Z	4	
Density (calculated)	1.498 Mg/m^3	
Absorption coefficient	8.855 mm^{-1}	
F(000)	1464	
Crystal size	0.649 x 0.144 x 0.094 mm^3	
□ range for data collection	3.642 to 73.748°.	
Index ranges	-11 ≤ h ≤ 10, -17 ≤ k ≤ 17, -30 ≤ l ≤ 30	
Reflections collected	53907	
Independent reflections	6449 [R_{int} = 0.0308]	
Completeness to □ = 67.684°	100.0 %	
Absorption correction	Gaussian	
Max. and min. transmission	0.904 and 0.181	
Refinement method	Full-matrix least-squares on F^2	
Data / restraints / parameters	6449 / 0 / 403	
Goodness-of-fit on F^2	1.065	
Final R indices [I > 2□(I)]	R_1 = 0.0156, $wR2$ = 0.0405	
R indices (all data)	R_1 = 0.0157, wR_2 = 0.0406	
Absolute structure parameter	-0.0179(13)	

Extinction coefficient	0.00027(3)
Largest diff. peak and hole	0.302 and -0.605 e.Å^{-3}

Table S11. Atomic coordinates (x 10^4) and equivalent isotropic displacement parameters (Å^{2}x 10^3)
for **14n**. U(eq) is defined as one third of the trace of the orthogonalized U^{ij} tensor.

	x	y	z	U(eq)
I(1)	-1150(1)	5877(1)	4872(1)	21(1)
S(1)	2569(1)	4212(1)	5601(1)	14(1)
F(1)	-189(2)	12378(1)	7262(1)	32(1)
O(1)	610(2)	6424(1)	6122(1)	15(1)
O(2)	4079(2)	4256(1)	5564(1)	21(1)
O(3)	1988(2)	3531(1)	5980(1)	20(1)
O(4)	3012(2)	6437(1)	6822(1)	18(1)
O(5)	4185(2)	7232(1)	6140(1)	14(1)
N(1)	2116(2)	5315(1)	5789(1)	14(1)
C(1)	1747(2)	7099(2)	6038(1)	14(1)
C(2)	870(2)	5529(2)	5949(1)	14(1)
C(3)	-440(2)	4943(2)	5981(1)	14(1)
C(4)	-1443(2)	4981(2)	5559(1)	17(1)
C(5)	-2666(3)	4431(2)	5591(1)	22(1)
C(6)	-2896(3)	3865(2)	6049(1)	24(1)
C(7)	-1906(3)	3827(2)	6473(1)	24(1)
C(8)	-688(3)	4356(2)	6440(1)	20(1)
C(9)	1859(2)	4063(2)	4931(1)	15(1)
C(10)	2416(3)	4644(2)	4507(1)	18(1)
C(11)	1912(3)	4512(2)	3972(1)	22(1)
C(12)	886(3)	3839(2)	3848(1)	25(1)
C(13)	334(3)	3295(2)	4275(1)	22(1)
C(14)	801(2)	3376(2)	4820(1)	18(1)
C(15)	3542(3)	5397(2)	4592(1)	24(1)
C(16)	390(4)	3688(2)	3261(1)	37(1)
C(17)	165(3)	2694(2)	5235(1)	25(1)
C(18)	1240(3)	8035(2)	6221(1)	16(1)

C(19)	990(3)	8806(2)	6403(1)	16(1)
C(20)	680(3)	9735(2)	6623(1)	17(1)
C(21)	-238(3)	9833(2)	7071(1)	21(1)
C(22)	-545(3)	10724(2)	7288(1)	24(1)
C(23)	88(3)	11501(2)	7050(1)	23(1)
C(24)	990(3)	11443(2)	6603(1)	28(1)
C(25)	1287(3)	10547(2)	6391(1)	24(1)
C(26)	3055(2)	6851(2)	6388(1)	14(1)
C(27)	5599(3)	7178(2)	6404(1)	16(1)
C(28)	5638(3)	7819(2)	6911(1)	16(1)
C(29)	4601(3)	8496(2)	7018(1)	22(1)
C(30)	4694(3)	9083(2)	7479(1)	26(1)
C(31)	5837(3)	9012(2)	7837(1)	26(1)
C(32)	6887(3)	8357(2)	7727(1)	25(1)
C(33)	6792(3)	7763(2)	7268(1)	21(1)
C(34)	6563(3)	7567(2)	5956(1)	24(1)
C(35)	5962(3)	6139(2)	6529(1)	22(1)

Table S12. Bond lengths [Å] and angles [°] for **14n**.

I(1)-C(4)	2.102(2)
S(1)-O(2)	1.4317(17)
S(1)-O(3)	1.4328(17)
S(1)-N(1)	1.6682(19)
S(1)-C(9)	1.768(2)
F(1)-C(23)	1.358(3)
O(1)-C(2)	1.348(3)
O(1)-C(1)	1.446(3)
O(4)-C(26)	1.201(3)
O(5)-C(26)	1.336(3)
O(5)-C(27)	1.483(3)
N(1)-C(2)	1.275(3)
C(1)-C(18)	1.465(3)
C(1)-C(26)	1.538(3)
C(1)-H(1)	1.0000
C(2)-C(3)	1.488(3)
C(3)-C(4)	1.394(3)
C(3)-C(8)	1.402(3)
C(4)-C(5)	1.391(3)
C(5)-C(6)	1.380(4)
C(5)-H(5)	0.9500
C(6)-C(7)	1.389(4)
C(6)-H(6)	0.9500
C(7)-C(8)	1.372(4)
C(7)-H(7)	0.9500
C(8)-H(8)	0.9500
C(9)-C(10)	1.412(3)
C(9)-C(14)	1.414(3)
C(10)-C(11)	1.392(3)
C(10)-C(15)	1.513(3)
C(11)-C(12)	1.387(4)
C(11)-H(11)	0.9500
C(12)-C(13)	1.386(4)
C(12)-C(16)	1.510(4)
C(13)-C(14)	1.397(3)
C(13)-H(13)	0.9500

C(14)-C(17)	1.511(3)
C(15)-H(15A)	0.9800
C(15)-H(15B)	0.9800
C(15)-H(15C)	0.9800
C(16)-H(16A)	0.9800
C(16)-H(16B)	0.9800
C(16)-H(16C)	0.9800
C(17)-H(17A)	0.9800
C(17)-H(17B)	0.9800
C(17)-H(17C)	0.9800
C(18)-C(19)	1.193(3)
C(19)-C(20)	1.437(3)
C(20)-C(25)	1.394(3)
C(20)-C(21)	1.397(3)
C(21)-C(22)	1.386(4)
C(21)-H(21)	0.9500
C(22)-C(23)	1.371(4)
C(22)-H(22)	0.9500
C(23)-C(24)	1.378(4)
C(24)-C(25)	1.387(3)
C(24)-H(24)	0.9500
C(25)-H(25)	0.9500
C(27)-C(34)	1.518(3)
C(27)-C(28)	1.523(3)
C(27)-C(35)	1.528(3)
C(28)-C(29)	1.389(3)
C(28)-C(33)	1.393(3)
C(29)-C(30)	1.391(4)
C(29)-H(29)	0.9500
C(30)-C(31)	1.387(4)
C(30)-H(30)	0.9500
C(31)-C(32)	1.377(4)
C(31)-H(31)	0.9500
C(32)-C(33)	1.392(4)
C(32)-H(32)	0.9500
C(33)-H(33)	0.9500
C(34)-H(34A)	0.9800
C(34)-H(34B)	0.9800

C(34)-H(34C)	0.9800
C(35)-H(35A)	0.9800
C(35)-H(35B)	0.9800
C(35)-H(35C)	0.9800

O(2)-S(1)-O(3)	116.75(10)
O(2)-S(1)-N(1)	103.47(10)
O(3)-S(1)-N(1)	110.20(10)
O(2)-S(1)-C(9)	109.04(10)
O(3)-S(1)-C(9)	111.33(11)
N(1)-S(1)-C(9)	105.18(10)
C(2)-O(1)-C(1)	115.57(17)
C(26)-O(5)-C(27)	120.38(17)
C(2)-N(1)-S(1)	122.52(16)
O(1)-C(1)-C(18)	107.53(19)
O(1)-C(1)-C(26)	111.82(17)
C(18)-C(1)-C(26)	107.46(18)
O(1)-C(1)-H(1)	110.0
C(18)-C(1)-H(1)	110.0
C(26)-C(1)-H(1)	110.0
N(1)-C(2)-O(1)	118.8(2)
N(1)-C(2)-C(3)	130.9(2)
O(1)-C(2)-C(3)	110.30(19)
C(4)-C(3)-C(8)	119.3(2)
C(4)-C(3)-C(2)	120.4(2)
C(8)-C(3)-C(2)	120.3(2)
C(5)-C(4)-C(3)	120.2(2)
C(5)-C(4)-I(1)	119.01(18)
C(3)-C(4)-I(1)	120.83(17)
C(6)-C(5)-C(4)	119.7(2)
C(6)-C(5)-H(5)	120.2
C(4)-C(5)-H(5)	120.2
C(5)-C(6)-C(7)	120.6(2)
C(5)-C(6)-H(6)	119.7
C(7)-C(6)-H(6)	119.7
C(8)-C(7)-C(6)	120.1(2)
C(8)-C(7)-H(7)	119.9
C(6)-C(7)-H(7)	119.9

C(7)-C(8)-C(3)	120.2(2)
C(7)-C(8)-H(8)	119.9
C(3)-C(8)-H(8)	119.9
C(10)-C(9)-C(14)	121.3(2)
C(10)-C(9)-S(1)	117.19(17)
C(14)-C(9)-S(1)	121.48(17)
C(11)-C(10)-C(9)	118.1(2)
C(11)-C(10)-C(15)	117.4(2)
C(9)-C(10)-C(15)	124.5(2)
C(12)-C(11)-C(10)	122.1(2)
C(12)-C(11)-H(11)	118.9
C(10)-C(11)-H(11)	118.9
C(13)-C(12)-C(11)	118.4(2)
C(13)-C(12)-C(16)	120.5(3)
C(11)-C(12)-C(16)	121.1(3)
C(12)-C(13)-C(14)	122.8(2)
C(12)-C(13)-H(13)	118.6
C(14)-C(13)-H(13)	118.6
C(13)-C(14)-C(9)	117.2(2)
C(13)-C(14)-C(17)	116.8(2)
C(9)-C(14)-C(17)	126.0(2)
C(10)-C(15)-H(15A)	109.5
C(10)-C(15)-H(15B)	109.5
H(15A)-C(15)-H(15B)	109.5
C(10)-C(15)-H(15C)	109.5
H(15A)-C(15)-H(15C)	109.5
H(15B)-C(15)-H(15C)	109.5
C(12)-C(16)-H(16A)	109.5
C(12)-C(16)-H(16B)	109.5
H(16A)-C(16)-H(16B)	109.5
C(12)-C(16)-H(16C)	109.5
H(16A)-C(16)-H(16C)	109.5
H(16B)-C(16)-H(16C)	109.5
C(14)-C(17)-H(17A)	109.5
C(14)-C(17)-H(17B)	109.5
H(17A)-C(17)-H(17B)	109.5
C(14)-C(17)-H(17C)	109.5
H(17A)-C(17)-H(17C)	109.5

H(17B)-C(17)-H(17C)	109.5
C(19)-C(18)-C(1)	171.5(3)
C(18)-C(19)-C(20)	179.7(3)
C(25)-C(20)-C(21)	119.2(2)
C(25)-C(20)-C(19)	120.6(2)
C(21)-C(20)-C(19)	120.2(2)
C(22)-C(21)-C(20)	120.8(2)
C(22)-C(21)-H(21)	119.6
C(20)-C(21)-H(21)	119.6
C(23)-C(22)-C(21)	117.9(2)
C(23)-C(22)-H(22)	121.1
C(21)-C(22)-H(22)	121.1
F(1)-C(23)-C(22)	118.5(2)
F(1)-C(23)-C(24)	118.0(2)
C(22)-C(23)-C(24)	123.5(2)
C(23)-C(24)-C(25)	118.0(2)
C(23)-C(24)-H(24)	121.0
C(25)-C(24)-H(24)	121.0
C(24)-C(25)-C(20)	120.5(2)
C(24)-C(25)-H(25)	119.7
C(20)-C(25)-H(25)	119.7
O(4)-C(26)-O(5)	127.8(2)
O(4)-C(26)-C(1)	124.3(2)
O(5)-C(26)-C(1)	107.73(18)
O(5)-C(27)-C(34)	102.44(18)
O(5)-C(27)-C(28)	109.85(18)
C(34)-C(27)-C(28)	110.4(2)
O(5)-C(27)-C(35)	109.70(19)
C(34)-C(27)-C(35)	110.5(2)
C(28)-C(27)-C(35)	113.40(19)
C(29)-C(28)-C(33)	118.5(2)
C(29)-C(28)-C(27)	122.4(2)
C(33)-C(28)-C(27)	119.0(2)
C(28)-C(29)-C(30)	120.6(2)
C(28)-C(29)-H(29)	119.7
C(30)-C(29)-H(29)	119.7
C(31)-C(30)-C(29)	120.5(2)
C(31)-C(30)-H(30)	119.7

C(29)-C(30)-H(30)	119.7
C(32)-C(31)-C(30)	119.2(2)
C(32)-C(31)-H(31)	120.4
C(30)-C(31)-H(31)	120.4
C(31)-C(32)-C(33)	120.5(2)
C(31)-C(32)-H(32)	119.8
C(33)-C(32)-H(32)	119.8
C(32)-C(33)-C(28)	120.7(2)
C(32)-C(33)-H(33)	119.6
C(28)-C(33)-H(33)	119.6
C(27)-C(34)-H(34A)	109.5
C(27)-C(34)-H(34B)	109.5
H(34A)-C(34)-H(34B)	109.5
C(27)-C(34)-H(34C)	109.5
H(34A)-C(34)-H(34C)	109.5
H(34B)-C(34)-H(34C)	109.5
C(27)-C(35)-H(35A)	109.5
C(27)-C(35)-H(35B)	109.5
H(35A)-C(35)-H(35B)	109.5
C(27)-C(35)-H(35C)	109.5
H(35A)-C(35)-H(35C)	109.5
H(35B)-C(35)-H(35C)	109.5

Symmetry transformations used to generate equivalent atoms:

Table S13. Anisotropic displacement parameters ($Å^2 x\ 10^3$)for **14n**. The anisotropic displacement factor exponent takes the form: $-2\pi^2[h^2 a^{*2} U^{11} + ... + 2\ h\ k\ a^*\ b^*\ U^{12}]$

	U^{11}	U^{22}	U^{33}	U^{23}	U^{13}	U^{12}
I(1)	21(1)	26(1)	17(1)	3(1)	0(1)	6(1)
S(1)	13(1)	12(1)	18(1)	-2(1)	-2(1)	1(1)
F(1)	45(1)	18(1)	35(1)	-11(1)	-6(1)	10(1)
O(1)	12(1)	12(1)	20(1)	-4(1)	2(1)	-1(1)
O(2)	13(1)	21(1)	29(1)	-5(1)	-3(1)	4(1)
O(3)	23(1)	16(1)	20(1)	1(1)	-2(1)	1(1)
O(4)	20(1)	18(1)	16(1)	2(1)	1(1)	-3(1)
O(5)	13(1)	16(1)	15(1)	0(1)	0(1)	-2(1)
N(1)	13(1)	13(1)	17(1)	-4(1)	-1(1)	0(1)
C(1)	13(1)	12(1)	17(1)	-1(1)	1(1)	-3(1)
C(2)	16(1)	12(1)	14(1)	-1(1)	-2(1)	0(1)
C(3)	12(1)	13(1)	18(1)	-2(1)	0(1)	0(1)
C(4)	15(1)	15(1)	20(1)	-3(1)	0(1)	2(1)
C(5)	13(1)	22(1)	30(1)	-6(1)	-3(1)	0(1)
C(6)	13(1)	18(1)	42(2)	-3(1)	5(1)	-2(1)
C(7)	23(1)	18(1)	30(1)	6(1)	7(1)	4(1)
C(8)	18(1)	20(1)	23(1)	0(1)	-2(1)	4(1)
C(9)	15(1)	14(1)	17(1)	-2(1)	1(1)	3(1)
C(10)	16(1)	18(1)	21(1)	-2(1)	5(1)	4(1)
C(11)	25(1)	23(1)	18(1)	0(1)	4(1)	5(1)
C(12)	28(2)	25(1)	21(1)	-5(1)	-3(1)	7(1)
C(13)	22(1)	19(1)	25(1)	-8(1)	-5(1)	1(1)
C(14)	16(1)	14(1)	22(1)	-5(1)	1(1)	0(1)
C(15)	21(1)	24(1)	26(1)	0(1)	6(1)	-4(1)
C(16)	48(2)	41(2)	23(1)	-5(1)	-9(1)	0(1)
C(17)	31(1)	18(1)	26(1)	-4(1)	0(1)	-9(1)
C(18)	15(1)	16(1)	19(1)	0(1)	-2(1)	-2(1)
C(19)	14(1)	17(1)	18(1)	1(1)	-1(1)	-1(1)
C(20)	18(1)	15(1)	17(1)	-3(1)	-4(1)	3(1)
C(21)	24(1)	19(1)	22(1)	-1(1)	2(1)	0(1)
C(22)	25(1)	25(1)	23(1)	-5(1)	3(1)	5(1)

C(23)	28(1)	15(1)	25(1)	-6(1)	-8(1)	7(1)
C(24)	42(2)	15(1)	26(1)	-1(1)	2(1)	-3(1)
C(25)	31(2)	19(1)	24(1)	-2(1)	6(1)	-2(1)
C(26)	16(1)	11(1)	16(1)	-6(1)	0(1)	0(1)
C(27)	11(1)	17(1)	19(1)	-1(1)	-1(1)	1(1)
C(28)	17(1)	13(1)	17(1)	1(1)	1(1)	-3(1)
C(29)	19(1)	20(1)	26(1)	-5(1)	-5(1)	1(1)
C(30)	24(1)	22(1)	34(1)	-11(1)	-2(1)	4(1)
C(31)	33(2)	23(1)	24(1)	-7(1)	-3(1)	-4(1)
C(32)	27(2)	28(1)	21(1)	-1(1)	-8(1)	-2(1)
C(33)	21(1)	20(1)	22(1)	0(1)	-3(1)	1(1)
C(34)	16(1)	32(1)	23(1)	1(1)	3(1)	-1(1)
C(35)	22(1)	16(1)	29(1)	-4(1)	-2(1)	3(1)

Table S14. Hydrogen coordinates (x 10^4) and isotropic displacement parameters ($Å^2$x 10^3) for **14n**.

	x	y	z	U(eq)
H(1)	2008	7124	5638	17
H(5)	-3338	4446	5300	26
H(6)	-3738	3498	6074	29
H(7)	-2074	3434	6786	28
H(8)	-10	4325	6729	24
H(11)	2283	4896	3683	26
H(13)	-392	2848	4193	26
H(15A)	3326	5765	4926	35
H(15B)	3563	5824	4272	35
H(15C)	4466	5088	4634	35
H(16A)	-602	3884	3228	56
H(16B)	477	3012	3164	56
H(16C)	972	4070	3009	56
H(17A)	882	2229	5349	37
H(17B)	-635	2359	5066	37
H(17C)	-164	3050	5558	37
H(21)	-658	9282	7230	26
H(22)	-1174	10794	7591	29
H(24)	1396	12000	6446	33
H(25)	1910	10486	6084	29
H(29)	3820	8558	6773	26
H(30)	3970	9535	7551	32
H(31)	5896	9410	8153	32
H(32)	7680	8311	7966	30
H(33)	7523	7314	7197	25
H(34A)	6487	7168	5625	36
H(34B)	7544	7564	6088	36
H(34C)	6283	8222	5866	36
H(35A)	5476	5940	6868	33
H(35B)	6987	6076	6580	33

H(35C)	5657	5736	6221	33

Table S15.Torsion angles [°] for **14n**.

O(2)-S(1)-N(1)-C(2)	-168.80(19)
O(3)-S(1)-N(1)-C(2)	-43.3(2)
C(9)-S(1)-N(1)-C(2)	76.8(2)
C(2)-O(1)-C(1)-C(18)	176.65(18)
C(2)-O(1)-C(1)-C(26)	-65.6(2)
S(1)-N(1)-C(2)-O(1)	176.35(15)
S(1)-N(1)-C(2)-C(3)	-3.8(3)
C(1)-O(1)-C(2)-N(1)	8.2(3)
C(1)-O(1)-C(2)-C(3)	-171.68(18)
N(1)-C(2)-C(3)-C(4)	-97.4(3)
O(1)-C(2)-C(3)-C(4)	82.4(3)
N(1)-C(2)-C(3)-C(8)	83.4(3)
O(1)-C(2)-C(3)-C(8)	-96.7(2)
C(8)-C(3)-C(4)-C(5)	-0.9(3)
C(2)-C(3)-C(4)-C(5)	179.9(2)
C(8)-C(3)-C(4)-I(1)	178.36(17)
C(2)-C(3)-C(4)-I(1)	-0.8(3)
C(3)-C(4)-C(5)-C(6)	1.5(3)
I(1)-C(4)-C(5)-C(6)	-177.77(18)
C(4)-C(5)-C(6)-C(7)	-1.1(4)
C(5)-C(6)-C(7)-C(8)	0.1(4)
C(6)-C(7)-C(8)-C(3)	0.5(4)
C(4)-C(3)-C(8)-C(7)	-0.1(3)
C(2)-C(3)-C(8)-C(7)	179.1(2)
O(2)-S(1)-C(9)-C(10)	-45.3(2)
O(3)-S(1)-C(9)-C(10)	-175.57(16)
N(1)-S(1)-C(9)-C(10)	65.08(19)
O(2)-S(1)-C(9)-C(14)	133.20(18)
O(3)-S(1)-C(9)-C(14)	3.0(2)
N(1)-S(1)-C(9)-C(14)	-116.38(18)
C(14)-C(9)-C(10)-C(11)	-1.1(3)
S(1)-C(9)-C(10)-C(11)	177.48(18)
C(14)-C(9)-C(10)-C(15)	179.7(2)
S(1)-C(9)-C(10)-C(15)	-1.7(3)
C(9)-C(10)-C(11)-C(12)	0.4(4)
C(15)-C(10)-C(11)-C(12)	179.7(2)

C(10)-C(11)-C(12)-C(13)	1.1(4)
C(10)-C(11)-C(12)-C(16)	-178.1(3)
C(11)-C(12)-C(13)-C(14)	-2.1(4)
C(16)-C(12)-C(13)-C(14)	177.1(2)
C(12)-C(13)-C(14)-C(9)	1.5(4)
C(12)-C(13)-C(14)-C(17)	-176.3(2)
C(10)-C(9)-C(14)-C(13)	0.1(3)
S(1)-C(9)-C(14)-C(13)	-178.34(17)
C(10)-C(9)-C(14)-C(17)	177.7(2)
S(1)-C(9)-C(14)-C(17)	-0.7(3)
C(25)-C(20)-C(21)-C(22)	-0.2(4)
C(19)-C(20)-C(21)-C(22)	179.9(2)
C(20)-C(21)-C(22)-C(23)	-0.4(4)
C(21)-C(22)-C(23)-F(1)	-179.2(2)
C(21)-C(22)-C(23)-C(24)	1.1(4)
F(1)-C(23)-C(24)-C(25)	179.2(3)
C(22)-C(23)-C(24)-C(25)	-1.0(4)
C(23)-C(24)-C(25)-C(20)	0.3(4)
C(21)-C(20)-C(25)-C(24)	0.3(4)
C(19)-C(20)-C(25)-C(24)	-179.9(3)
C(27)-O(5)-C(26)-O(4)	-0.6(3)
C(27)-O(5)-C(26)-C(1)	175.19(17)
O(1)-C(1)-C(26)-O(4)	-28.5(3)
C(18)-C(1)-C(26)-O(4)	89.3(3)
O(1)-C(1)-C(26)-O(5)	155.53(17)
C(18)-C(1)-C(26)-O(5)	-86.7(2)
C(26)-O(5)-C(27)-C(34)	172.79(19)
C(26)-O(5)-C(27)-C(28)	-69.9(2)
C(26)-O(5)-C(27)-C(35)	55.4(3)
O(5)-C(27)-C(28)-C(29)	-13.2(3)
C(34)-C(27)-C(28)-C(29)	99.0(3)
C(35)-C(27)-C(28)-C(29)	-136.4(2)
O(5)-C(27)-C(28)-C(33)	170.2(2)
C(34)-C(27)-C(28)-C(33)	-77.5(3)
C(35)-C(27)-C(28)-C(33)	47.1(3)
C(33)-C(28)-C(29)-C(30)	-1.9(4)
C(27)-C(28)-C(29)-C(30)	-178.5(2)
C(28)-C(29)-C(30)-C(31)	1.0(4)

C(29)-C(30)-C(31)-C(32)	0.4(4)
C(30)-C(31)-C(32)-C(33)	-1.0(4)
C(31)-C(32)-C(33)-C(28)	0.1(4)
C(29)-C(28)-C(33)-C(32)	1.4(4)
C(27)-C(28)-C(33)-C(32)	178.1(2)

Symmetry transformations used to generate equivalent atoms:

Citations

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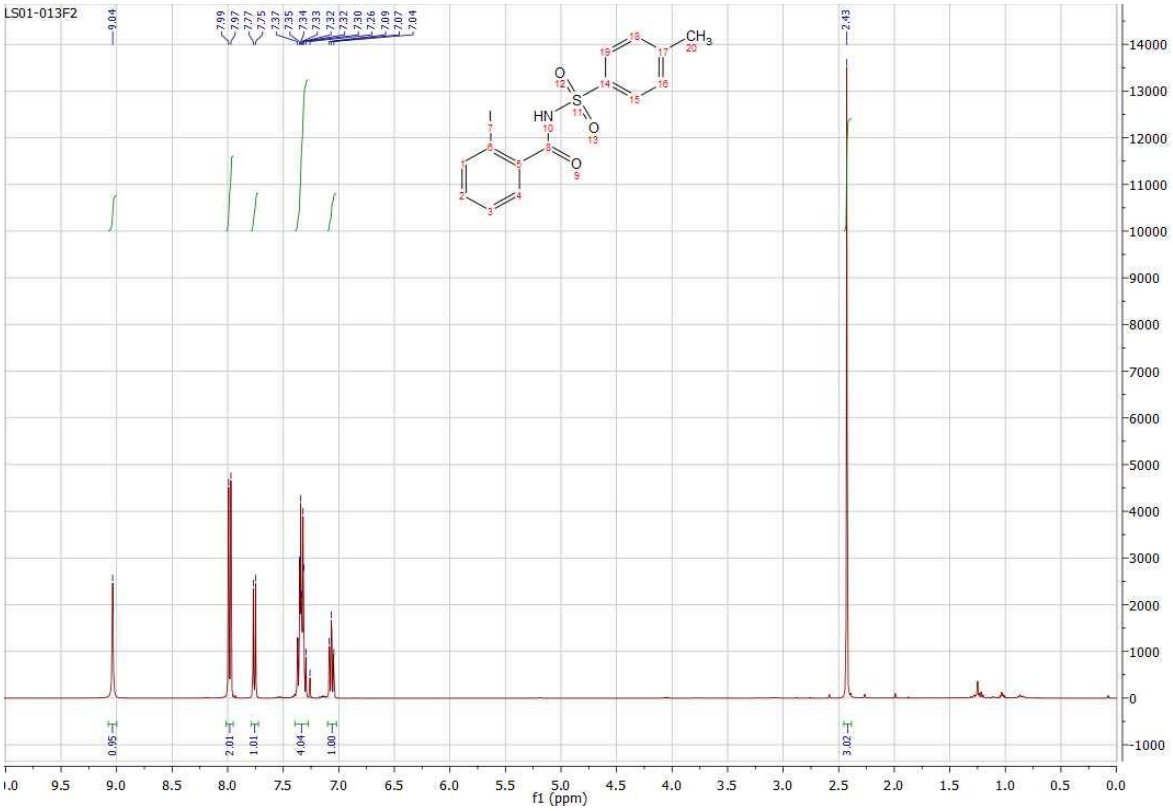
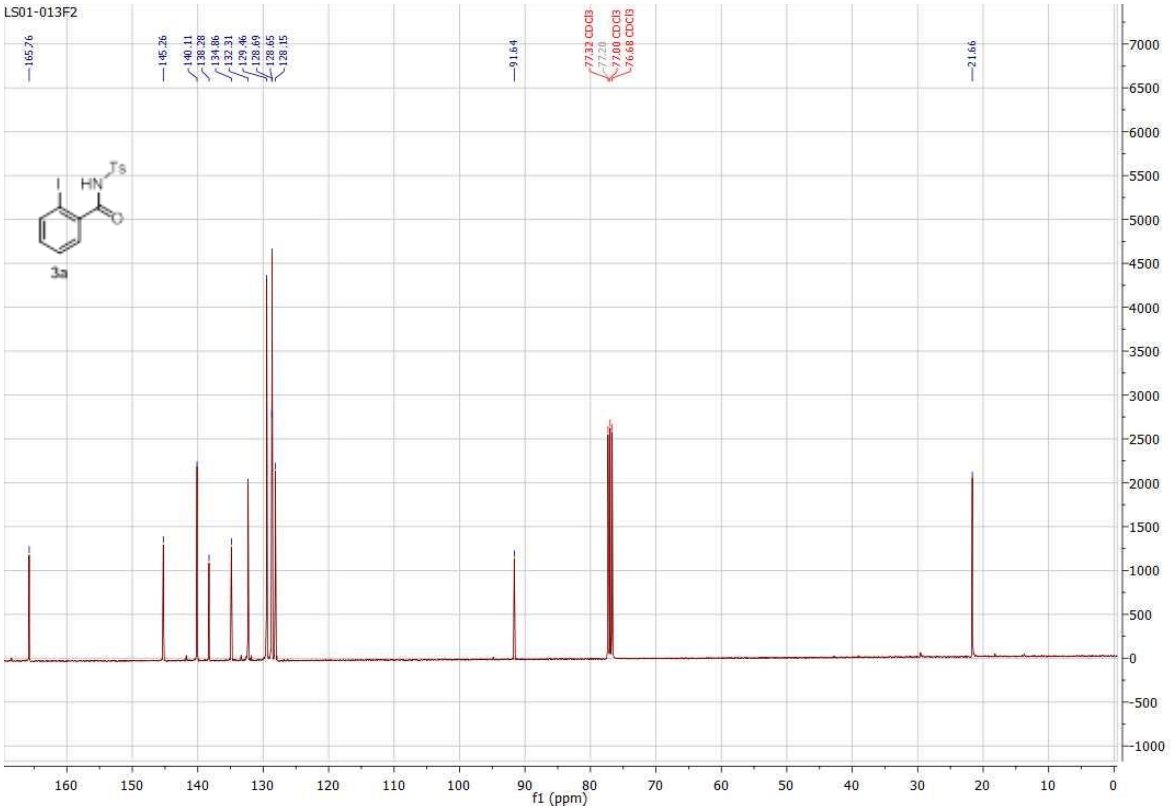
10. Spectra of new compounds.

^{1}H-NMR (400 MHz, $CDCl_3$) of compound **3a**

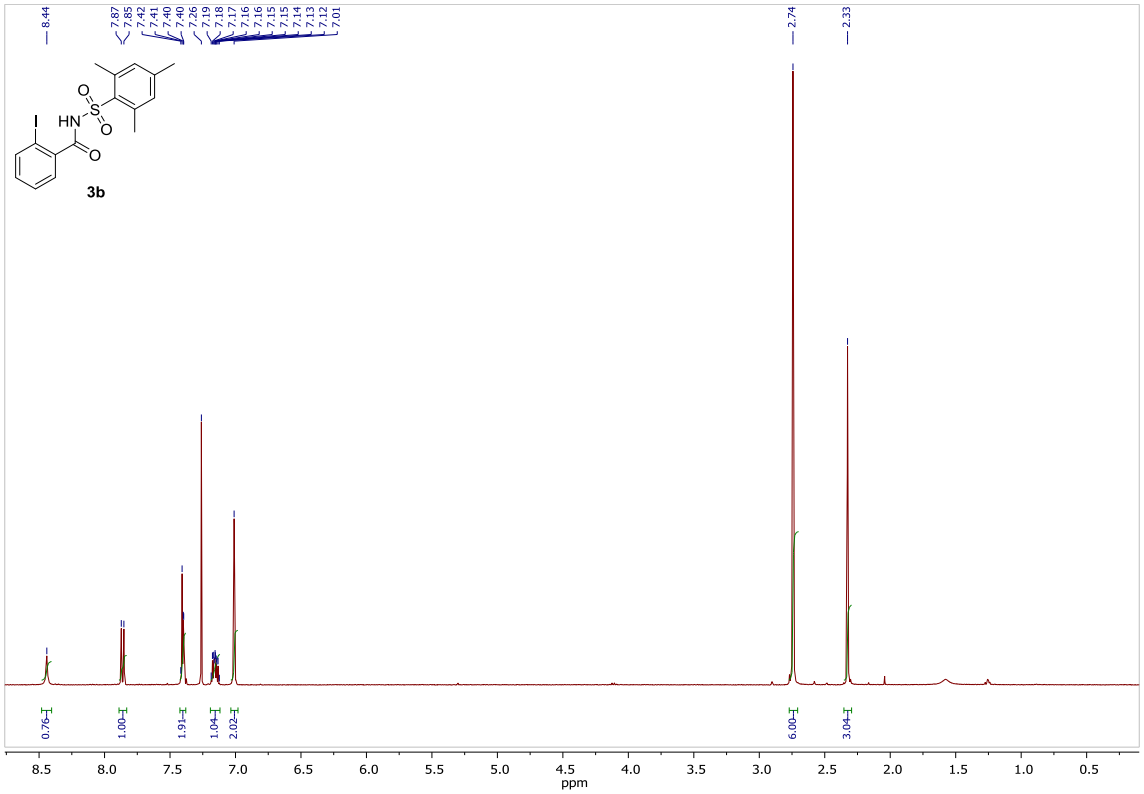


^{13}C-NMR (100 MHz, $CDCl_3$) of compound **3a**

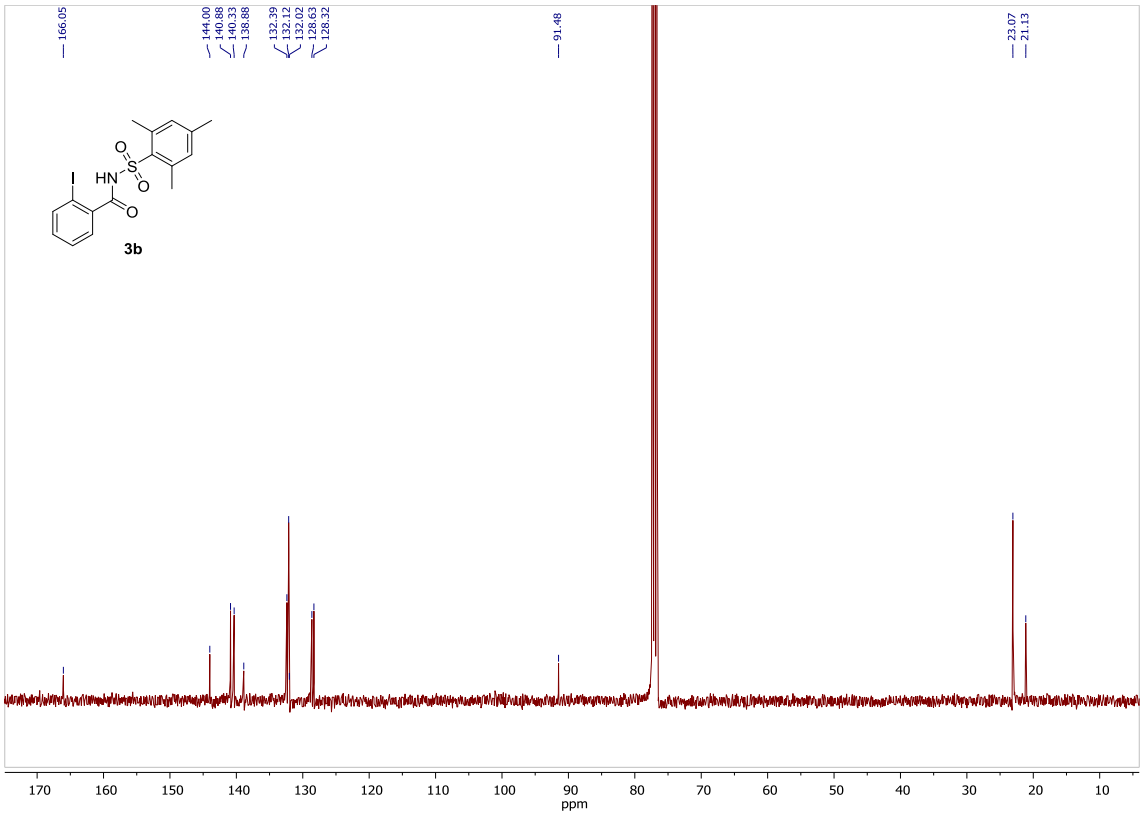


IR of compound **3a**

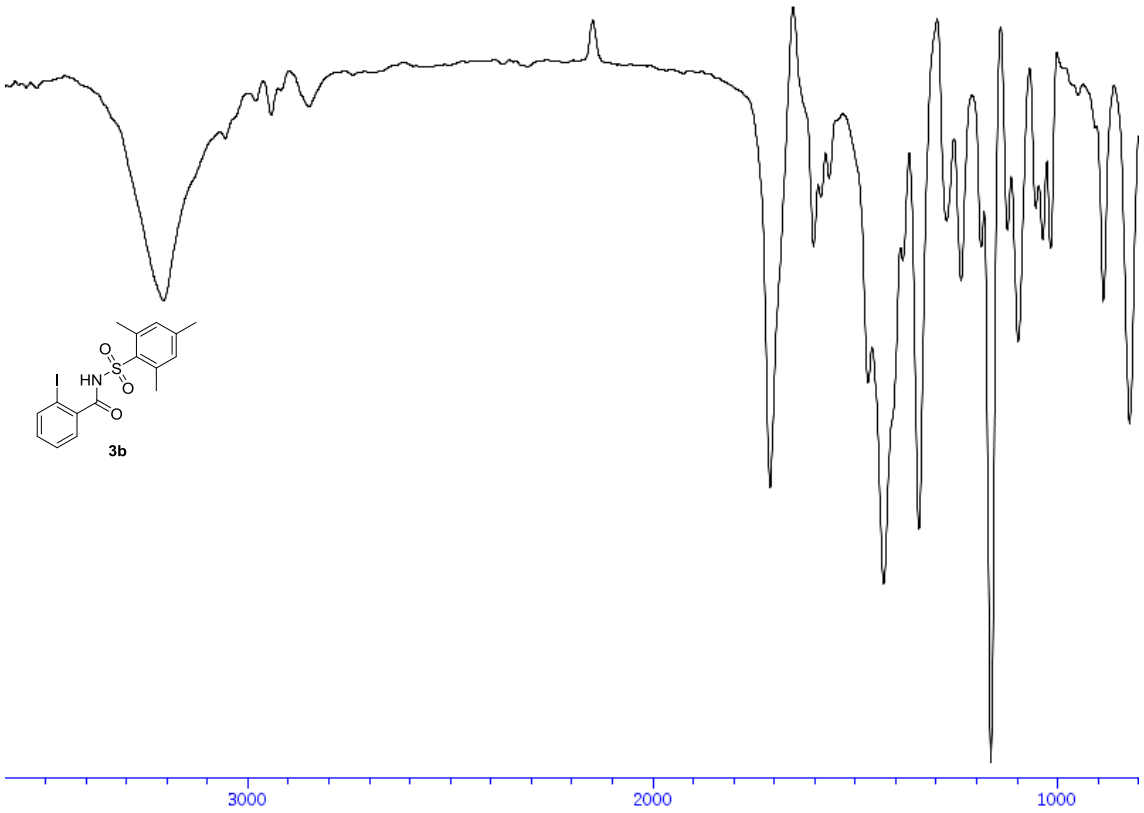
^{1}H-NMR (400 MHz, $CDCl_3$) of compound **3b**



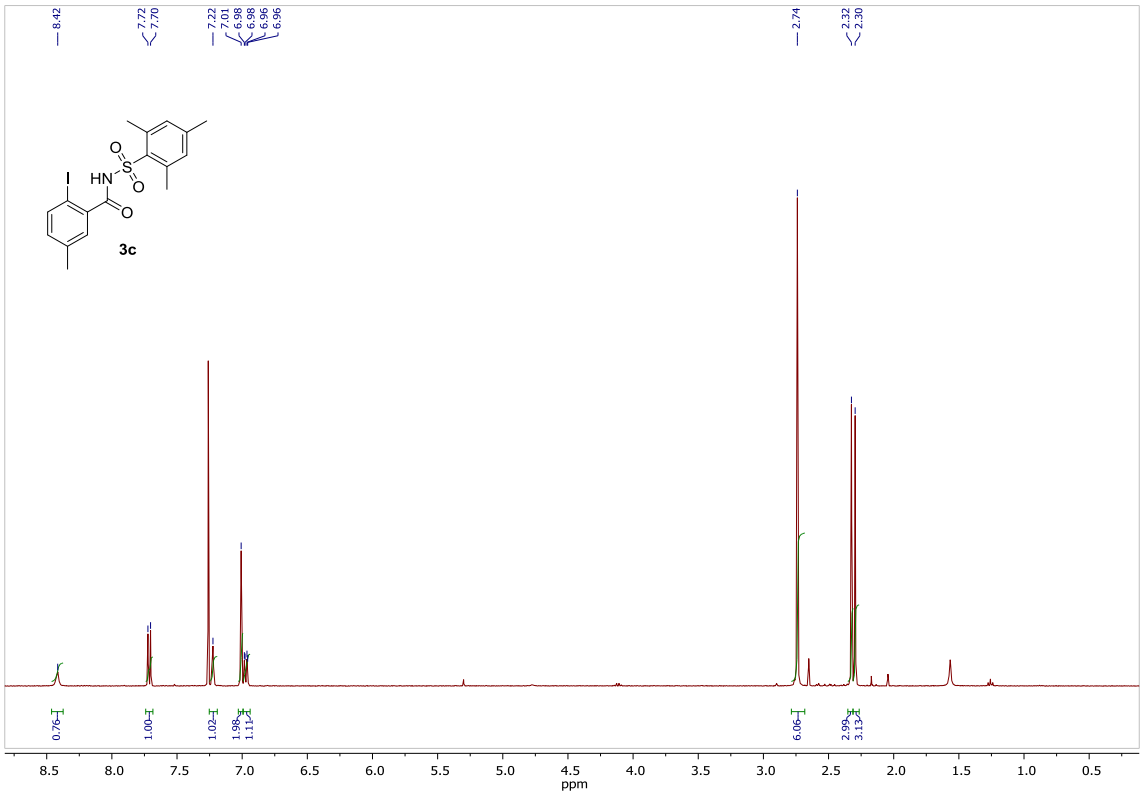
^{13}C-NMR (100 MHz, $CDCl_3$) of compound **3b**



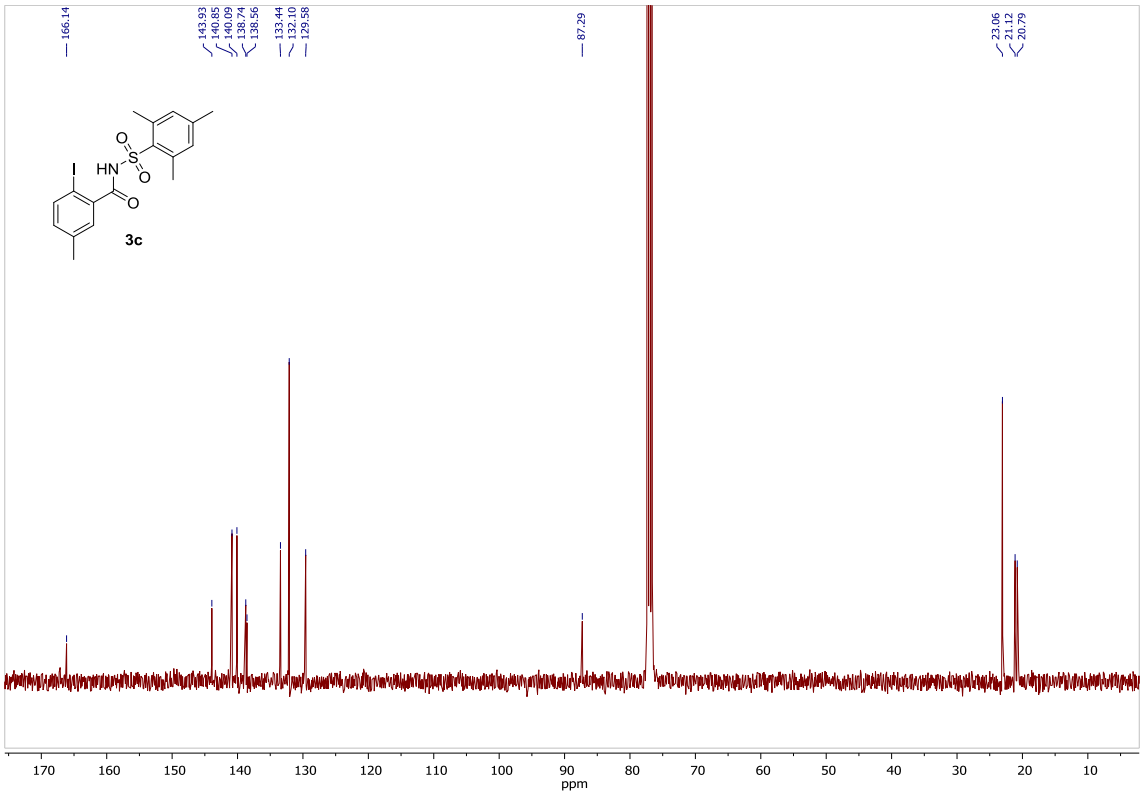
IR of compound **3b**



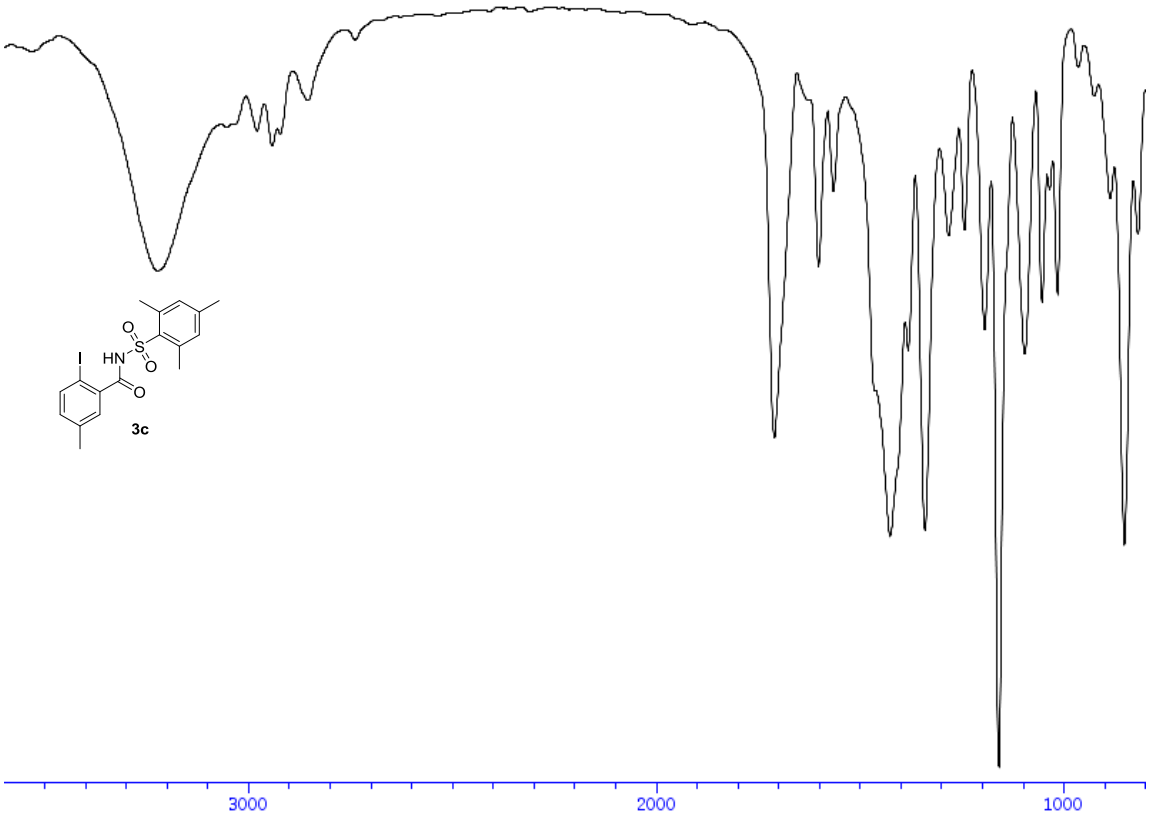
^{1}H-NMR (400 MHz, $CDCl_3$) of compound **3c**



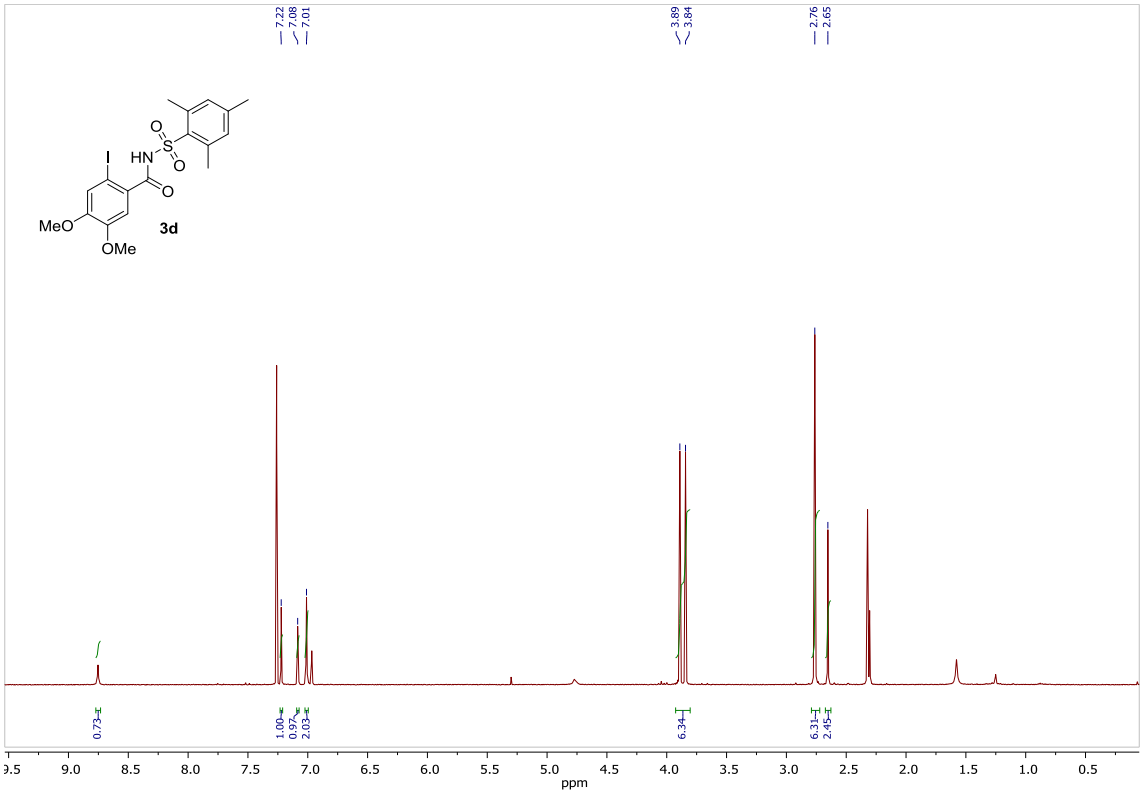
^{13}C-NMR (100 MHz, $CDCl_3$) of compound **3c**



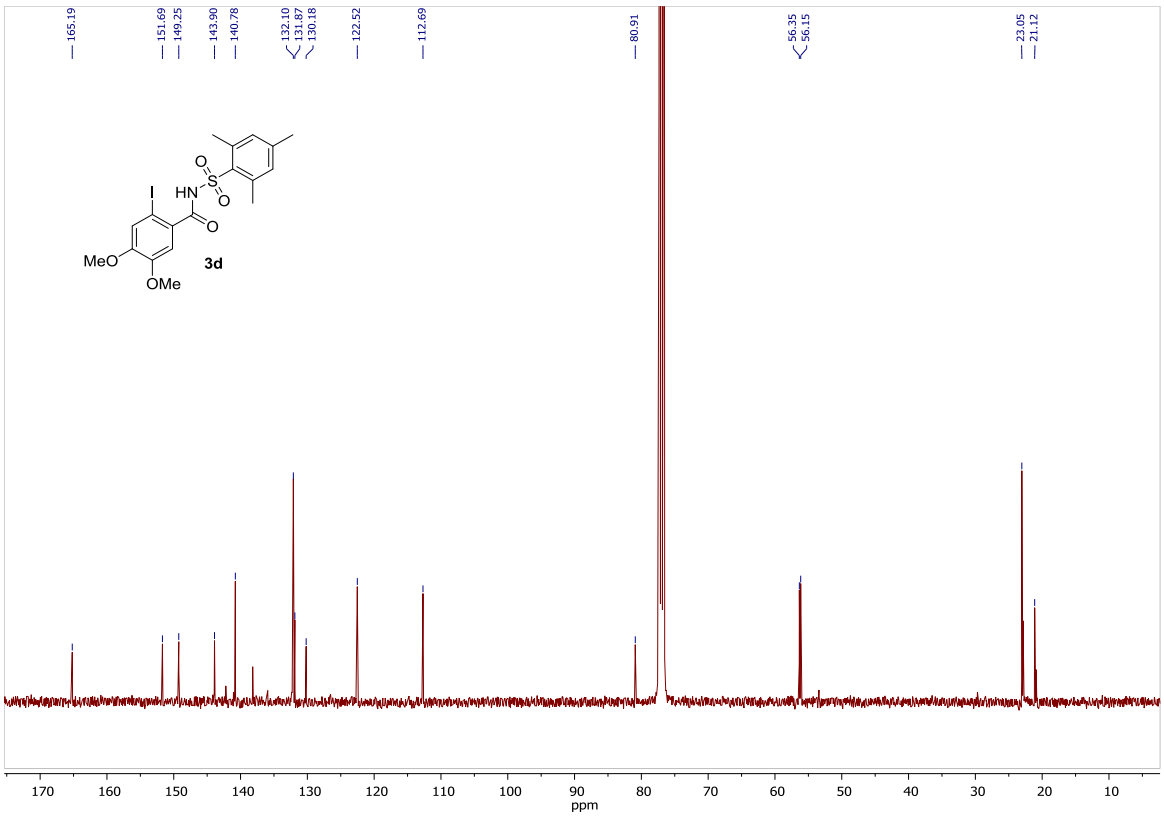
IR of compound **3c**



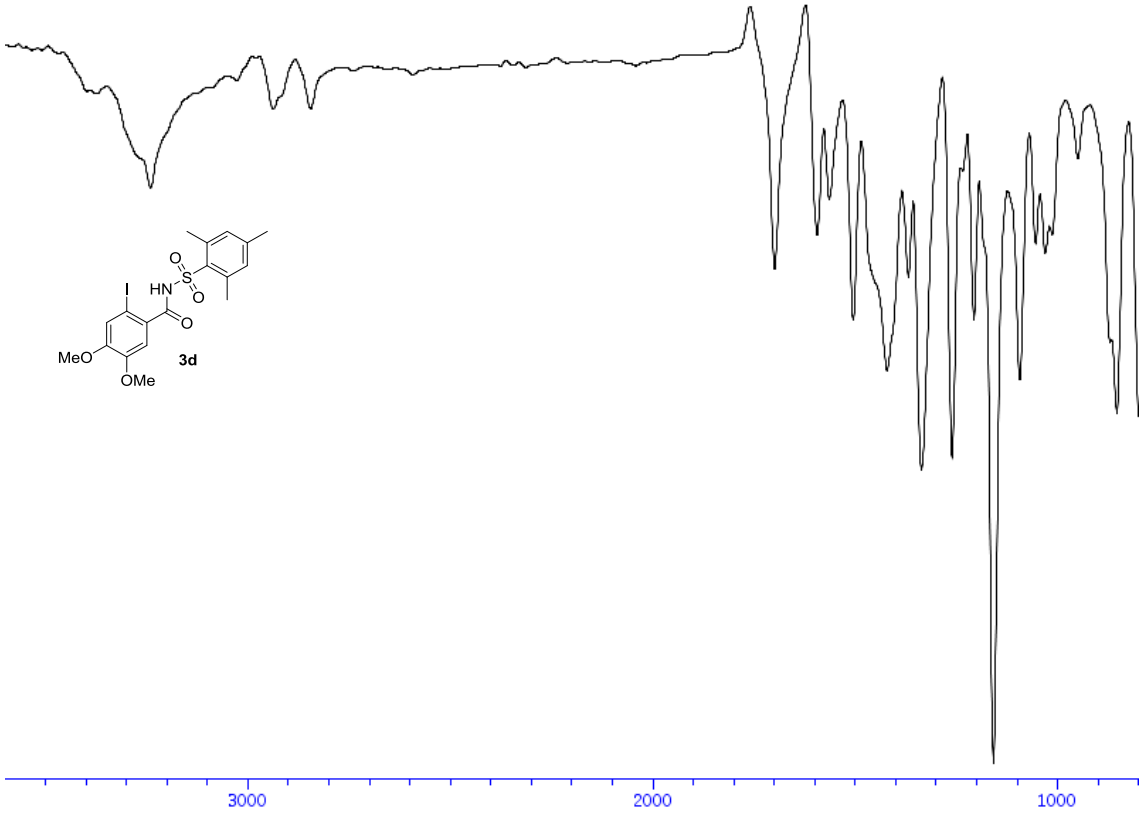
^{1}H-NMR (400 MHz, $CDCl_3$) of compound **3d**



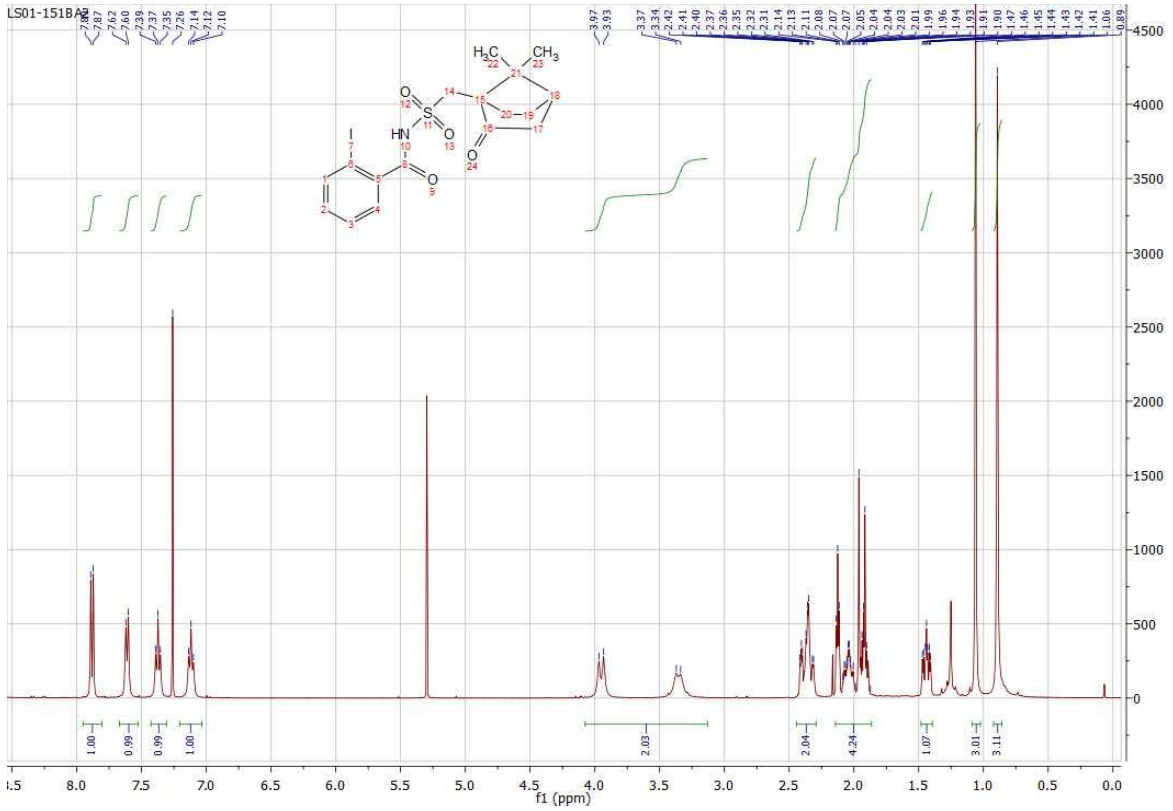
^{13}C-NMR (100 MHz, $CDCl_3$) of compound **3d**



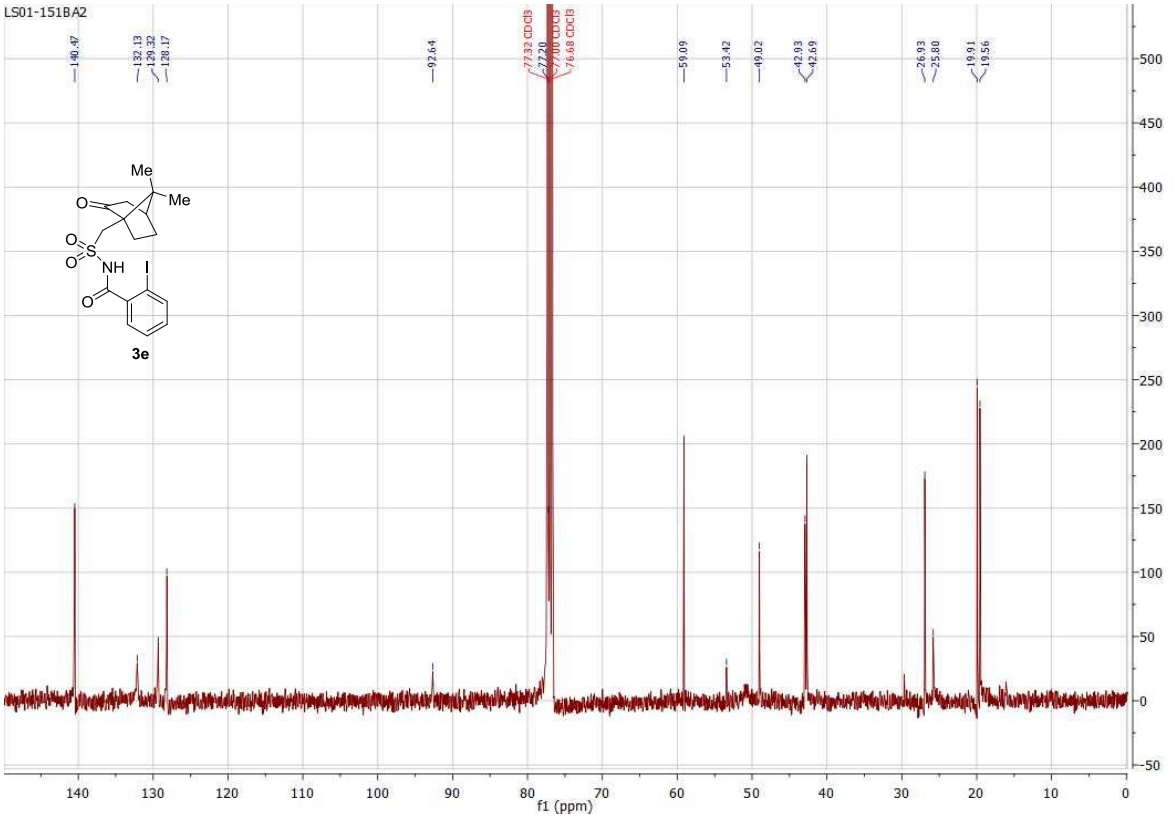
IR of compound **3d**



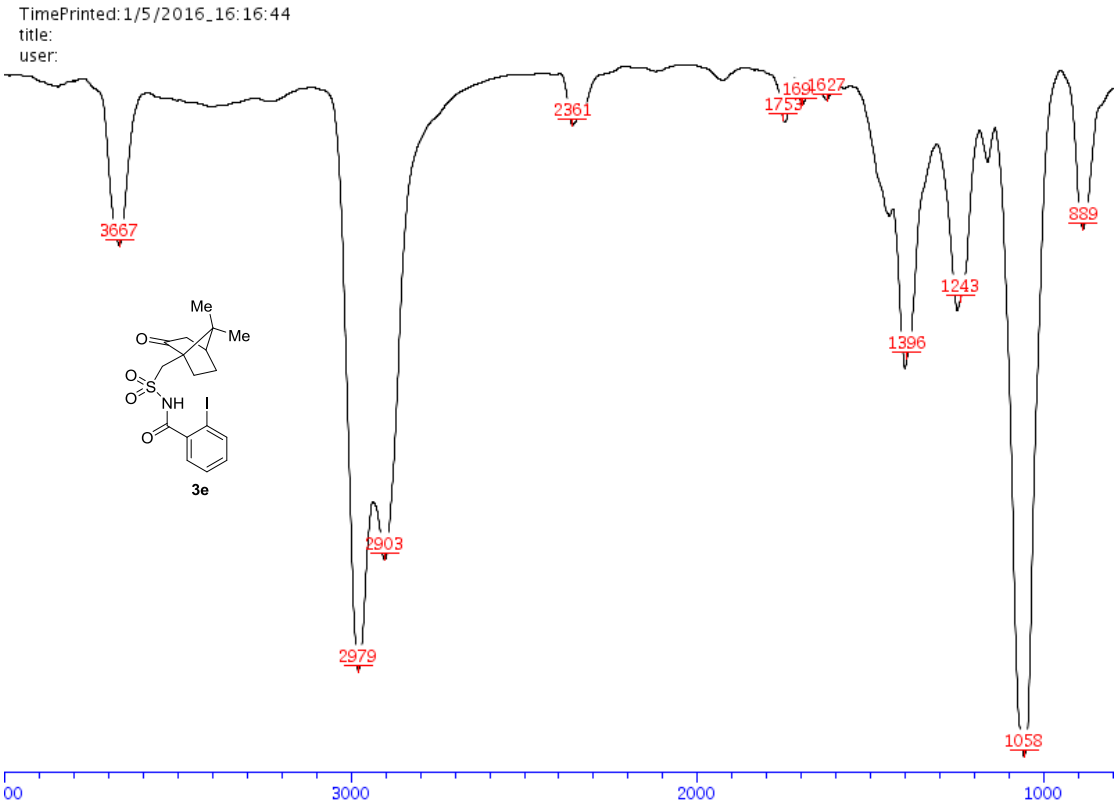
^{1}H-NMR (400 MHz, $CDCl_3$) of compound **3e**



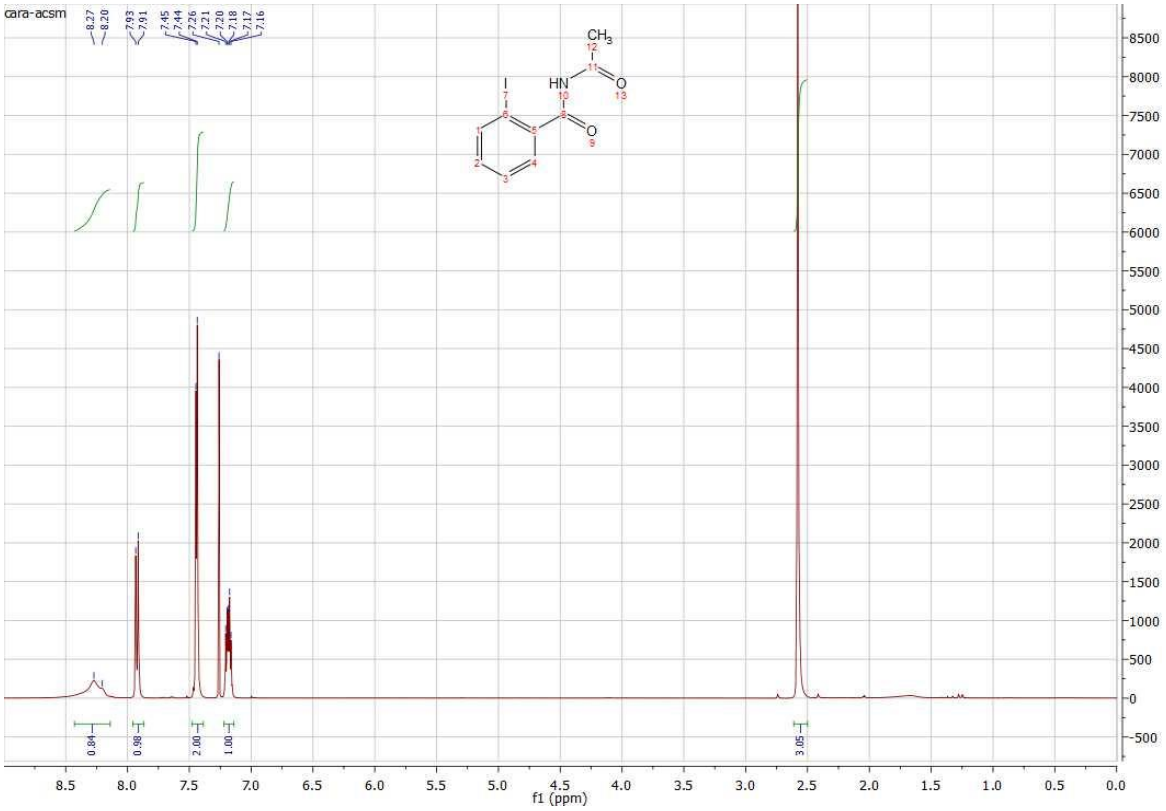
^{13}C-NMR (100 MHz, $CDCl_3$) of compound **3e**



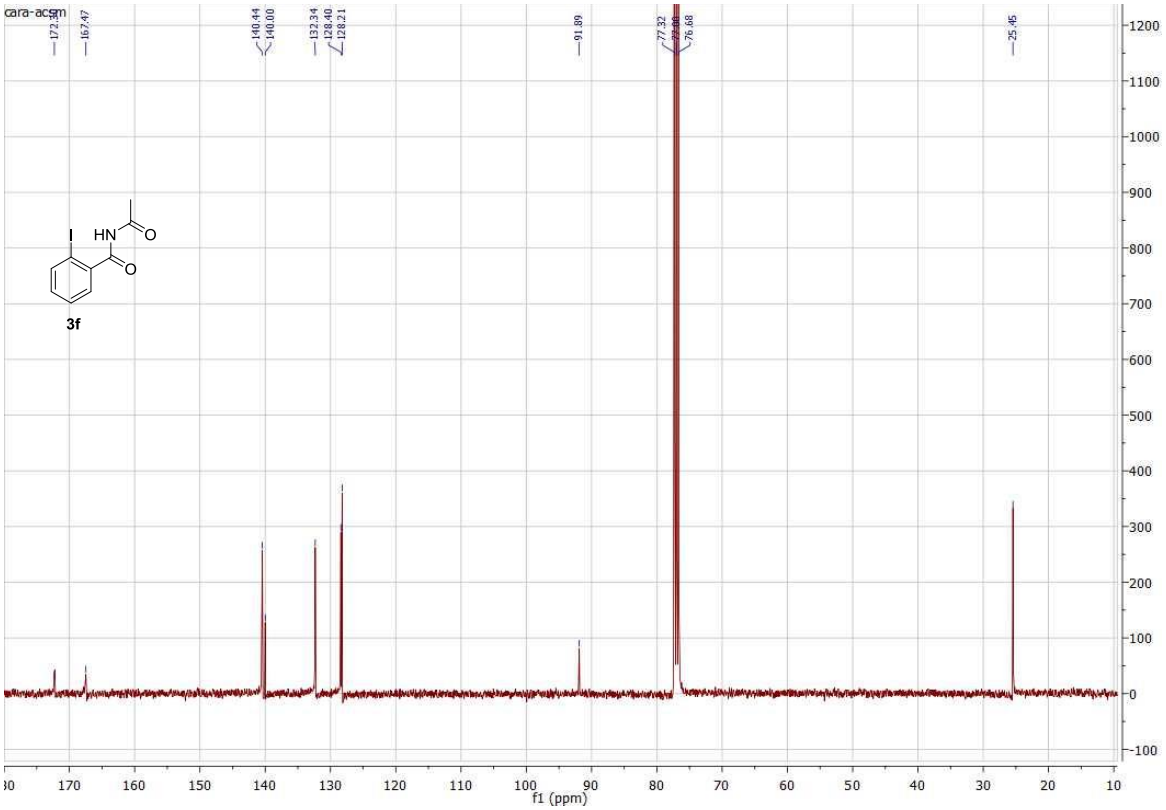
IR of compound **3e**



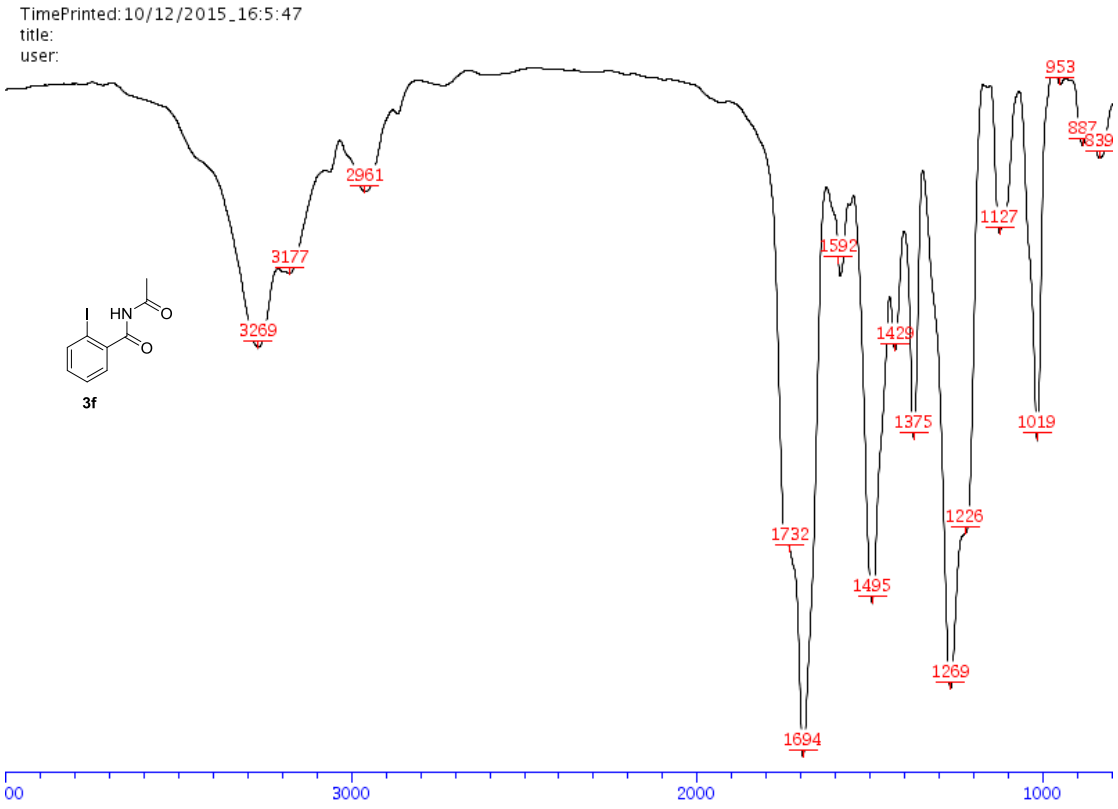
[1]H-NMR (400 MHz, $CDCl_3$) of compound **3f**



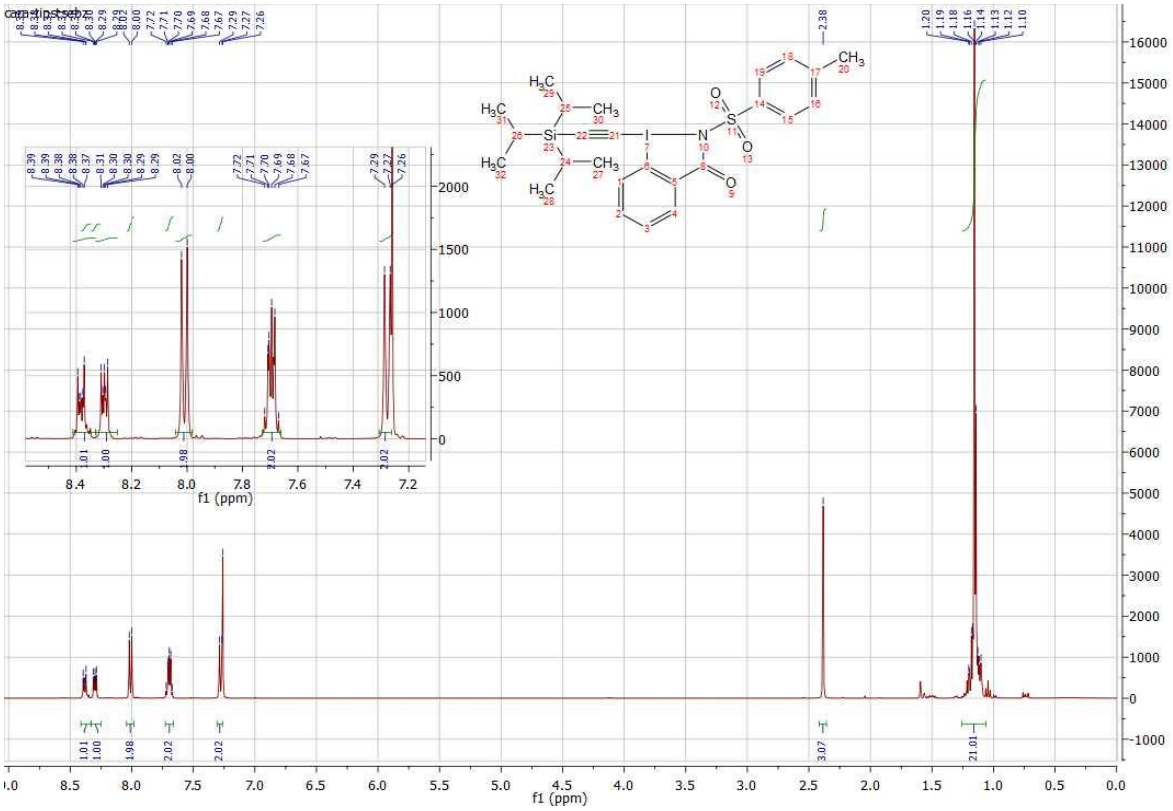
[13]C-NMR (100 MHz, $CDCl_3$) of compound **3f**



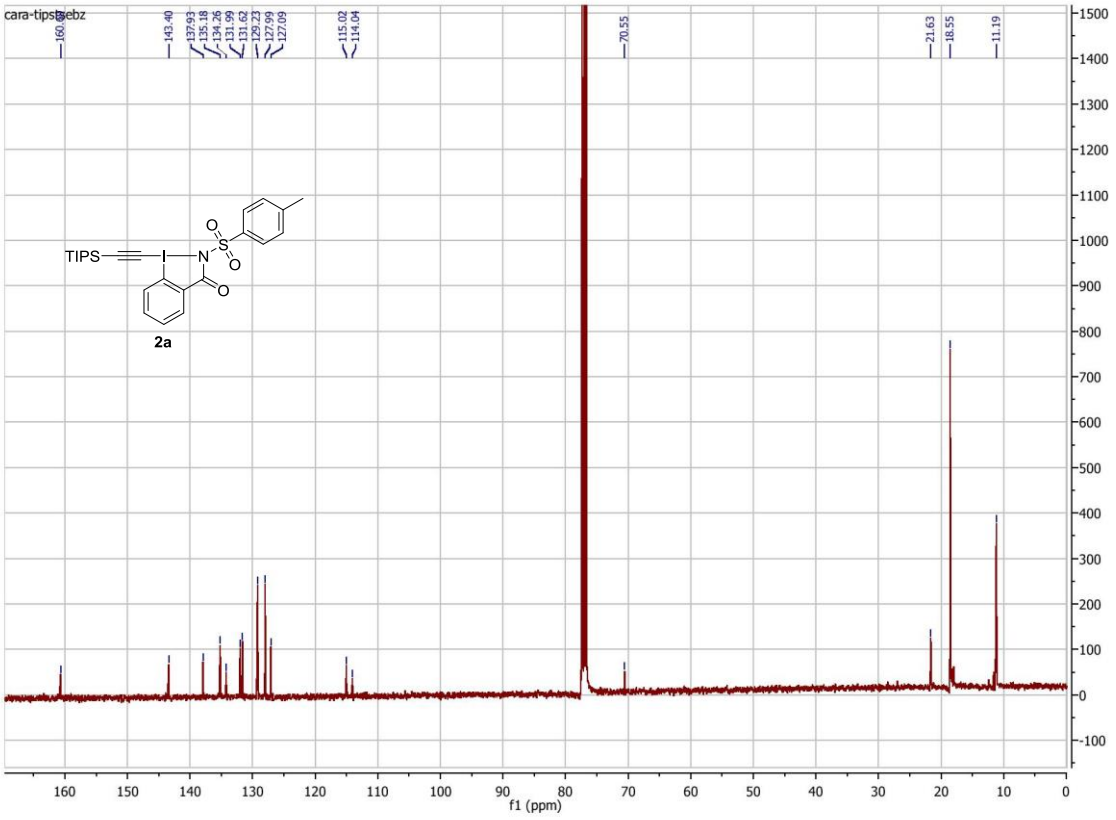
IR of compound **3f**



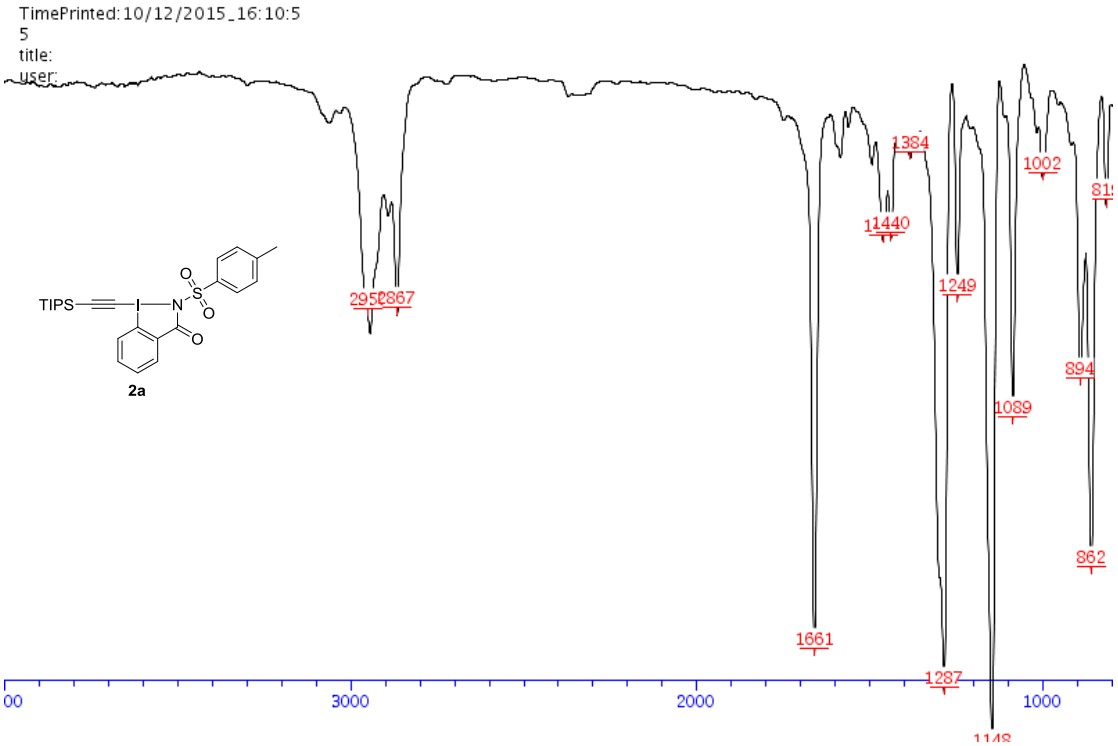
^{1}H-NMR (400 MHz, $CDCl_3$) of compound **2a**



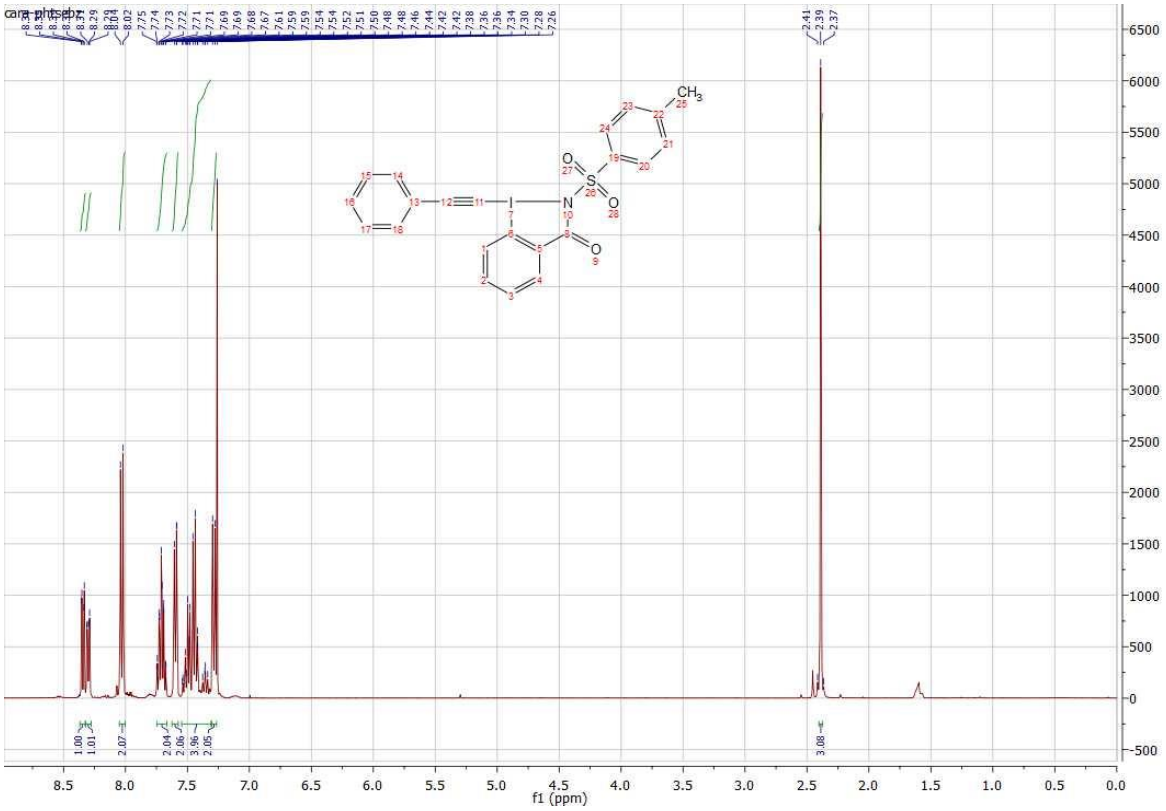
^{13}C-NMR (100 MHz, $CDCl_3$) of compound **2a**



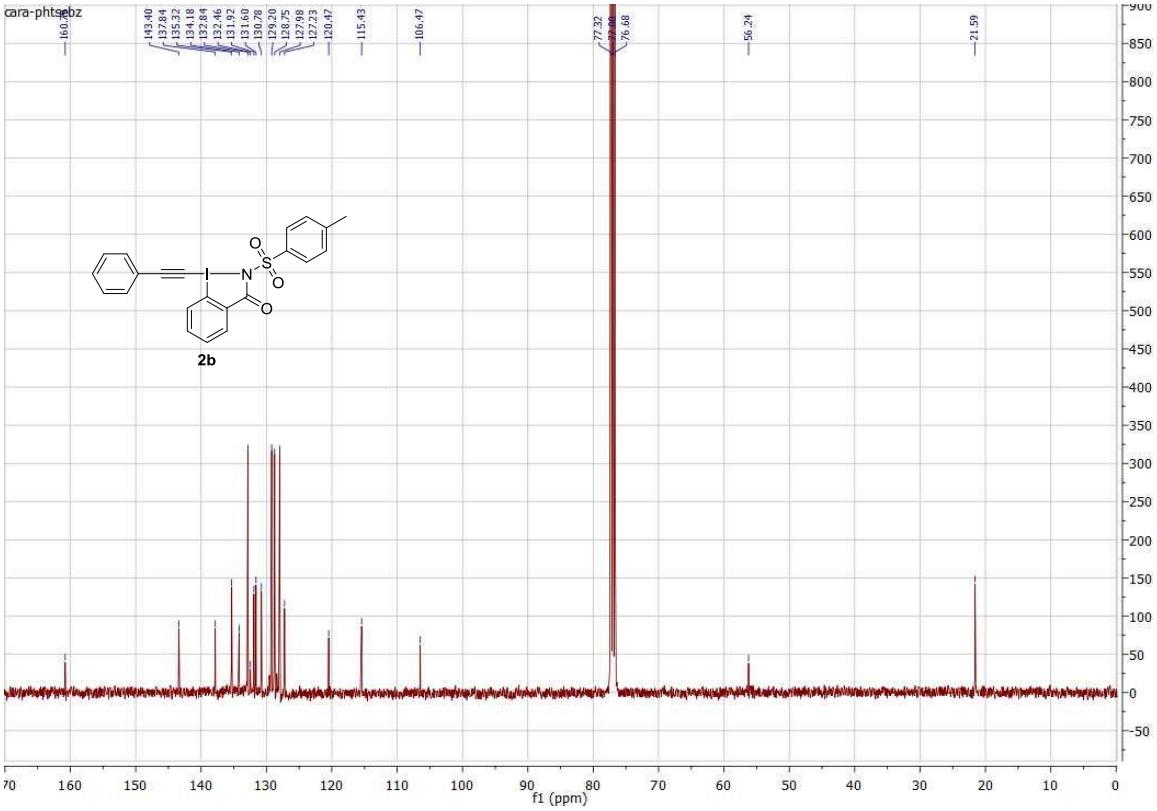
IR of compound **2a**



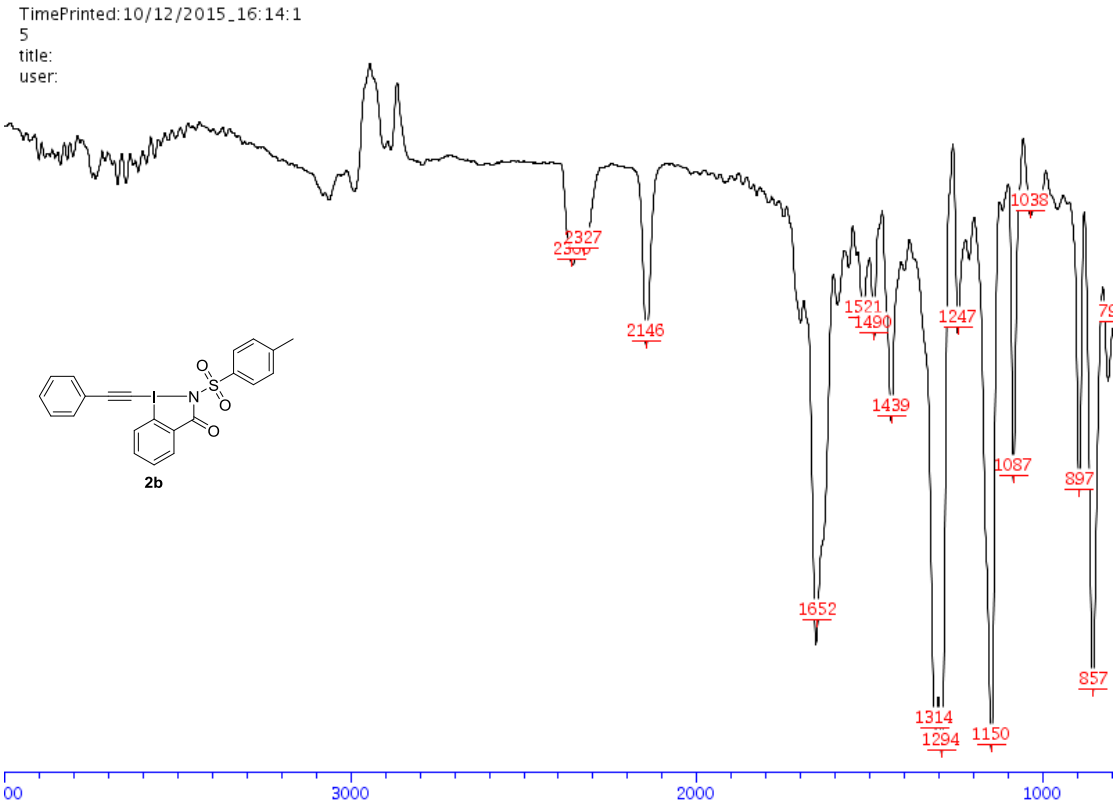
^{1}H-NMR (400 MHz, $CDCl_3$) of compound **2b**



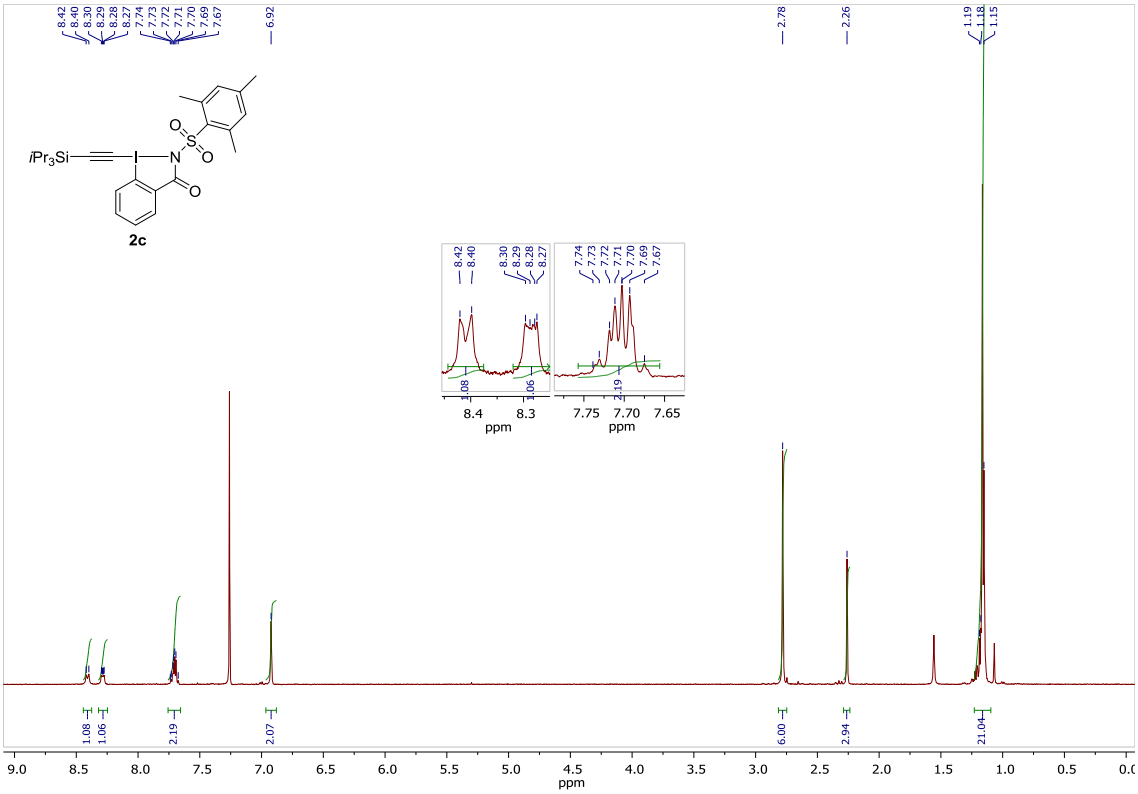
^{13}C-NMR (100 MHz, $CDCl_3$) of compound **2b**



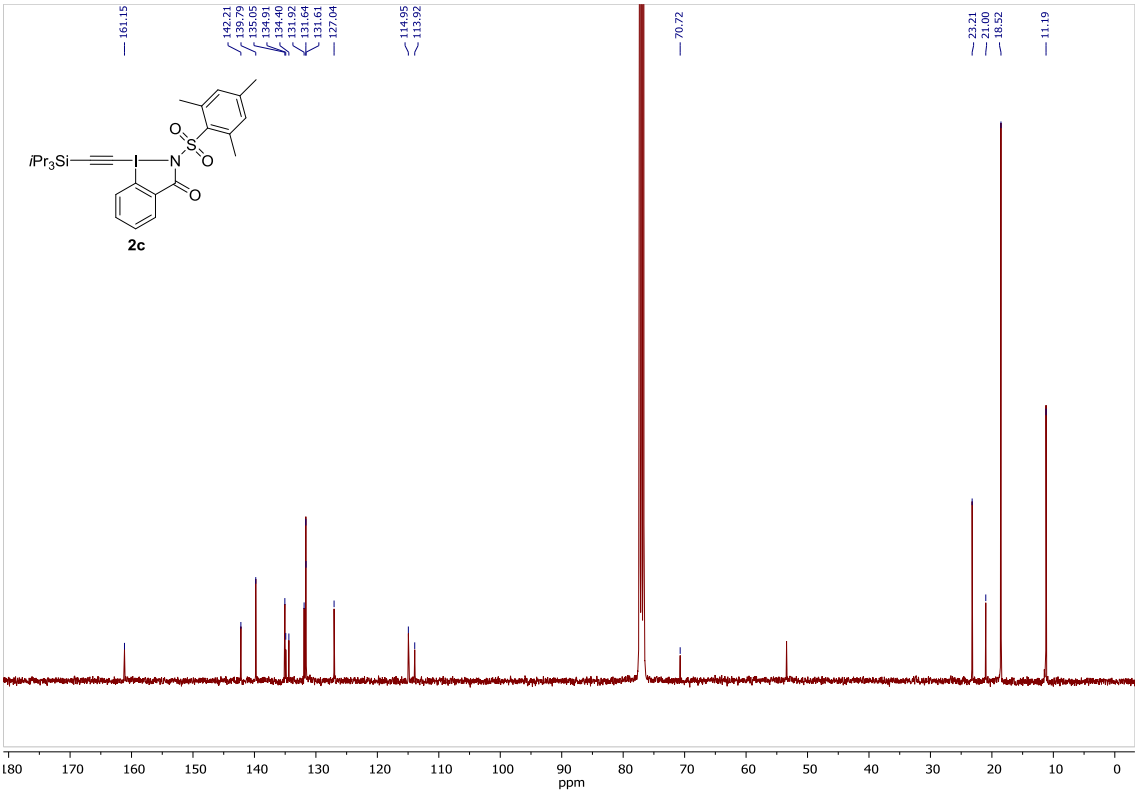
IR of compound **2b**



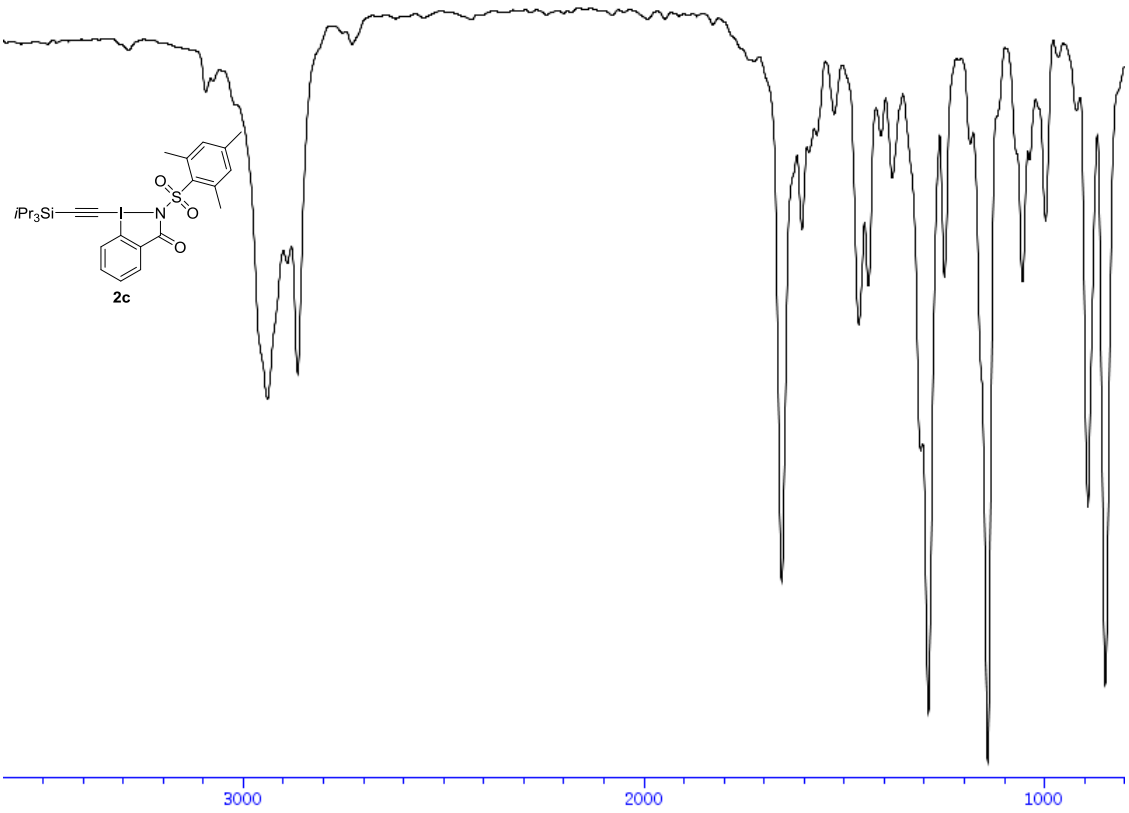
^{1}H-NMR (400 MHz, $CDCl_3$) of compound **2c**



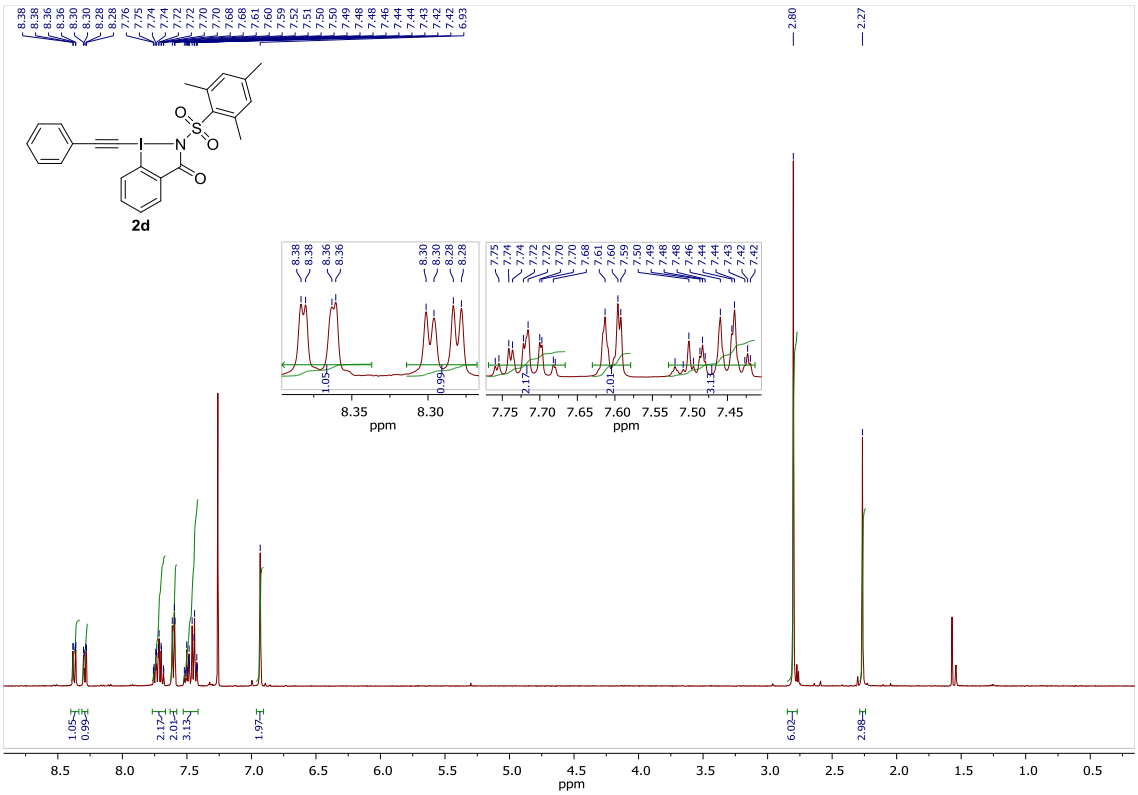
^{13}C-NMR (100 MHz, $CDCl_3$) of compound **2c**



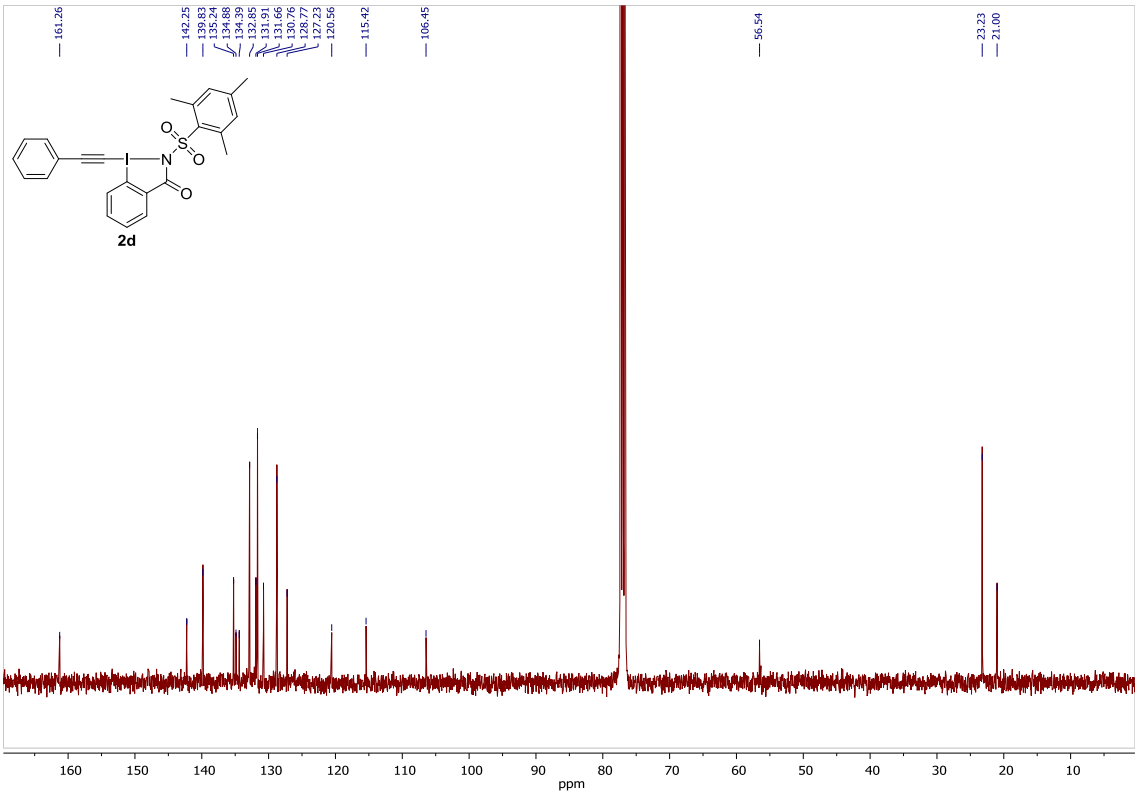
IR of compound **2c**



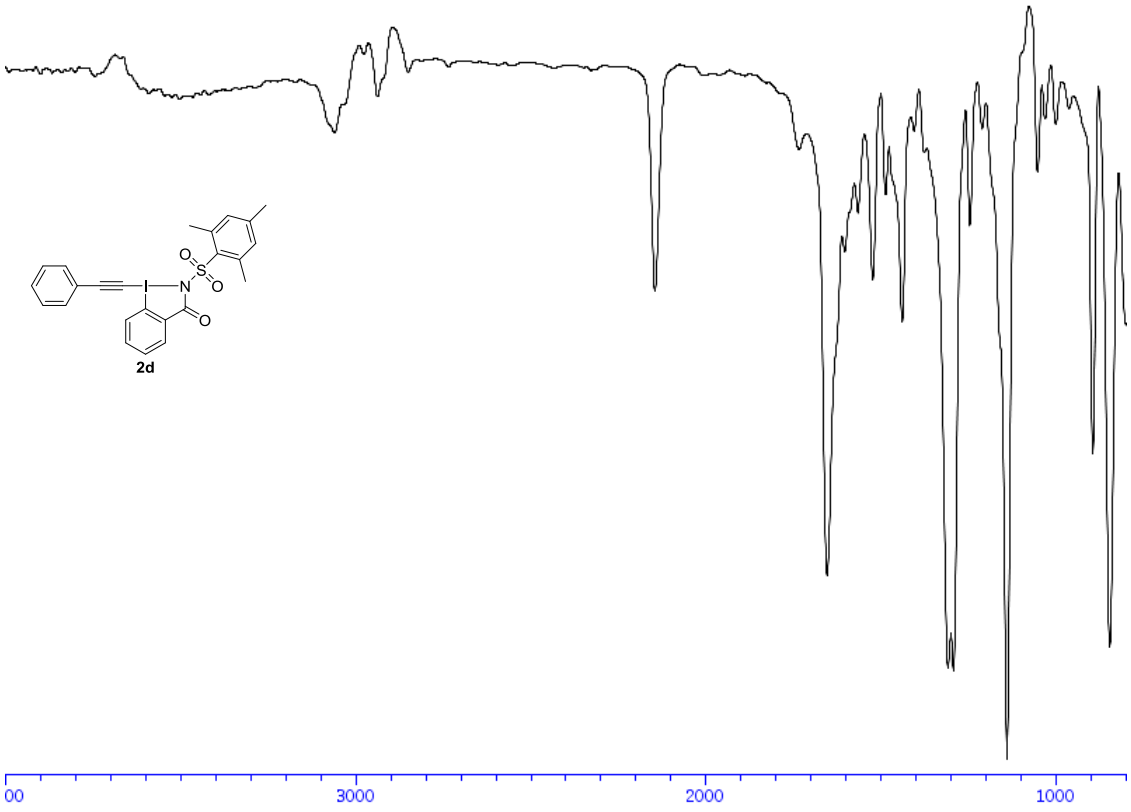
^{1}H-NMR (400 MHz, $CDCl_3$) of compound **2d**



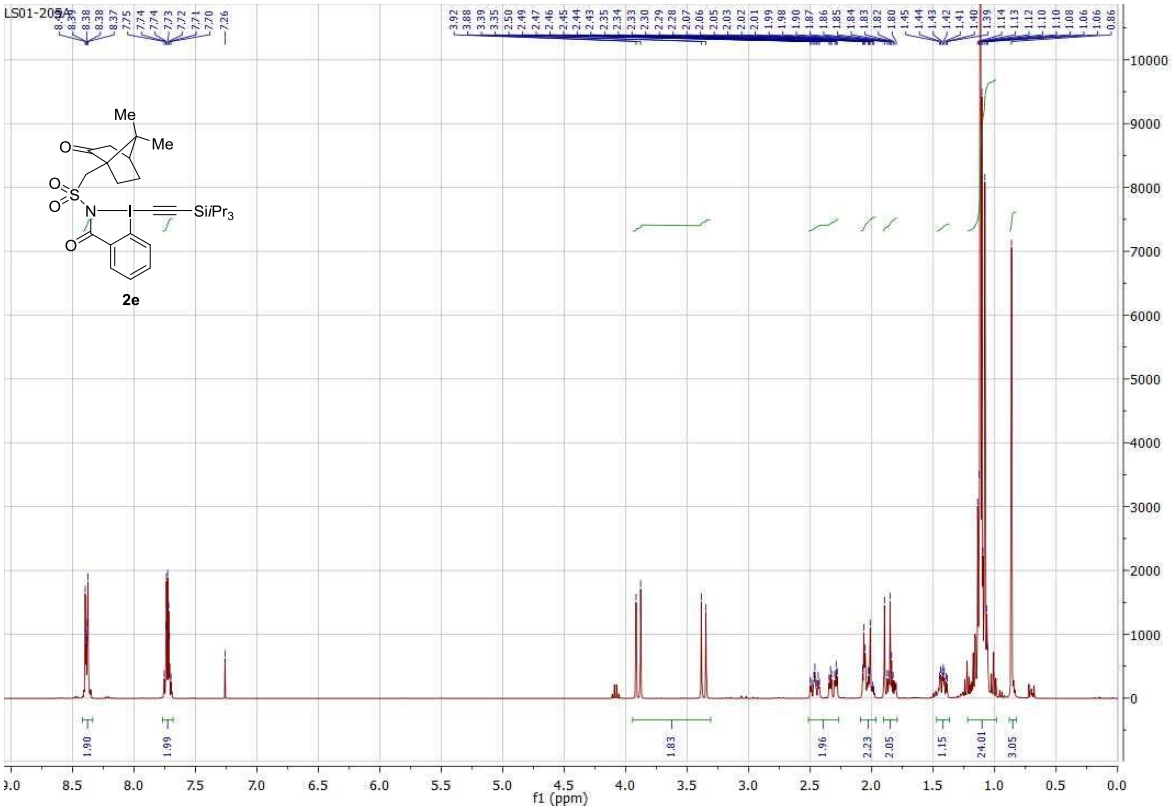
^{13}C-NMR (100 MHz, $CDCl_3$) of compound **2d**



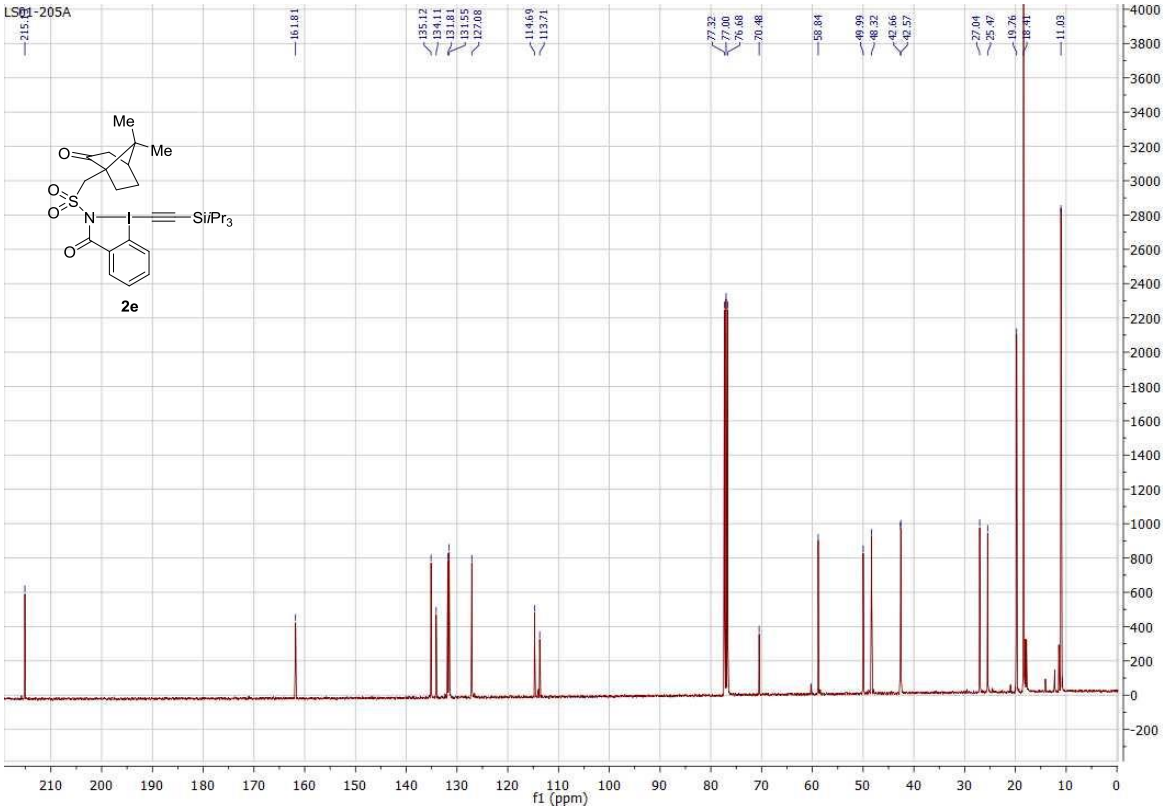
IR of compound **2d**



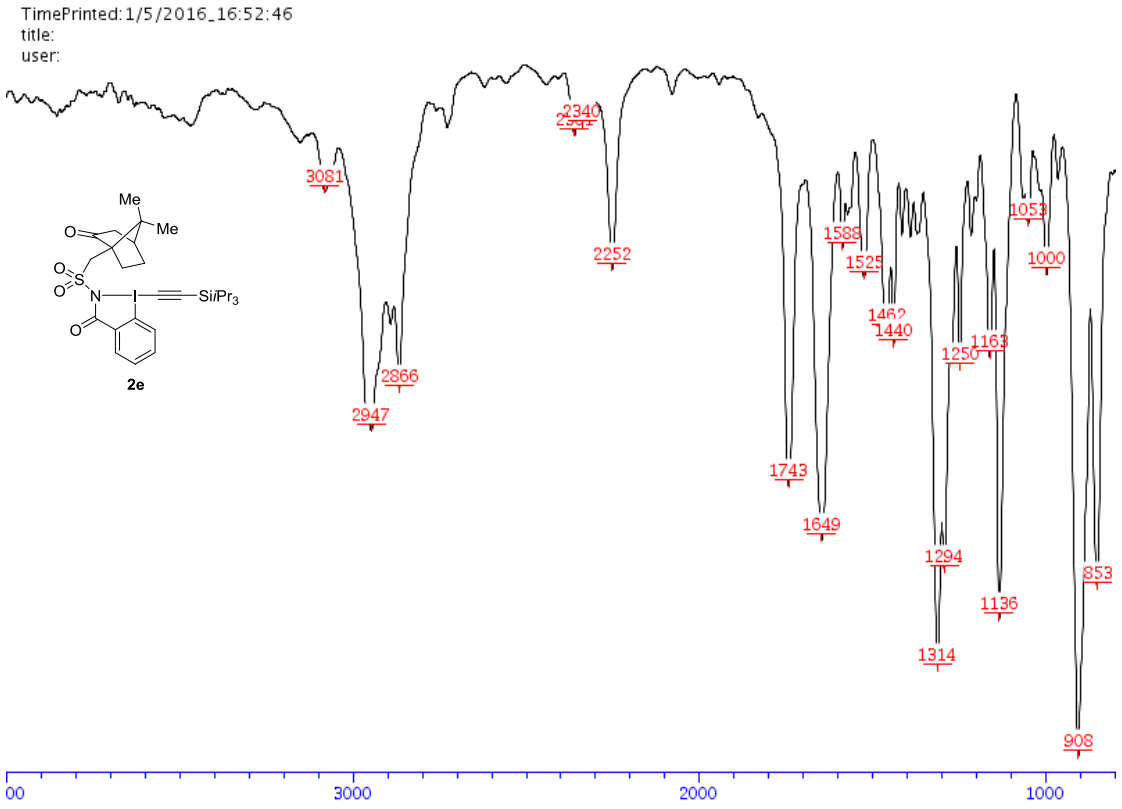
^{1}H-NMR (400 MHz, $CDCl_3$) of compound **2e**



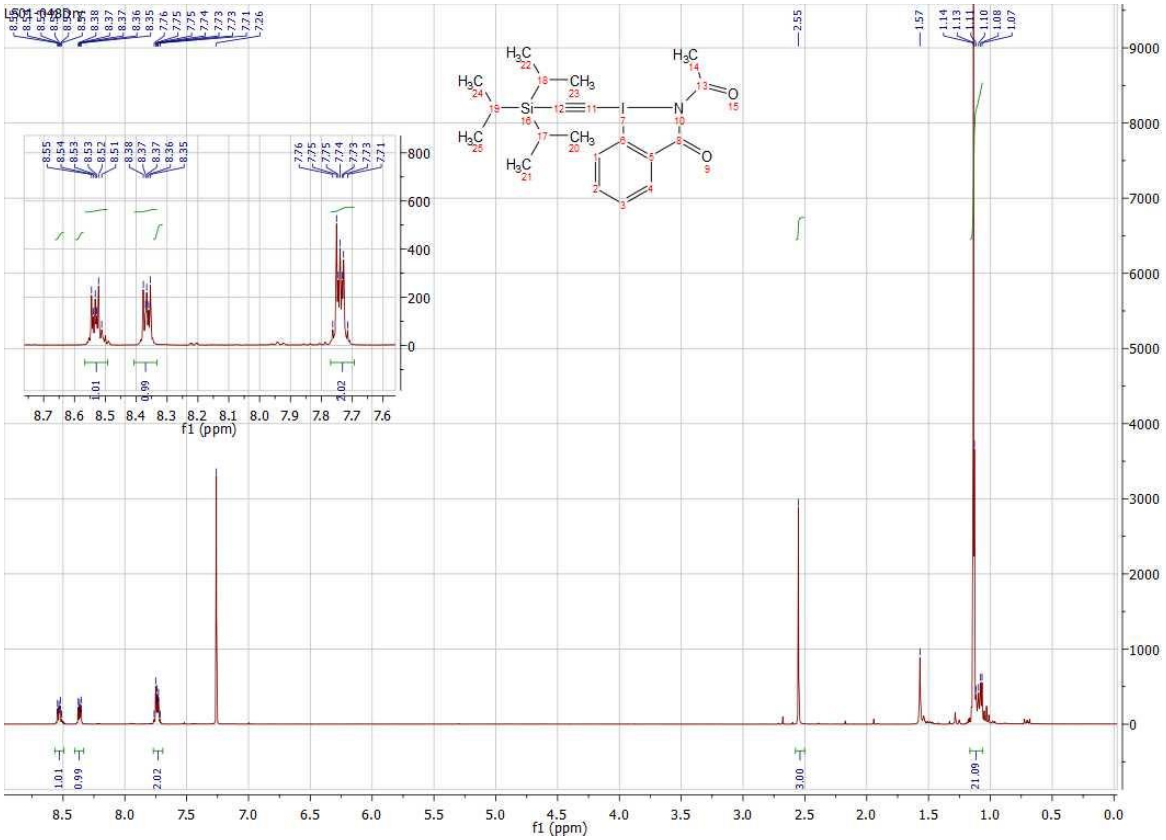
^{13}C-NMR (100 MHz, $CDCl_3$) of compound **2e**



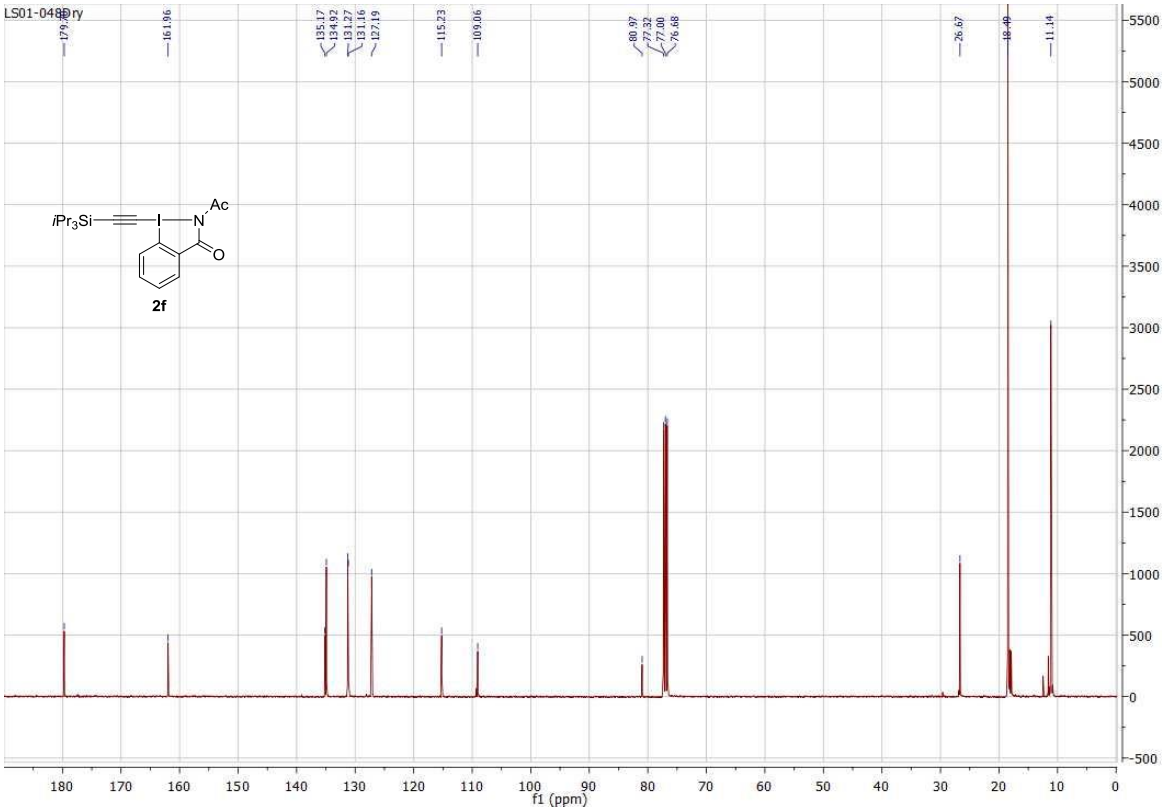
IR of compound **2e**



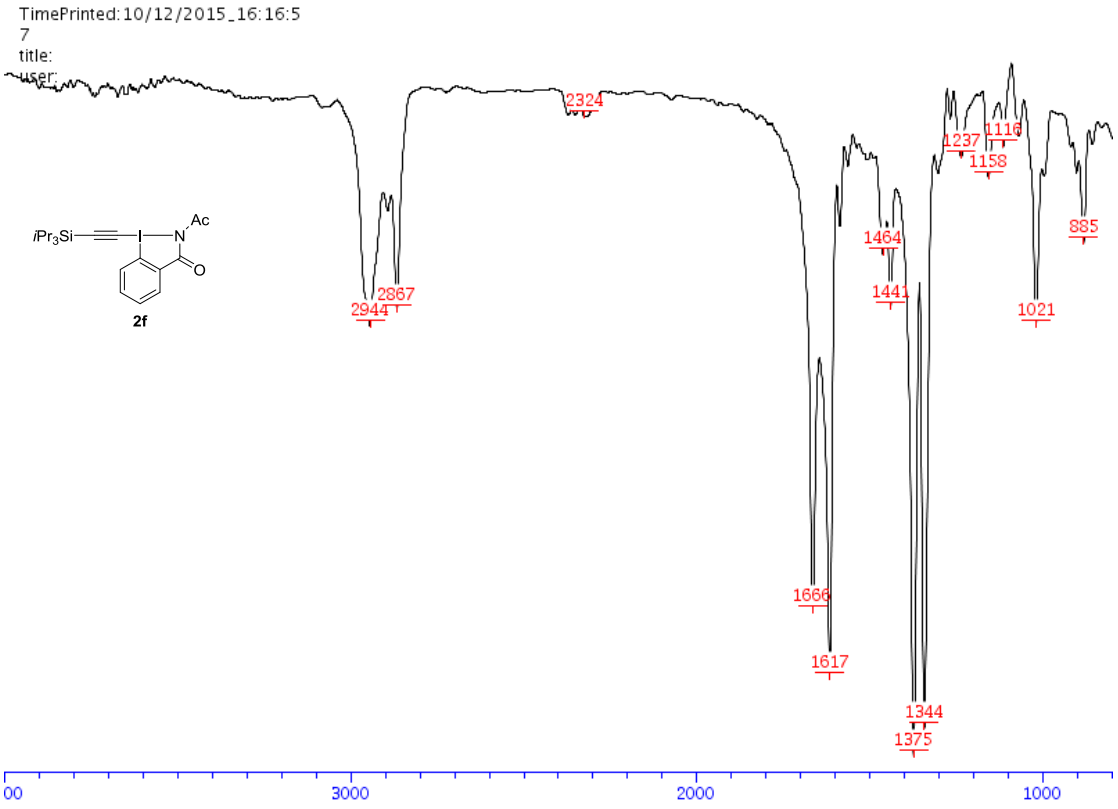
^{1}H-NMR (400 MHz, $CDCl_3$) of compound **2f**



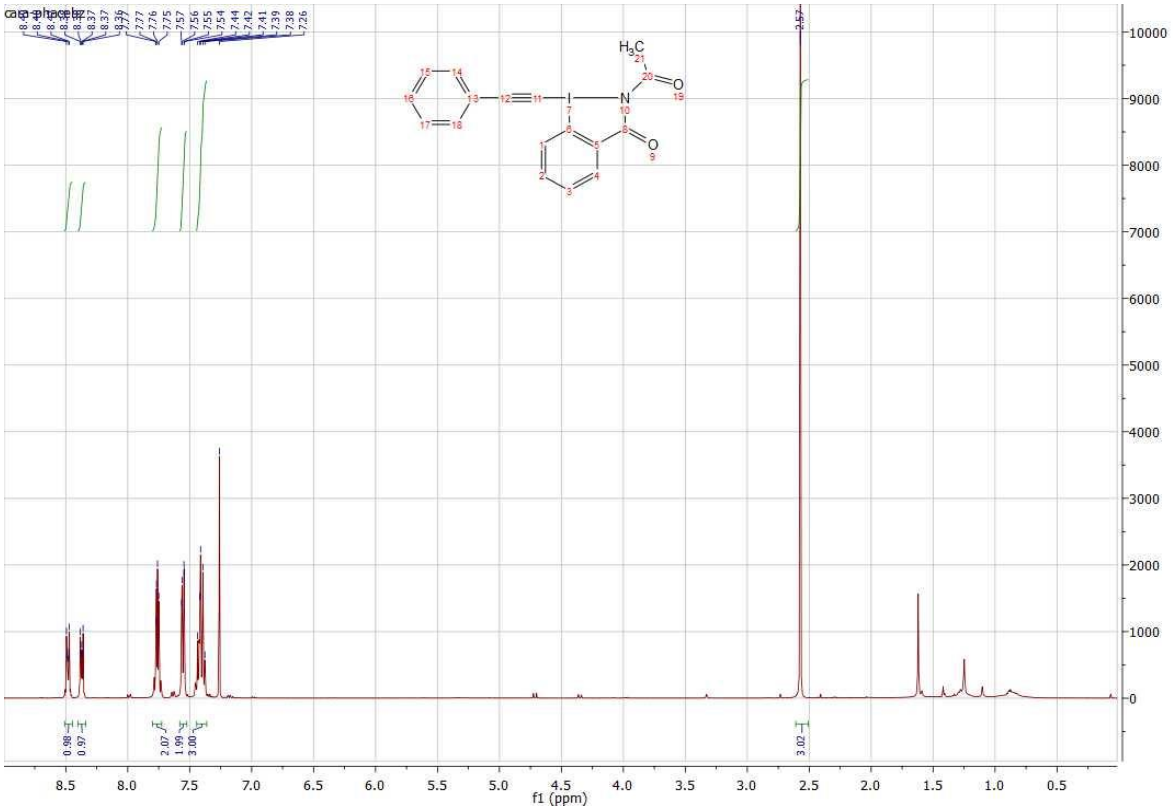
^{13}C-NMR (100 MHz, $CDCl_3$) of compound **2f**



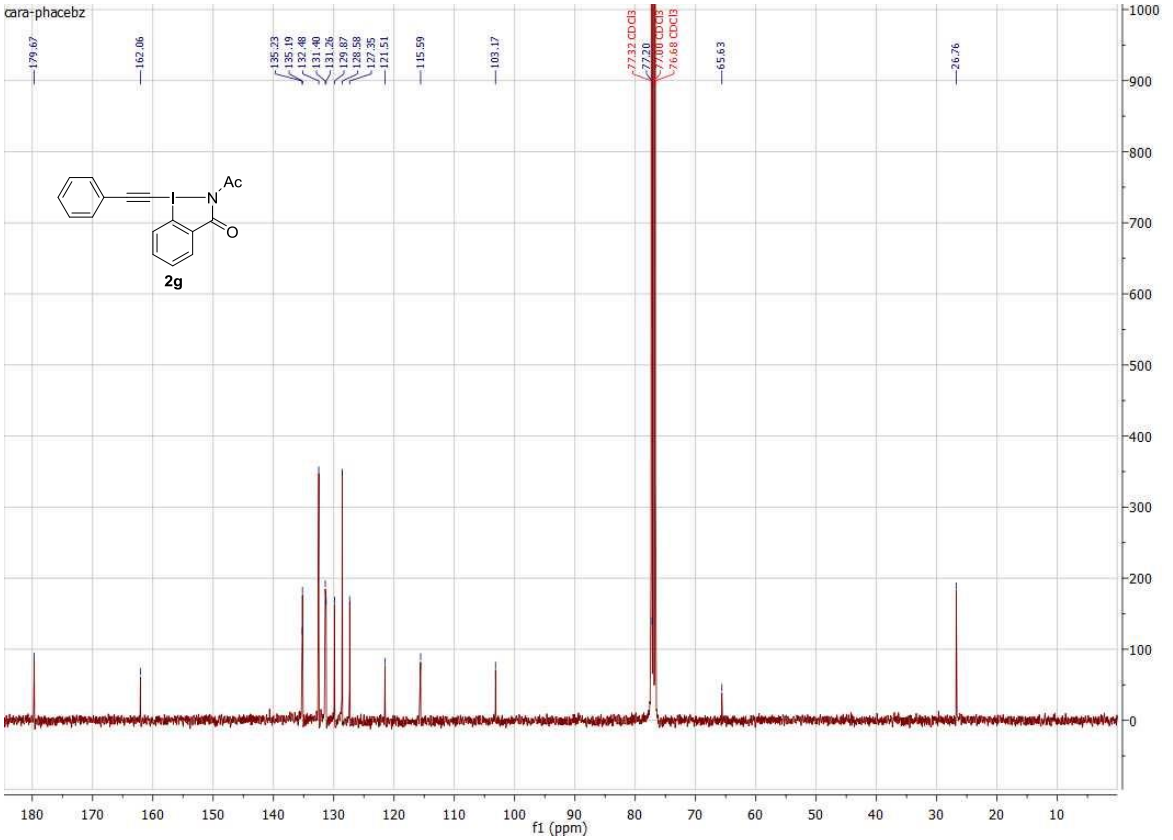
IR of compound **2f**



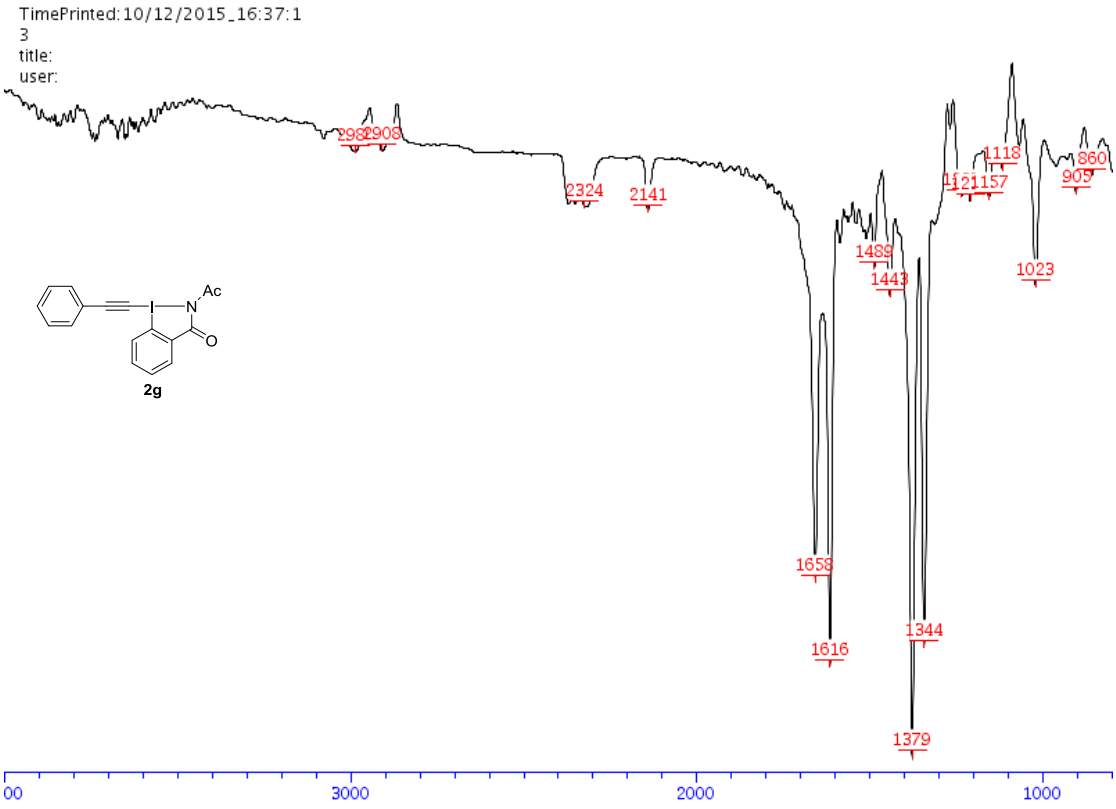
^{1}H-NMR (400 MHz, $CDCl_3$) of compound **2g**



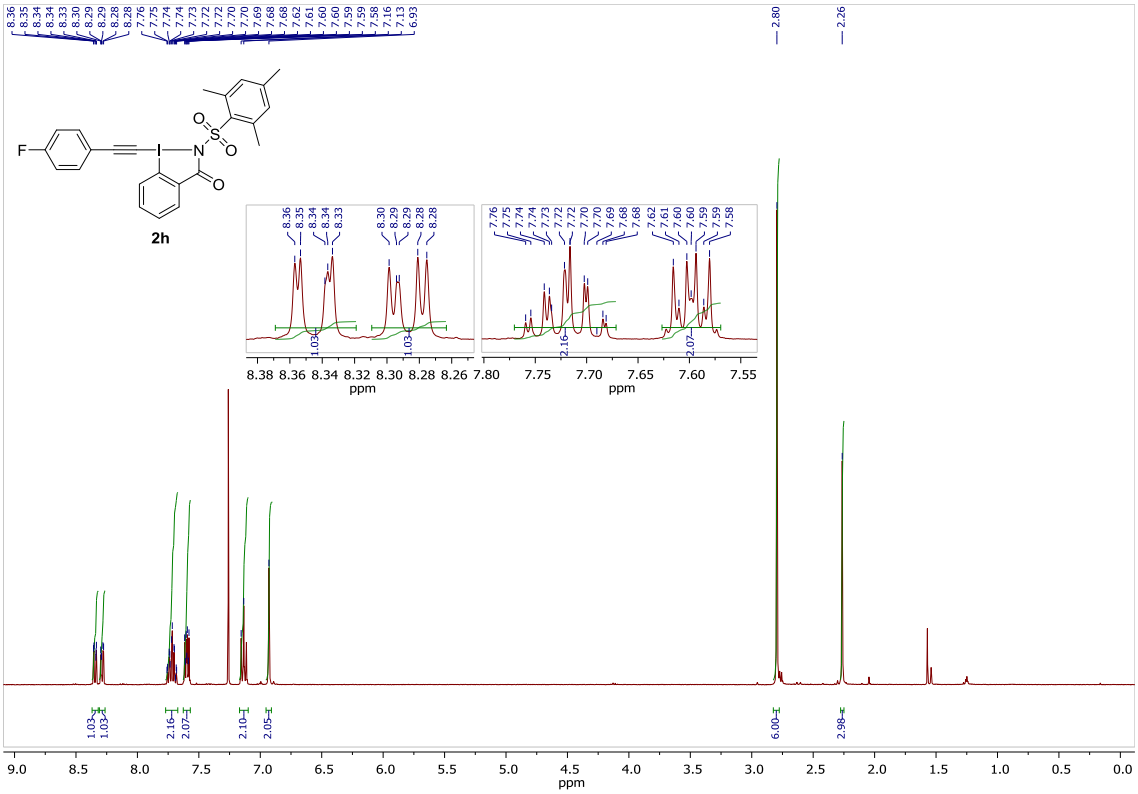
^{13}C-NMR (100 MHz, $CDCl_3$) of compound **2g**



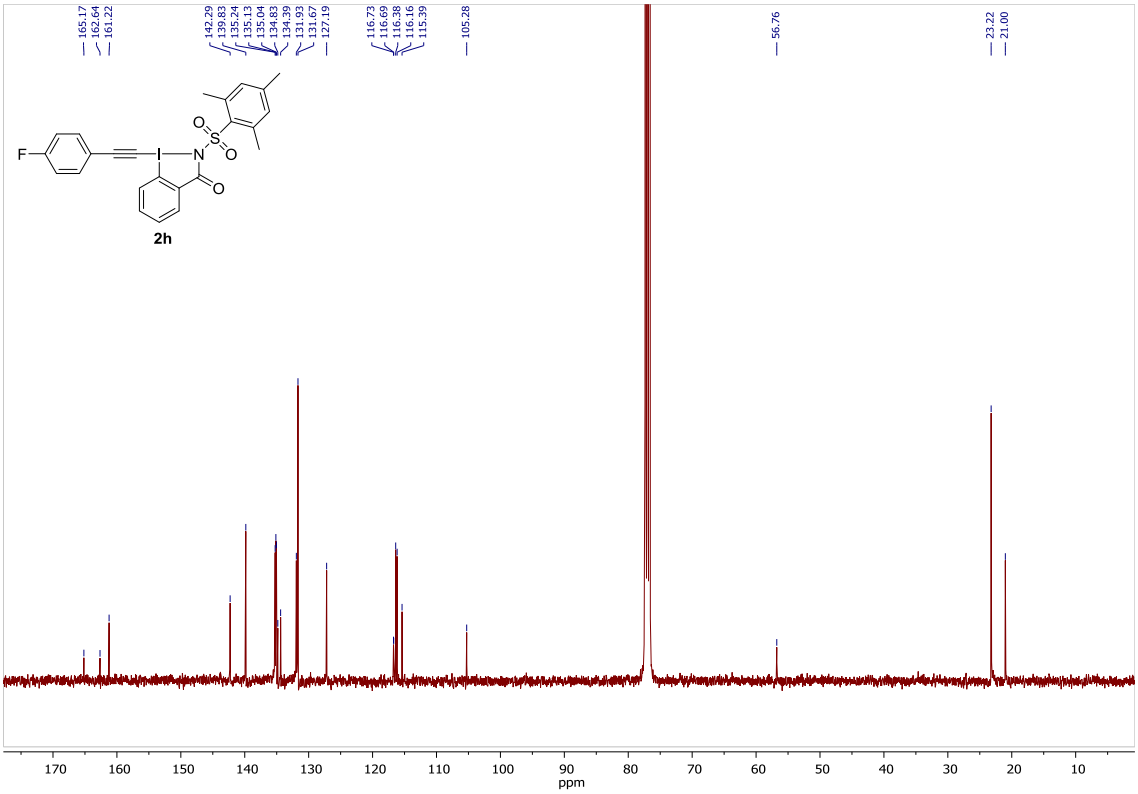
IR of compound **2g**



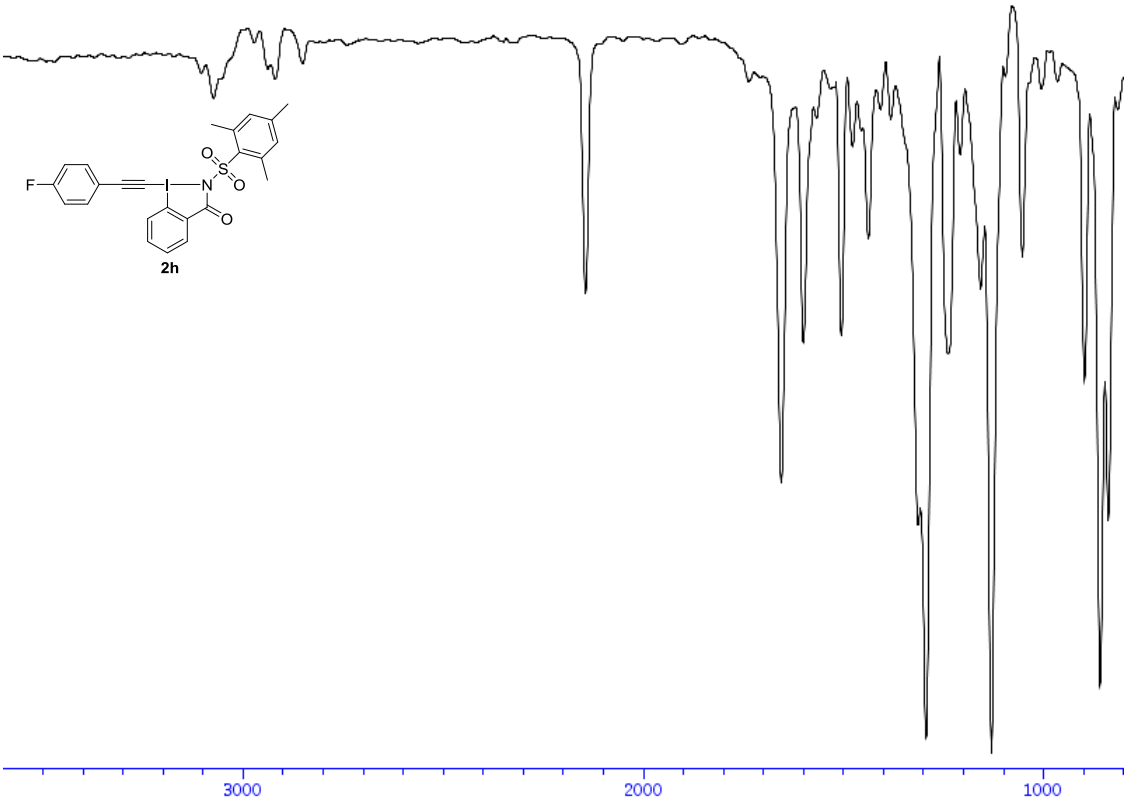
^{1}H-NMR (400 MHz, $CDCl_3$) of compound **2h**



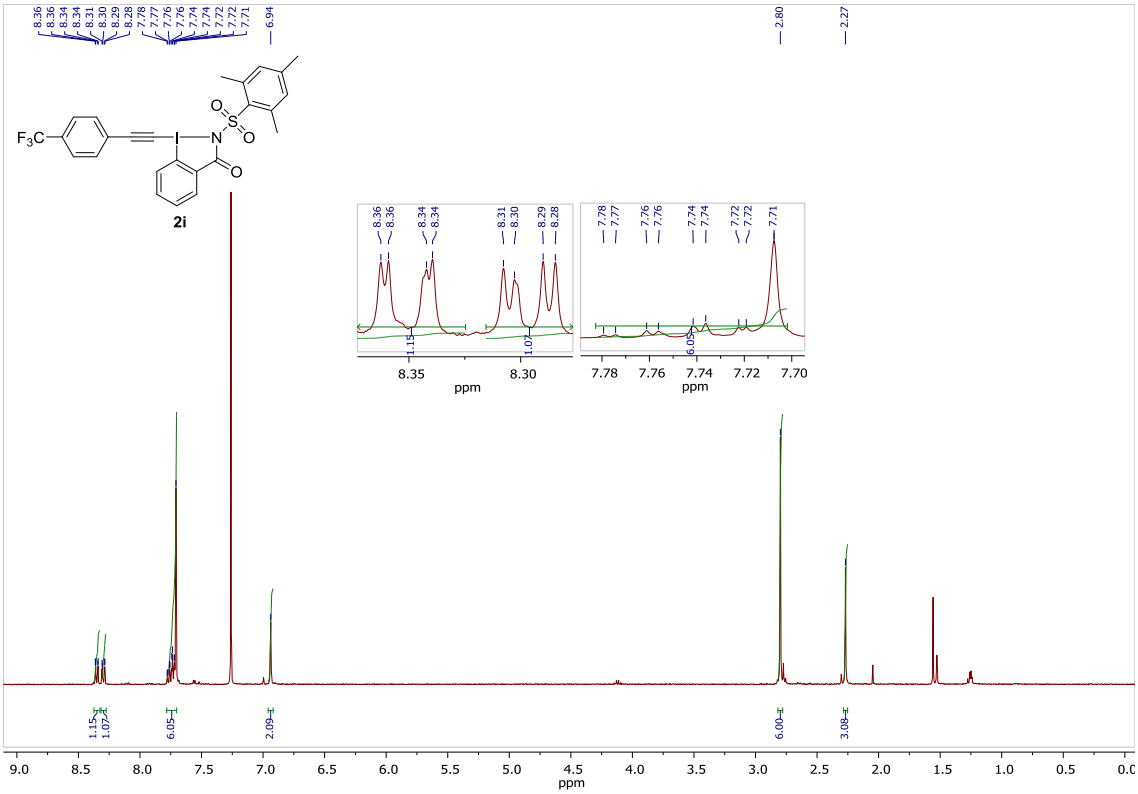
^{13}C-NMR (100 MHz, $CDCl_3$) of compound **2h**



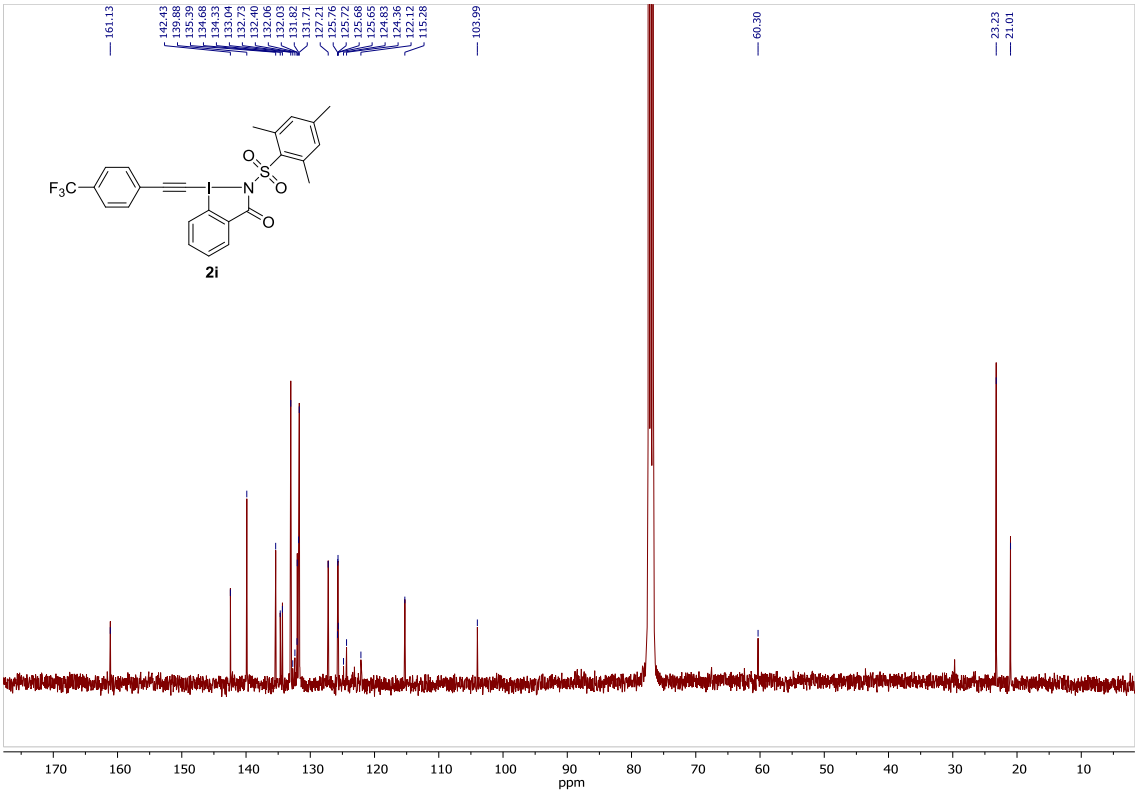
IR of compound **2h**



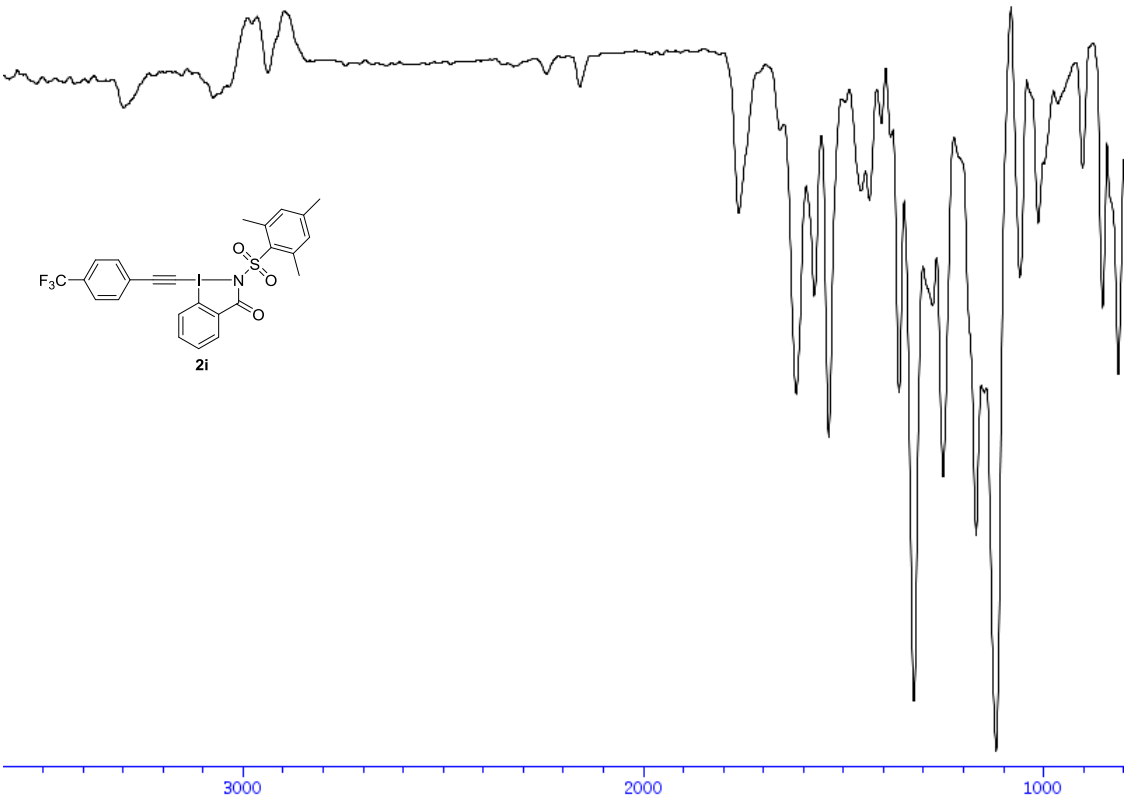
^{1}H-NMR (400 MHz, $CDCl_3$) of compound **2i**



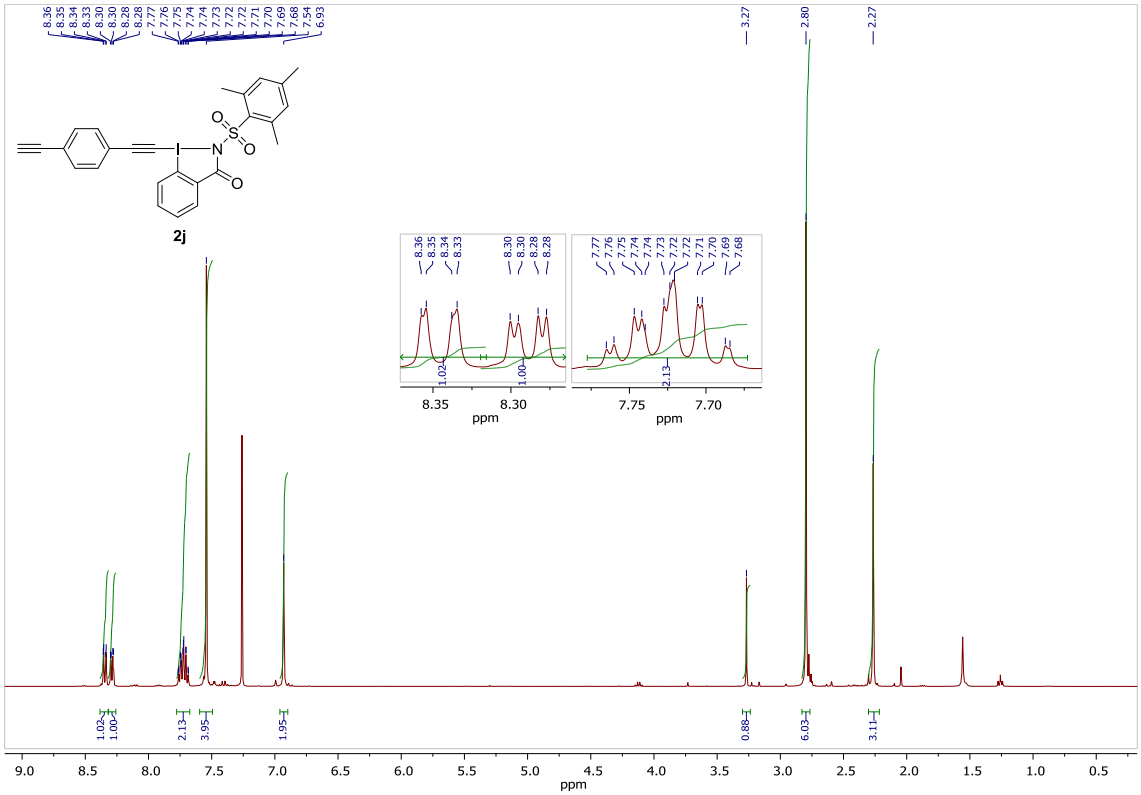
^{13}C-NMR (100 MHz, $CDCl_3$) of compound **2i**



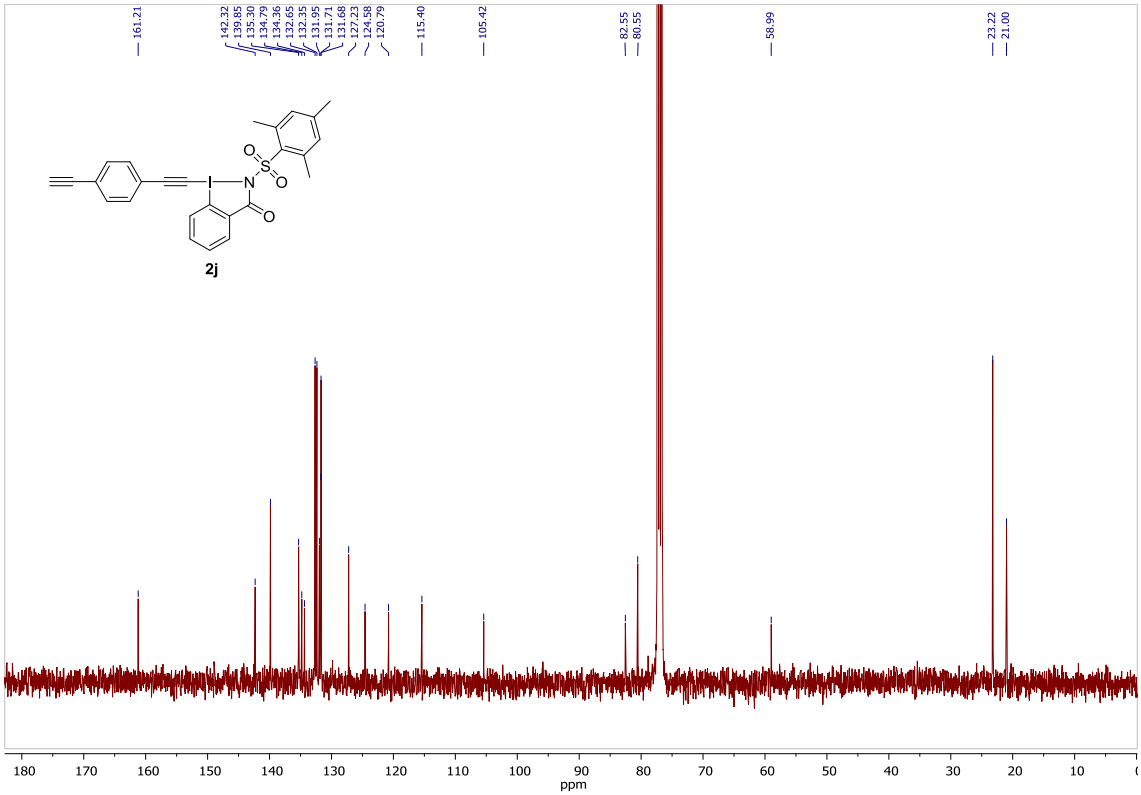
IR of compound **2i**



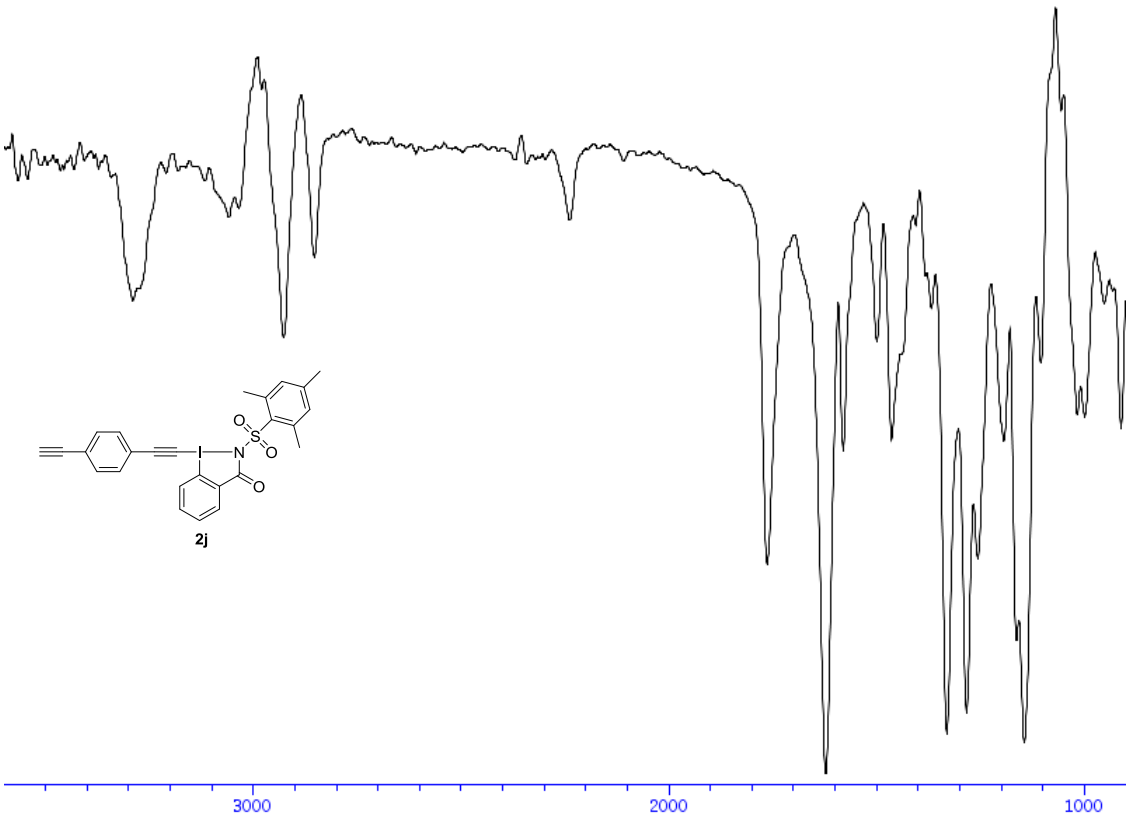
^{1}H-NMR (400 MHz, $CDCl_3$) of compound **2j**



^{13}C-NMR (100 MHz, $CDCl_3$) of compound **2j**

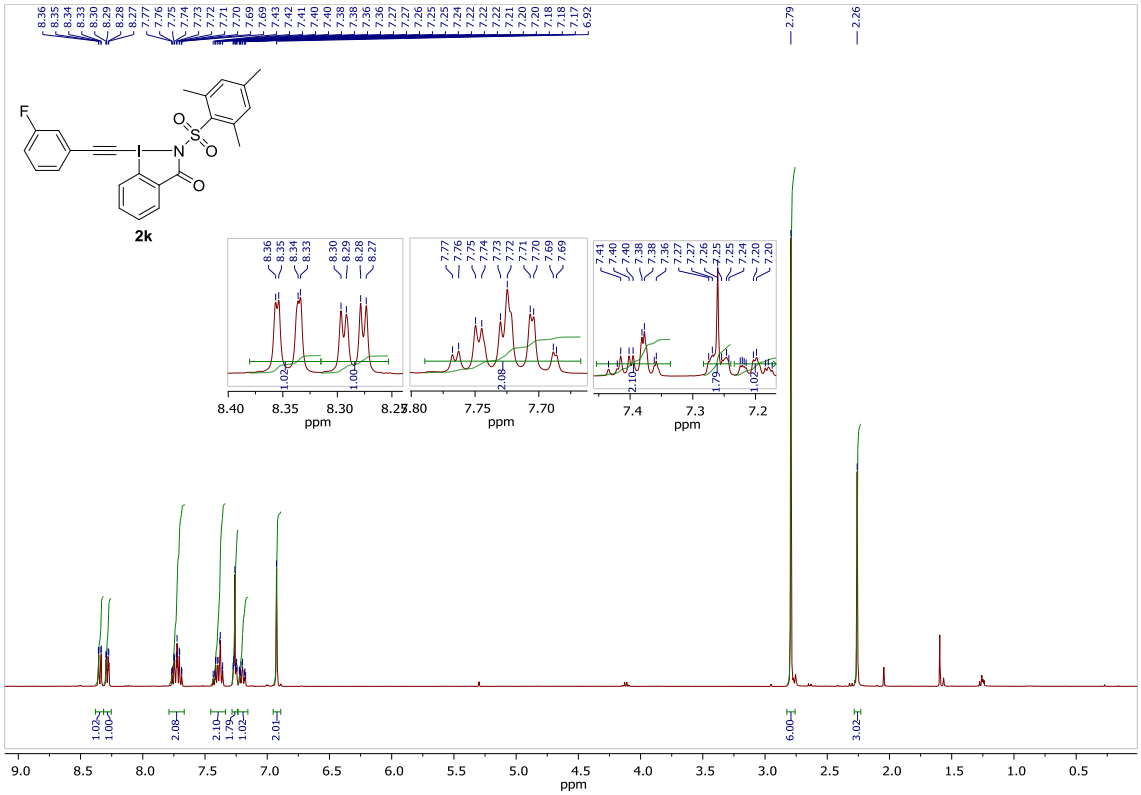


IR of compound **2j**

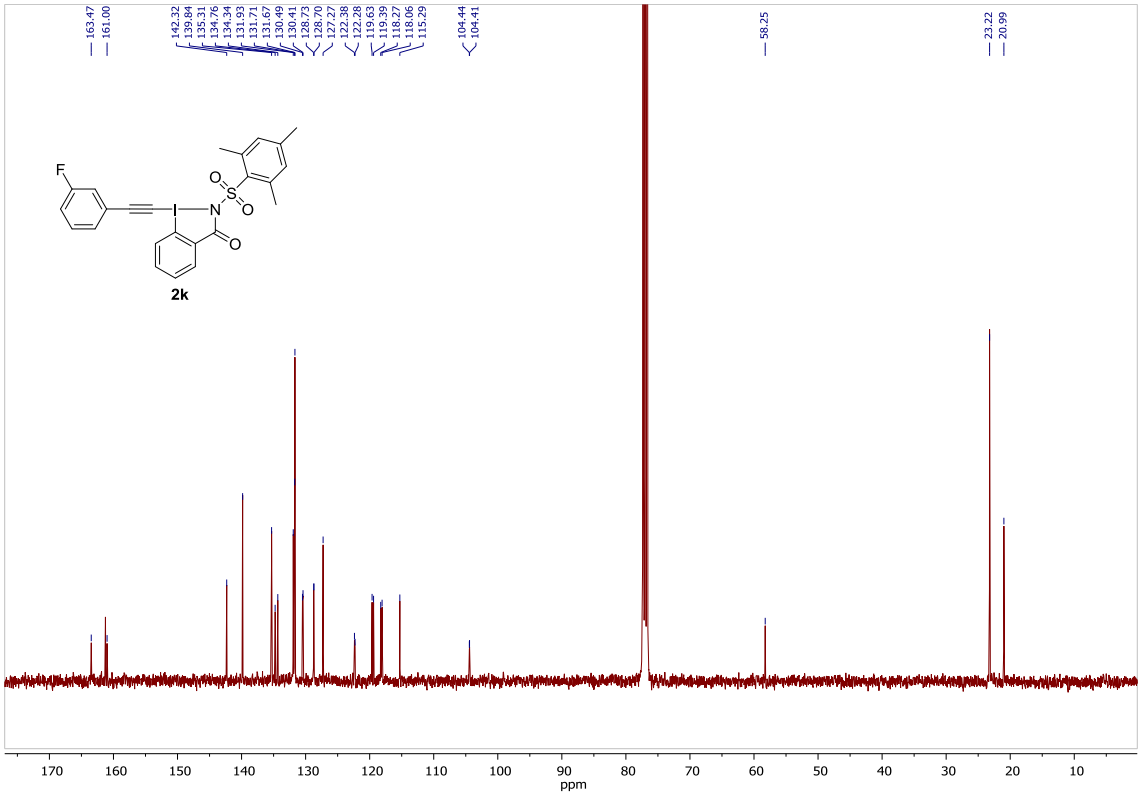


2j

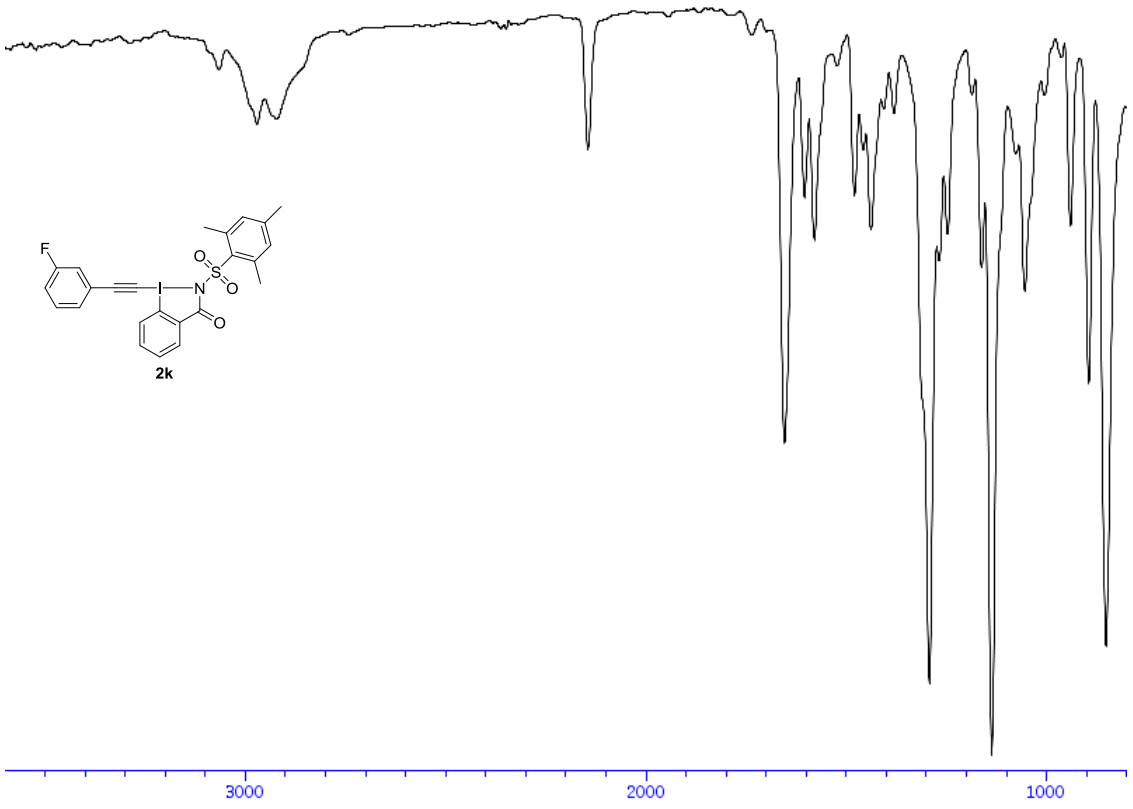
^{1}H-NMR (400 MHz, $CDCl_3$) of compound **2k**



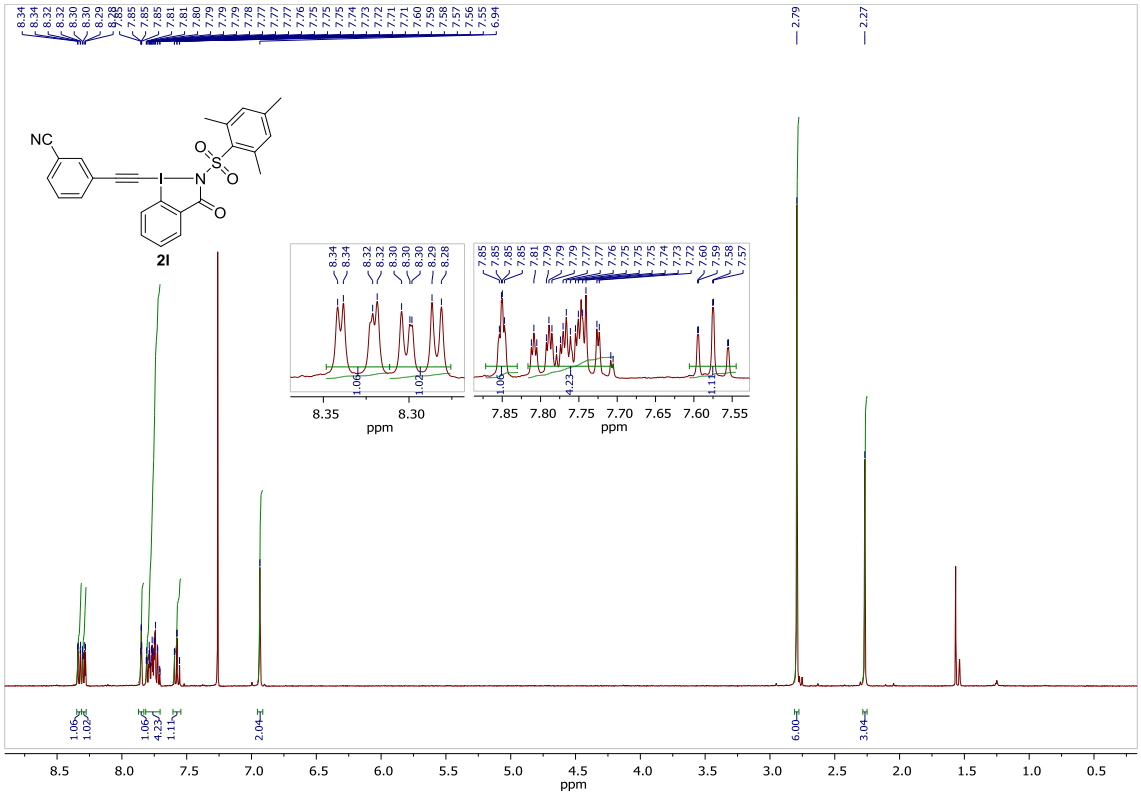
^{13}C-NMR (100 MHz, $CDCl_3$) of compound **2k**



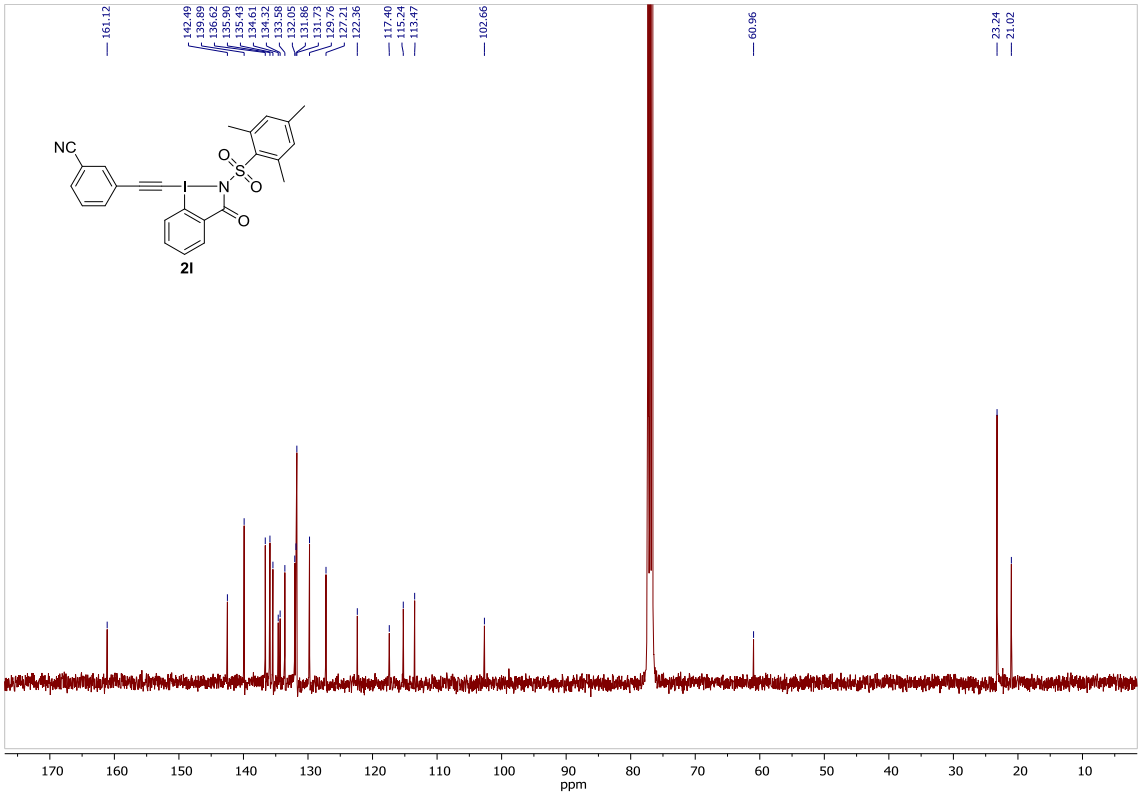
IR of compound **2k**



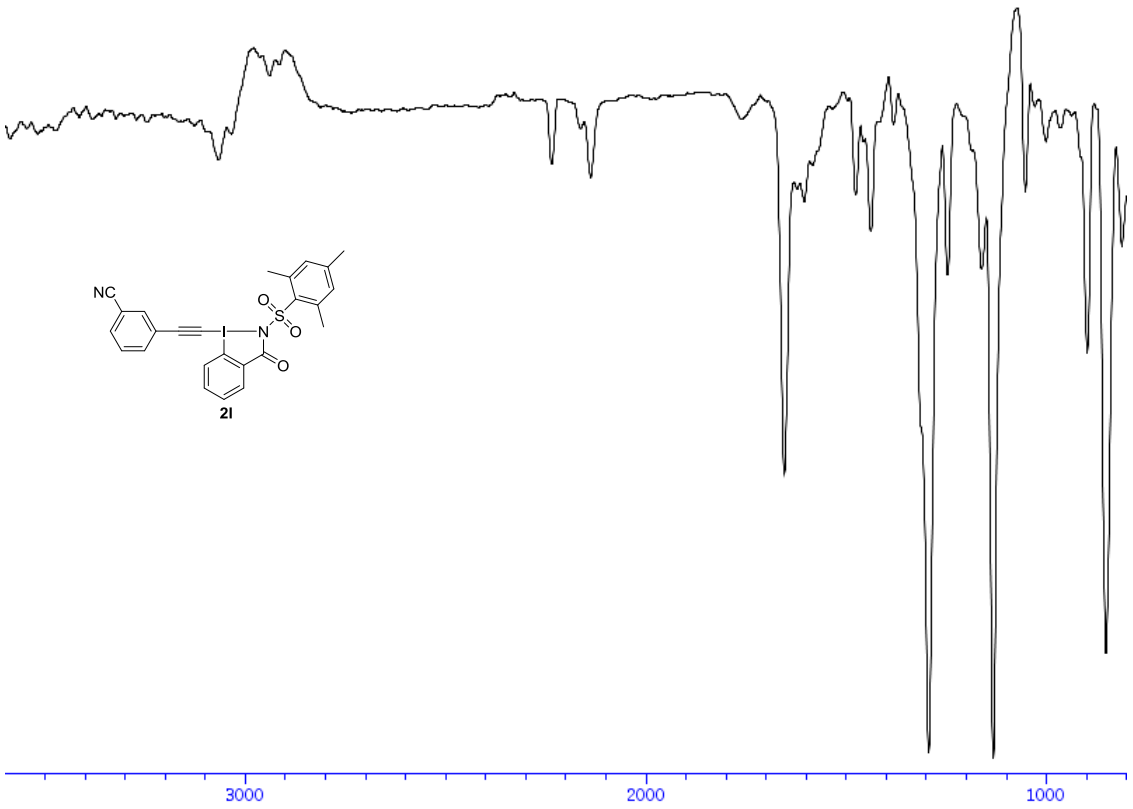
[1]H-NMR (400 MHz, $CDCl_3$) of compound **2l**



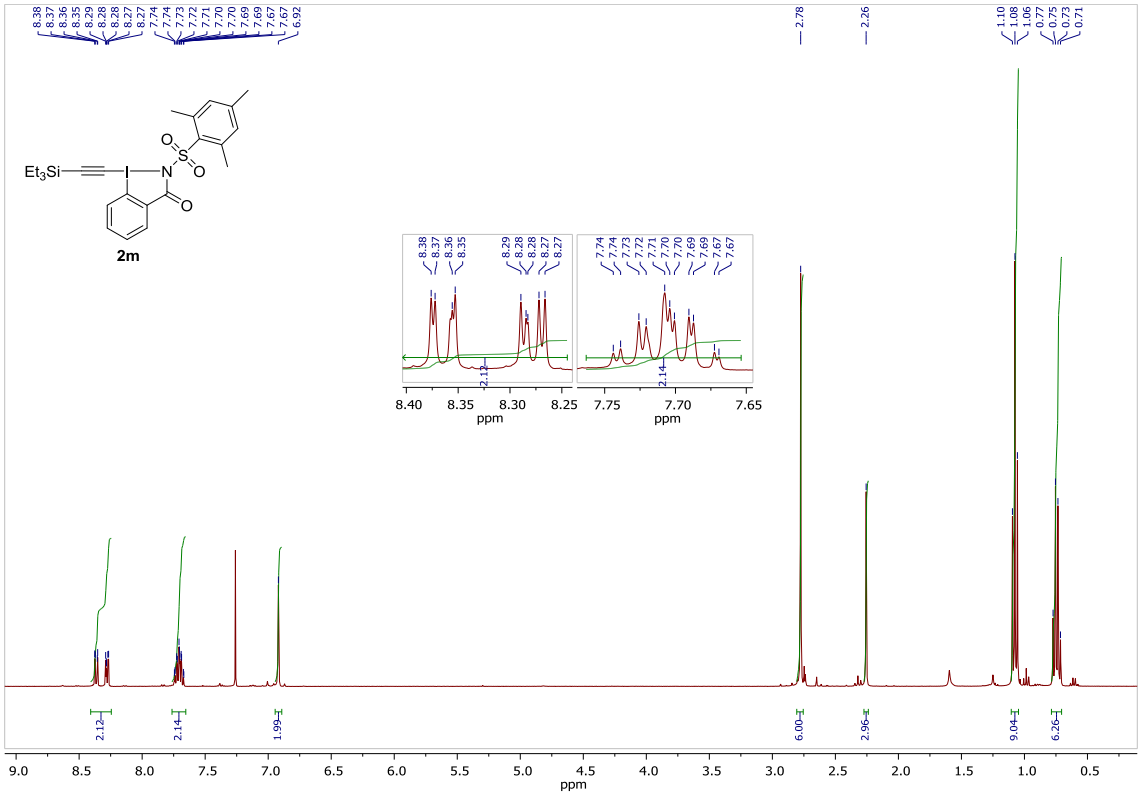
[13]C-NMR (100 MHz, $CDCl_3$) of compound **2l**



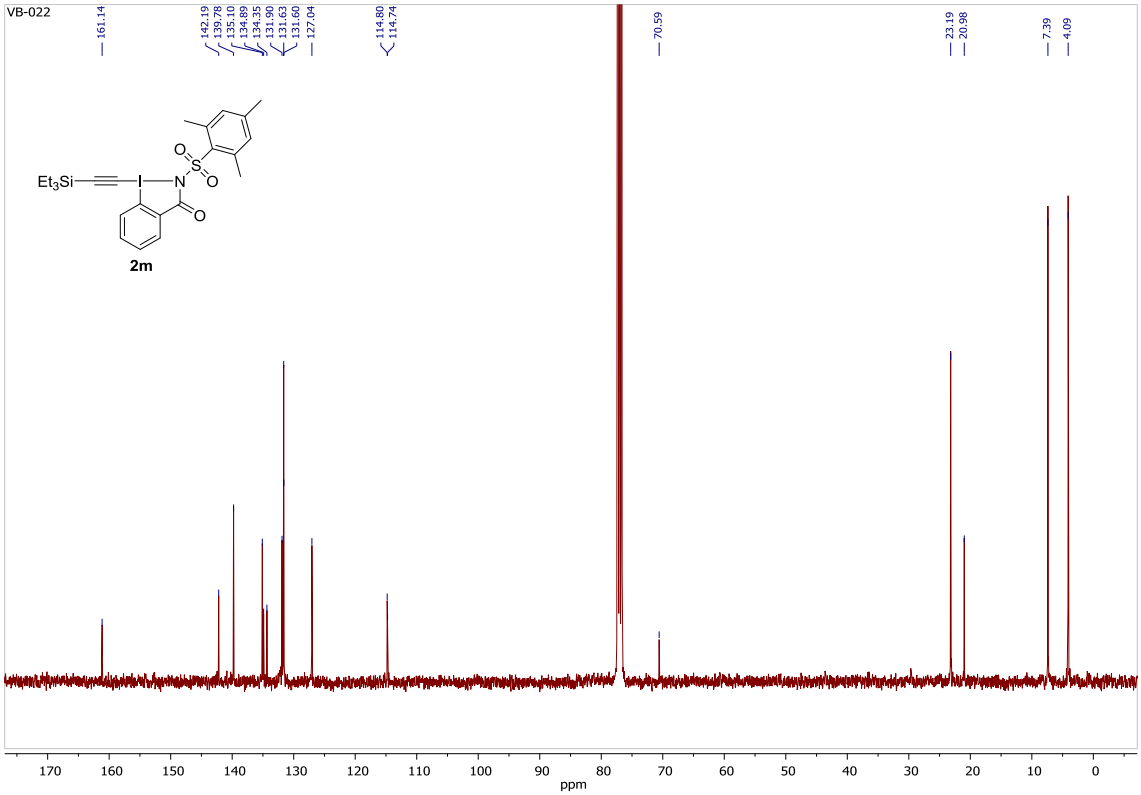
IR of compound **2l**



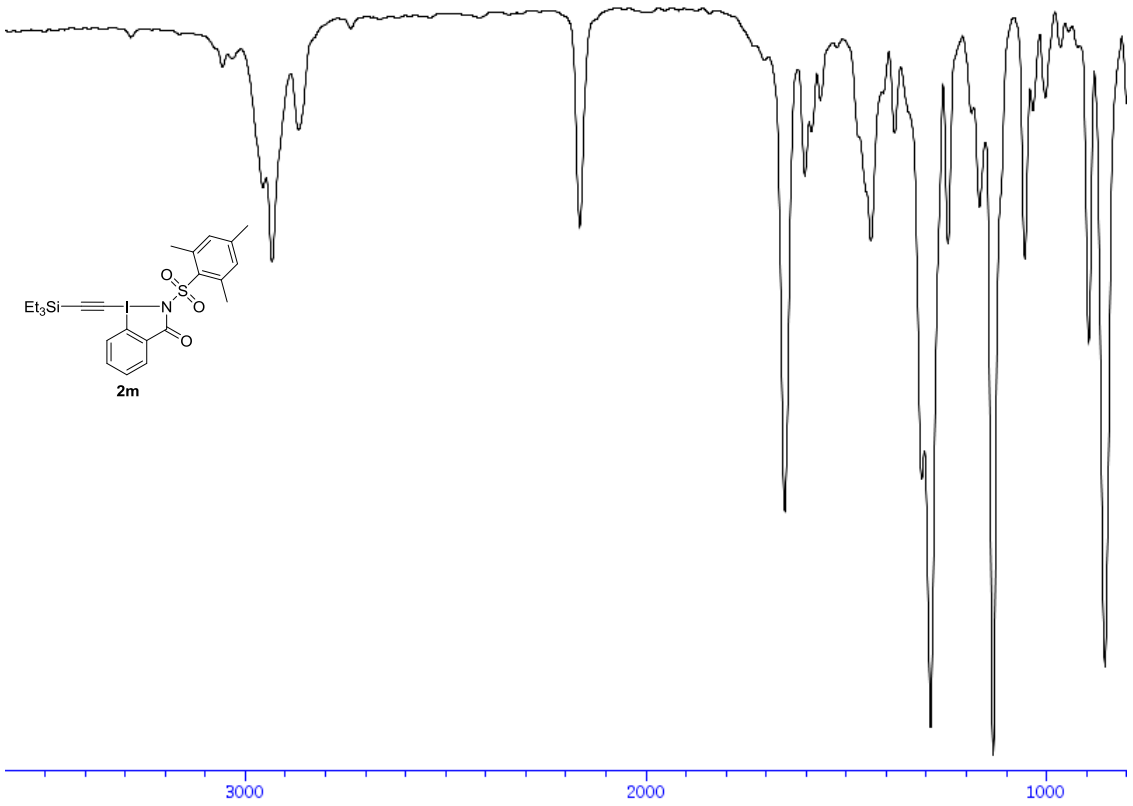
^{1}H-NMR (400 MHz, $CDCl_3$) of compound **2m**



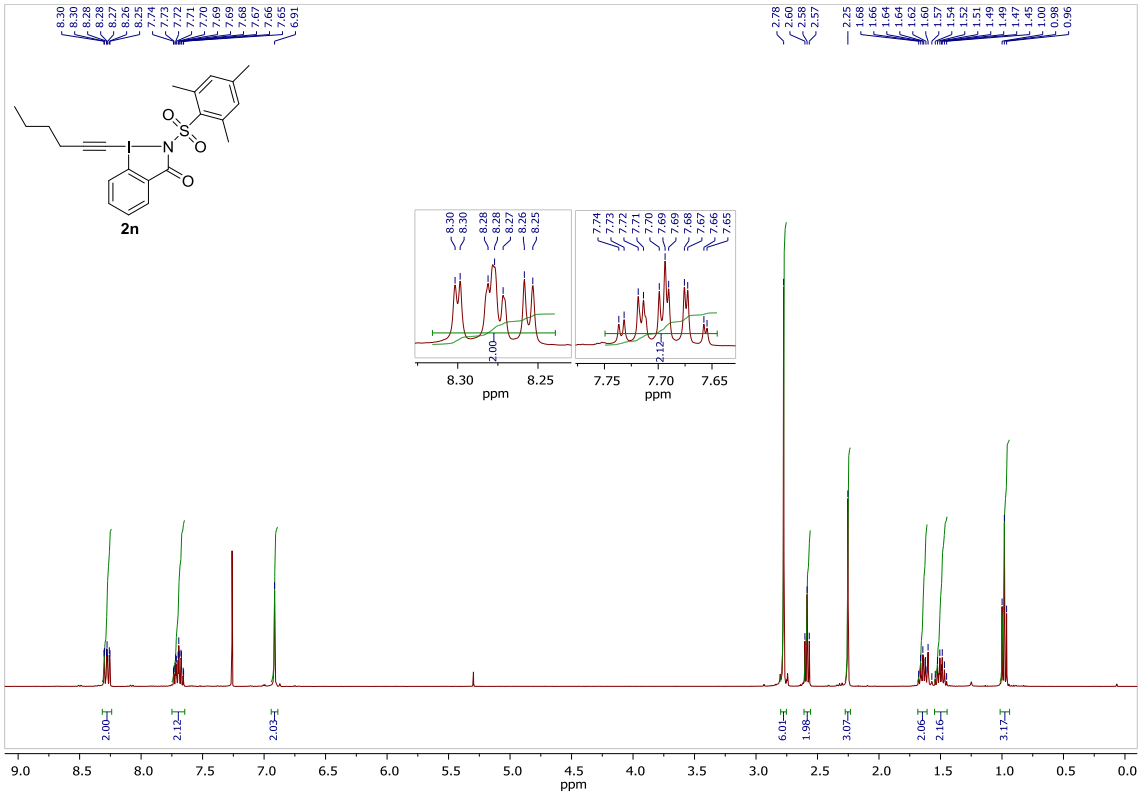
^{13}C-NMR (100 MHz, $CDCl_3$) of compound **2m**



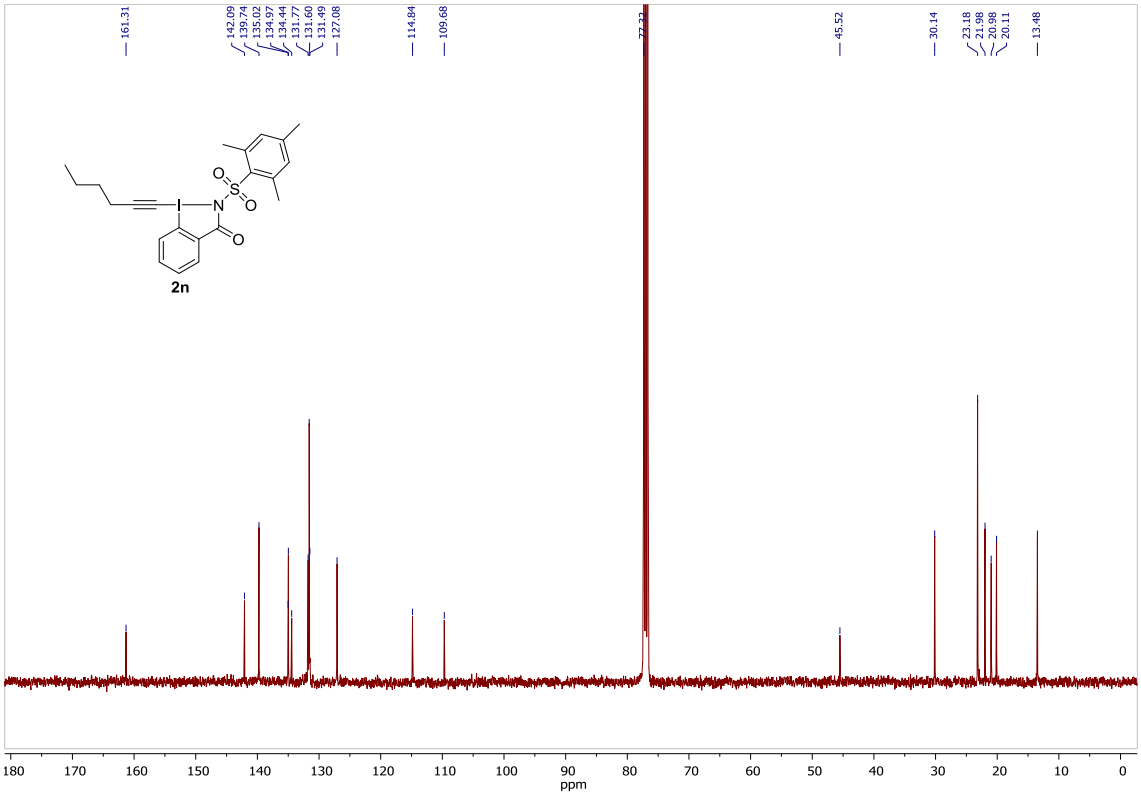
IR of compound **2m**



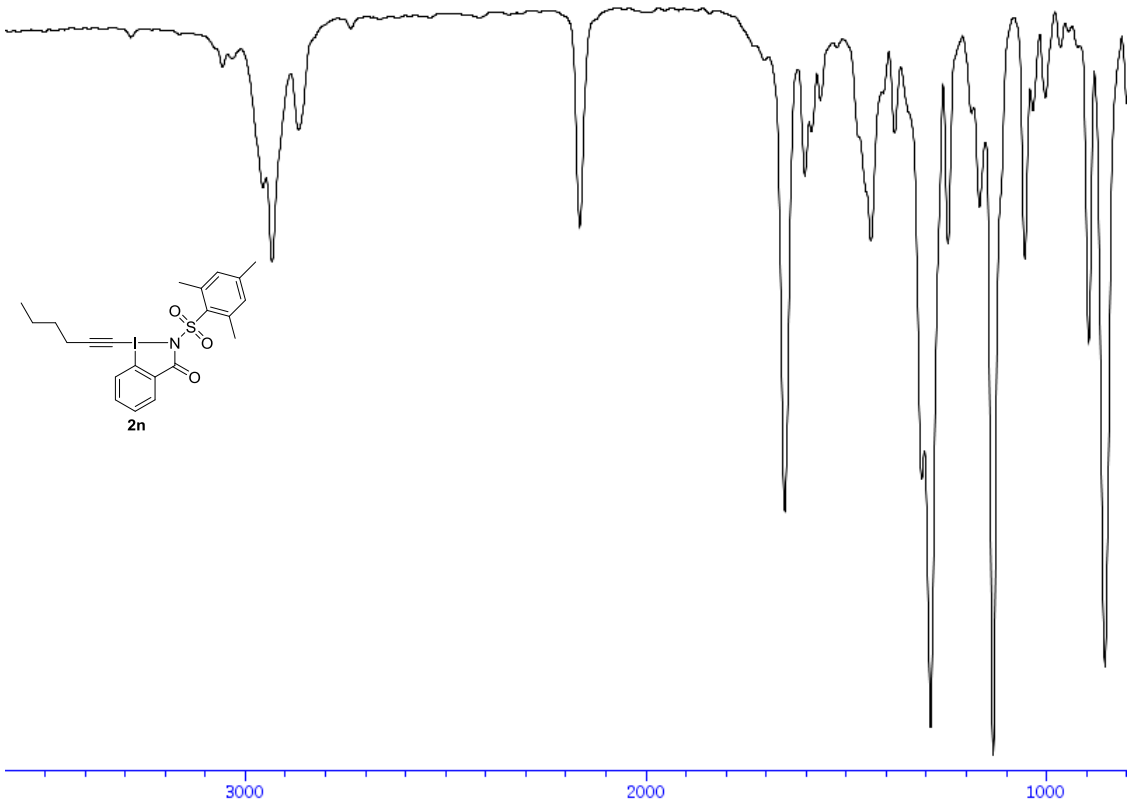
^{1}H-NMR (400 MHz, $CDCl_3$) of compound **2n**



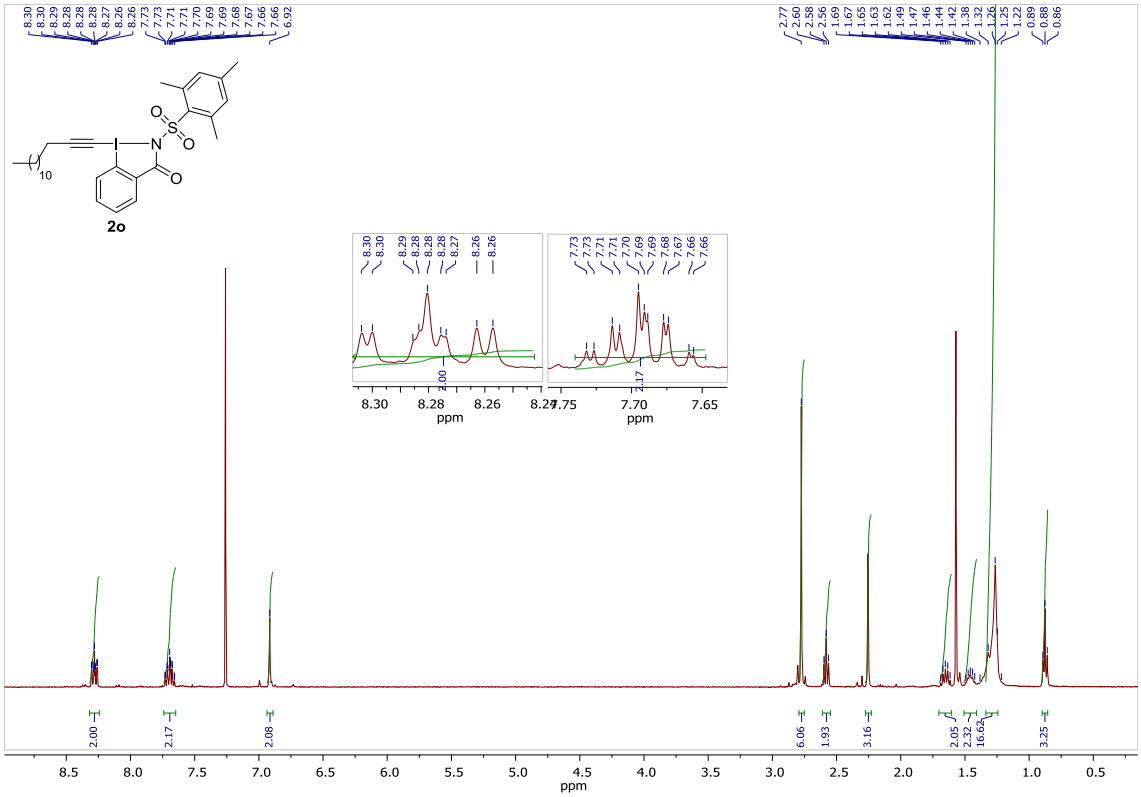
^{13}C-NMR (100 MHz, $CDCl_3$) of compound **2n**



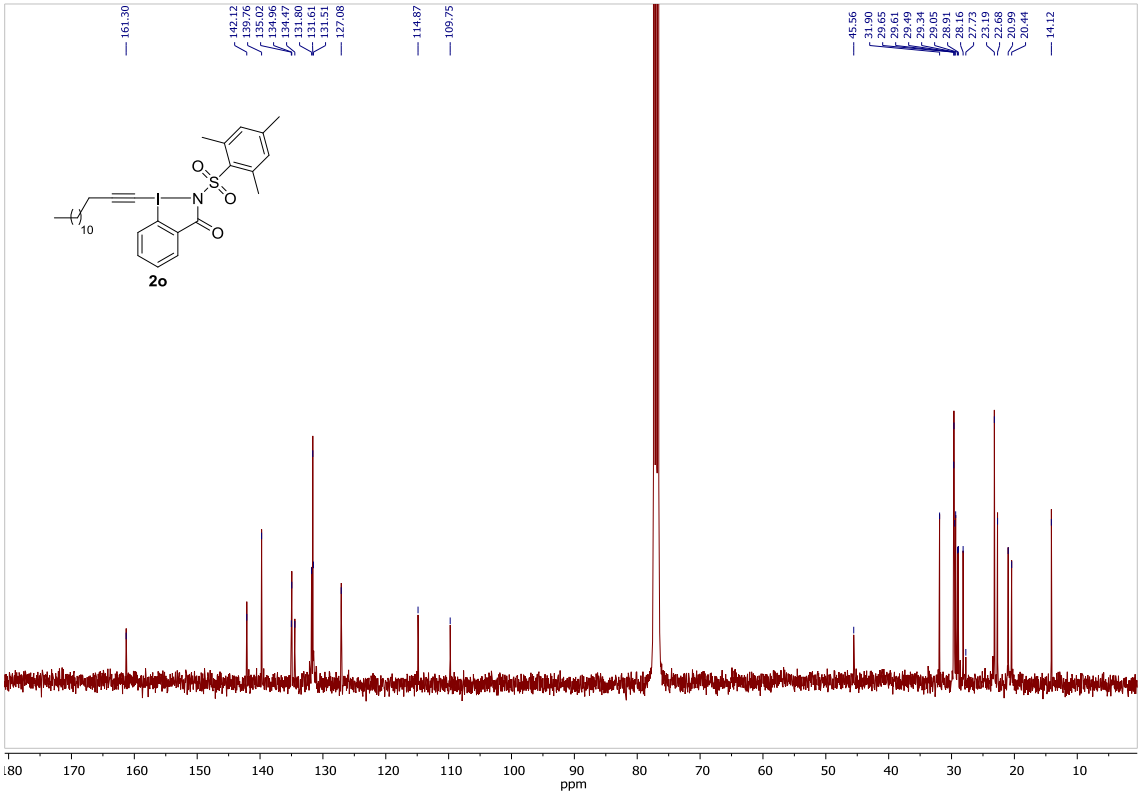
IR of compound **2n**



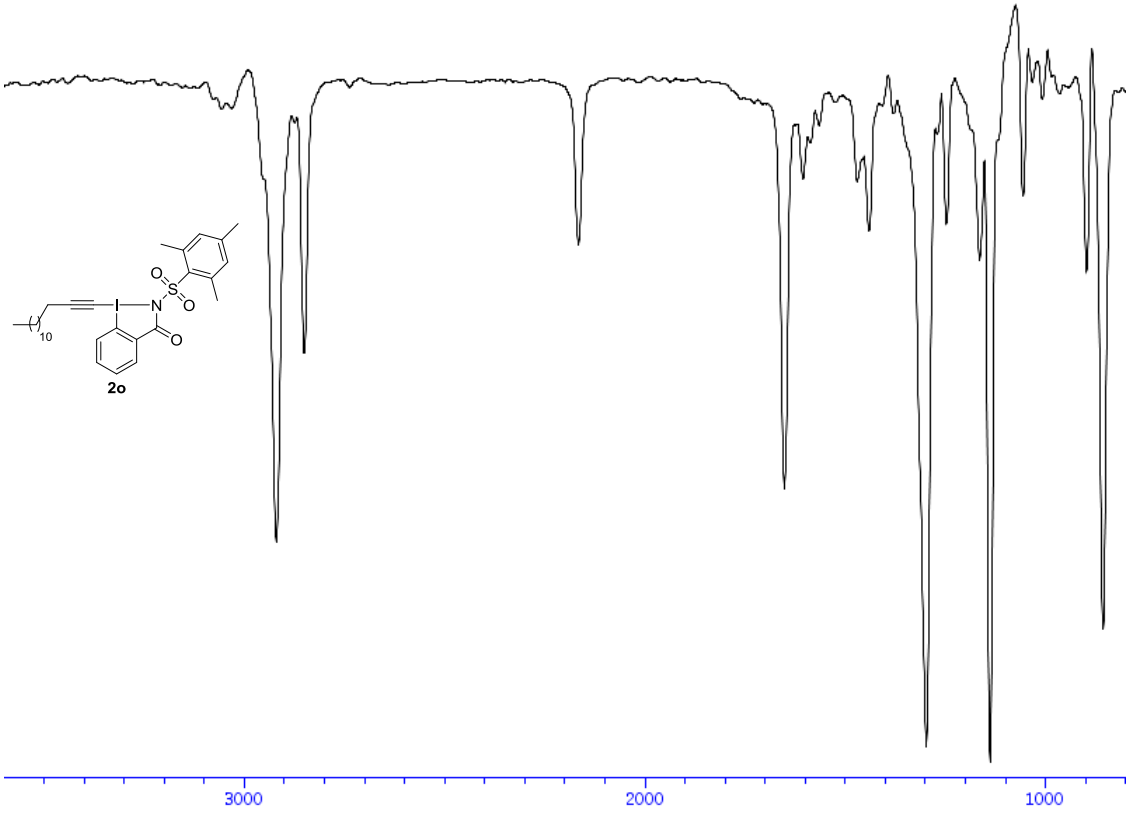
^{1}H-NMR (400 MHz, $CDCl_3$) of compound **2o**



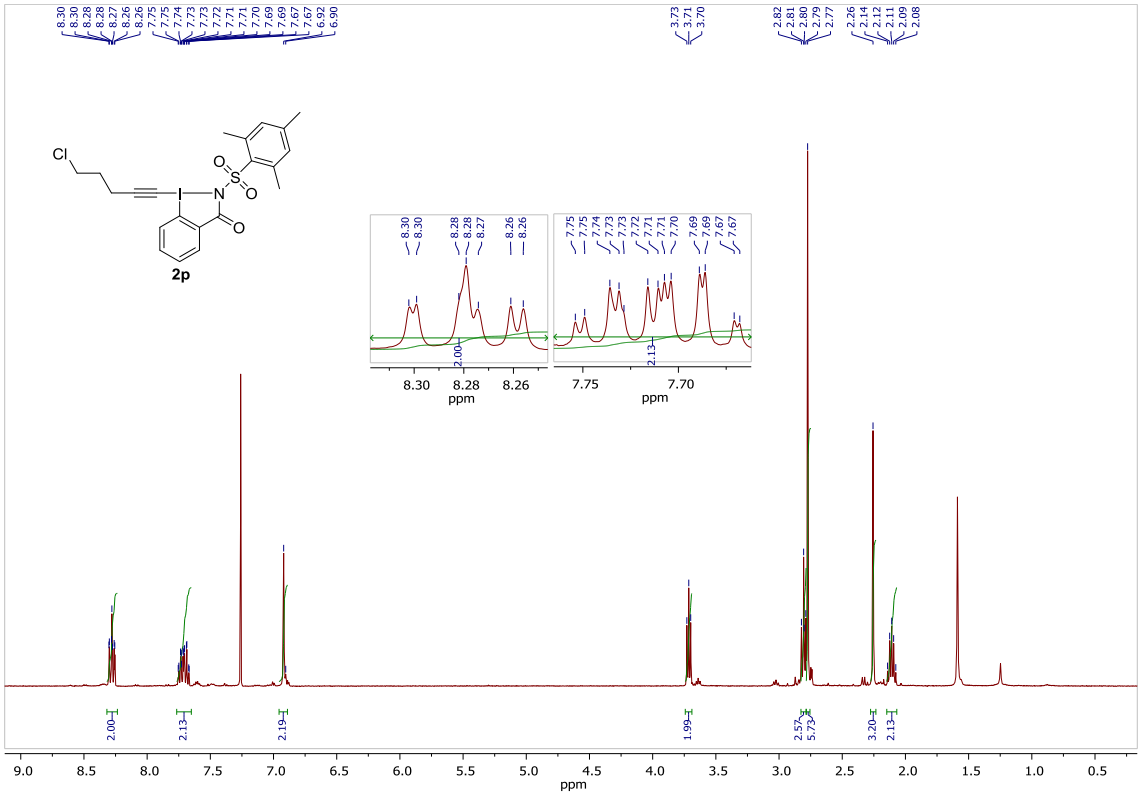
^{13}C-NMR (100 MHz, $CDCl_3$) of compound **2o**



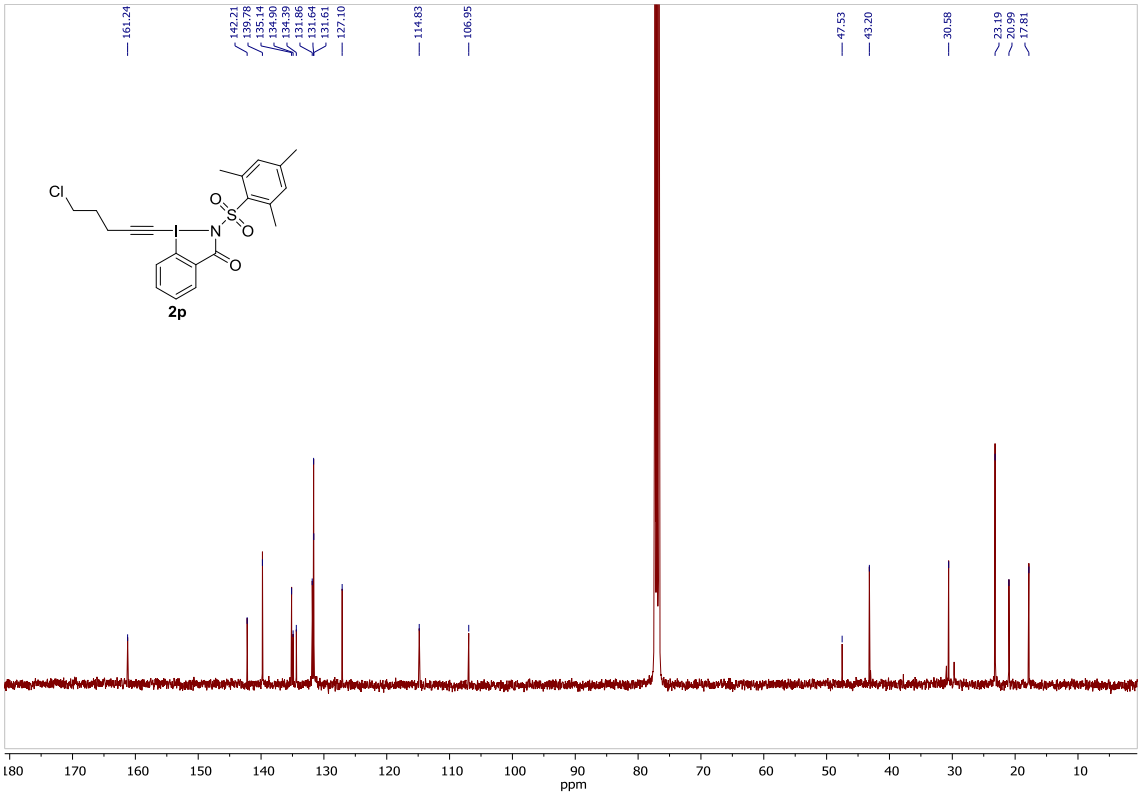
IR of compound **2o**



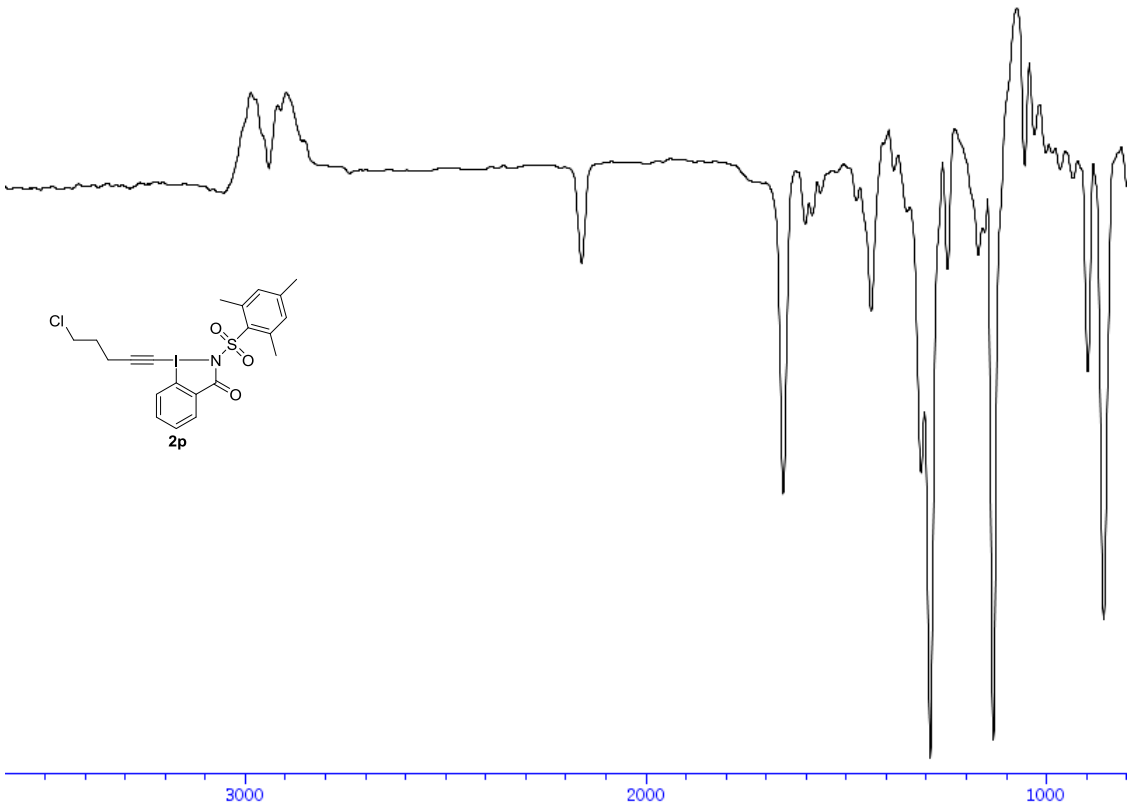
^{1}H-NMR (400 MHz, $CDCl_3$) of compound **2p**



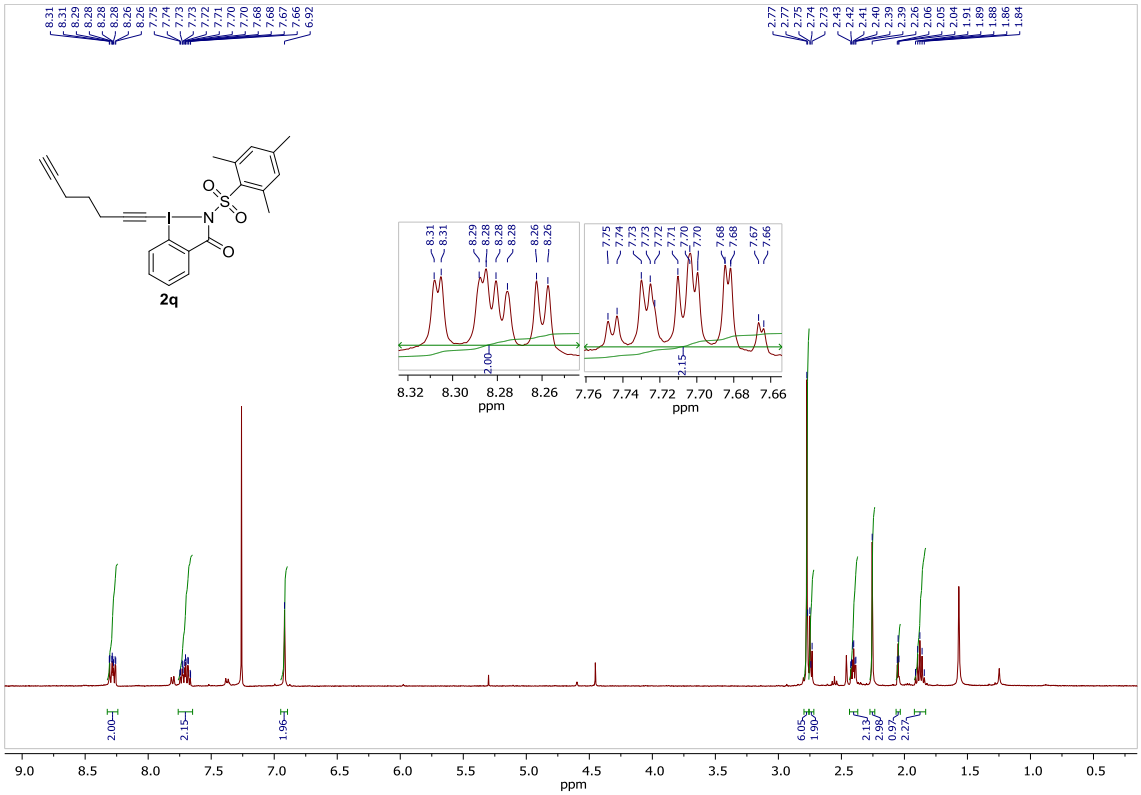
^{13}C-NMR (100 MHz, $CDCl_3$) of compound **2p**



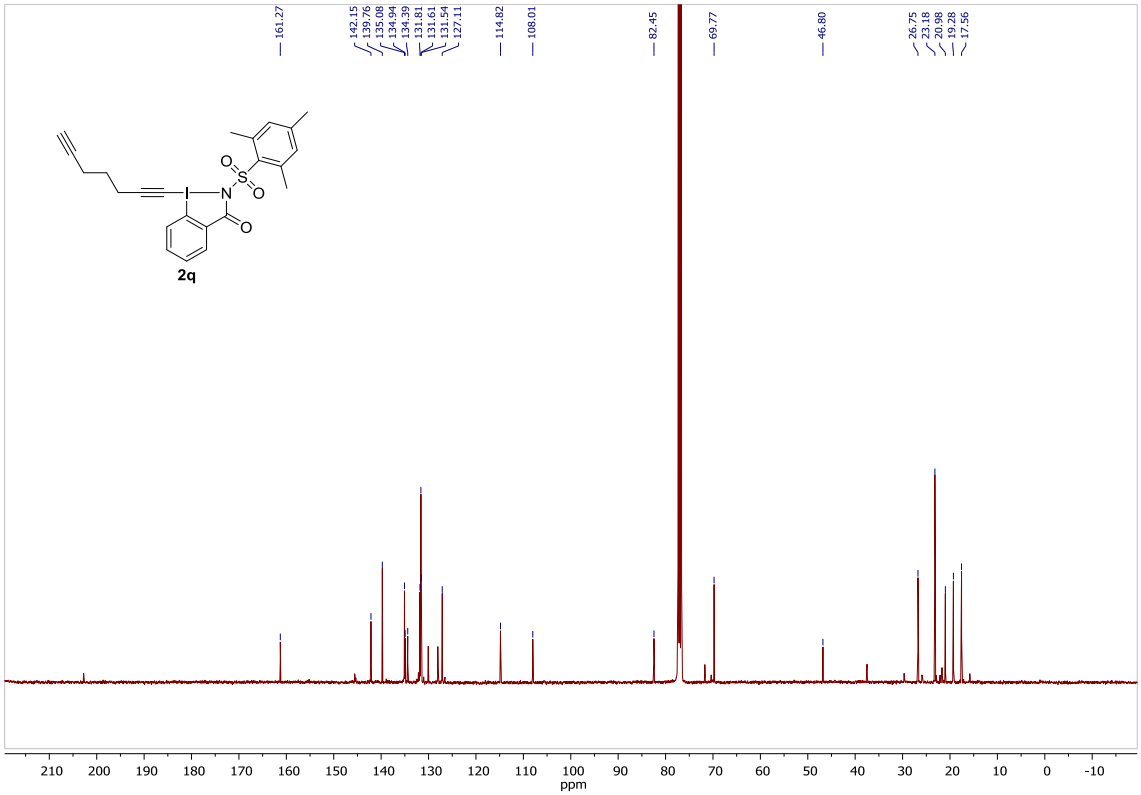
IR of compound **2p**



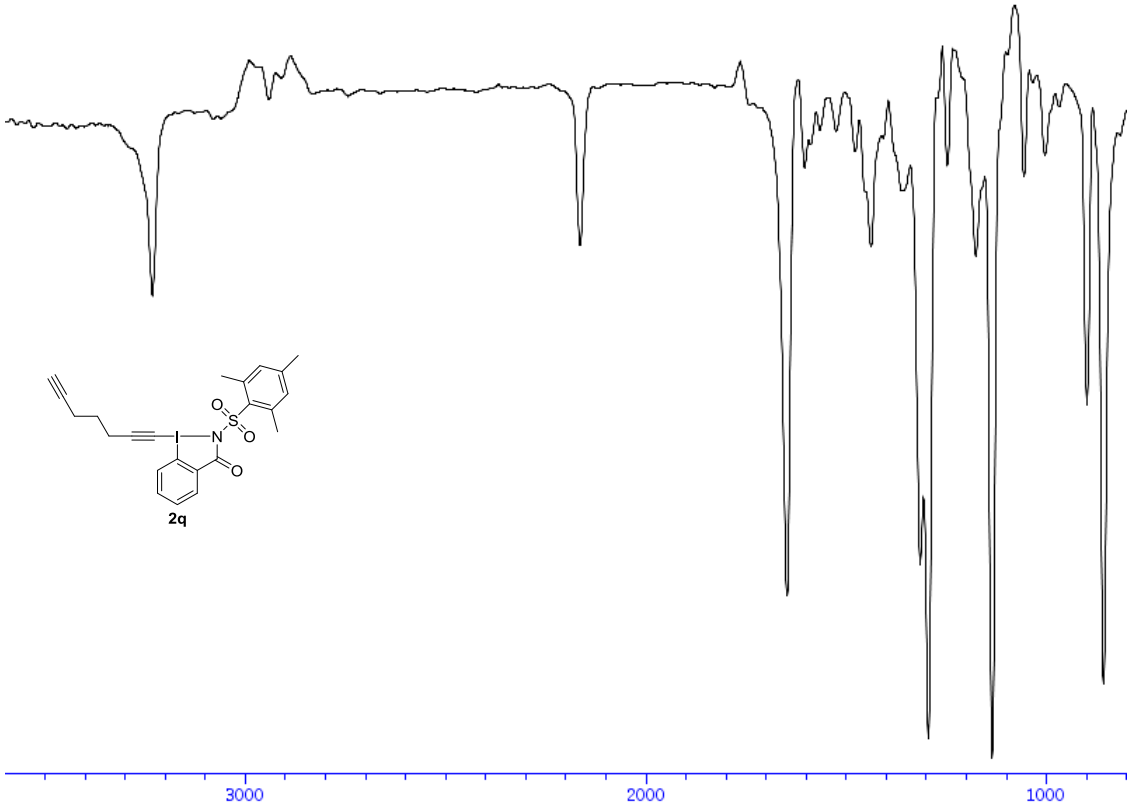
^{1}H-NMR (400 MHz, $CDCl_3$) of compound **2q**



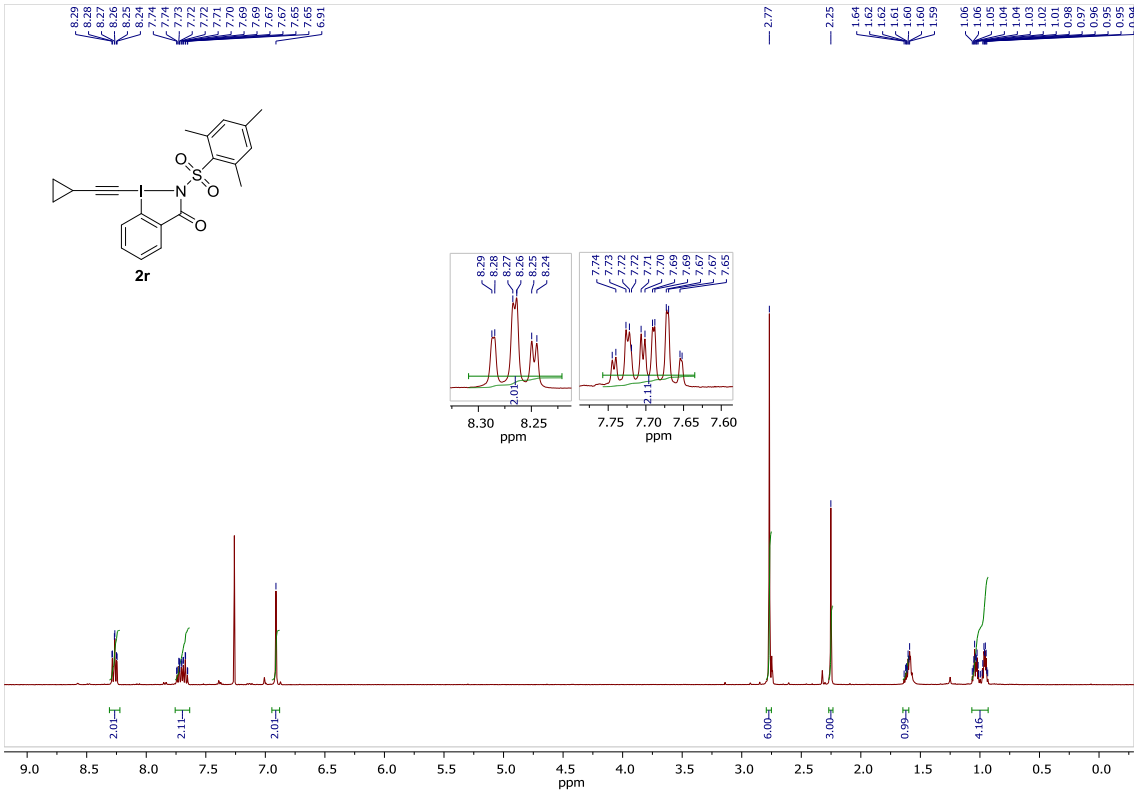
^{13}C-NMR (100 MHz, $CDCl_3$) of compound **2q**



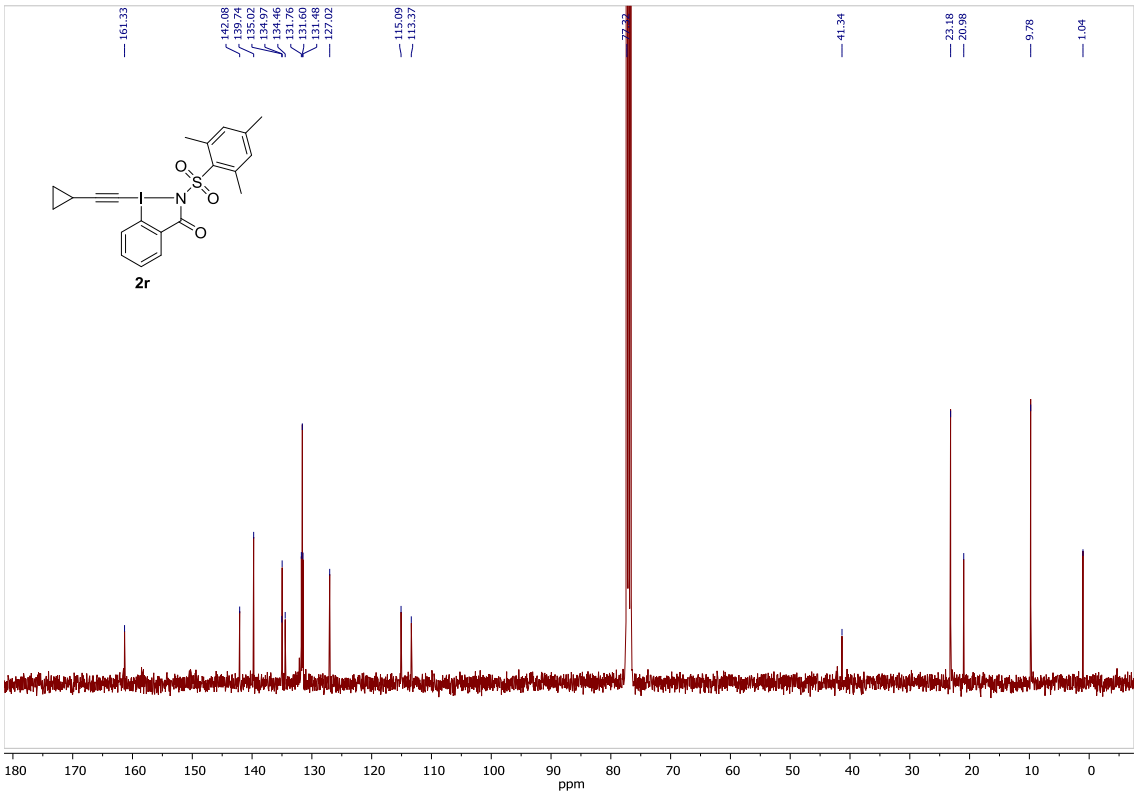
IR of compound **2q**



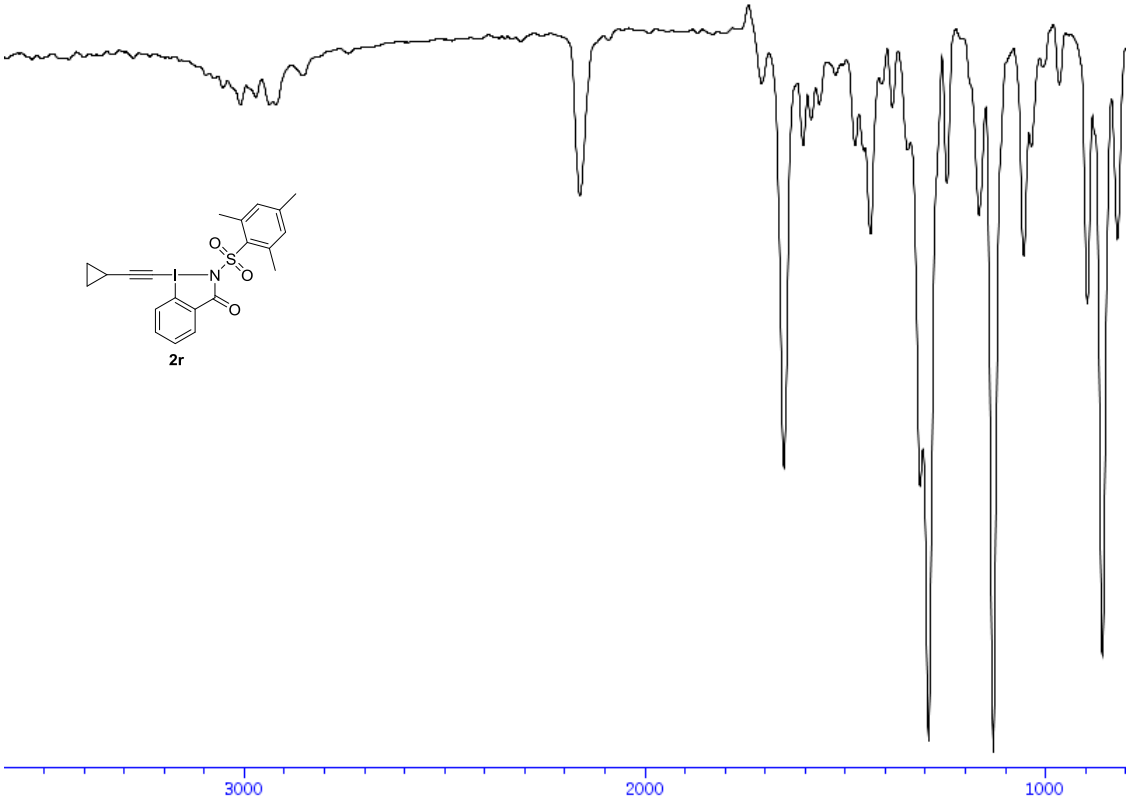
^{1}H-NMR (400 MHz, $CDCl_3$) of compound **2r**



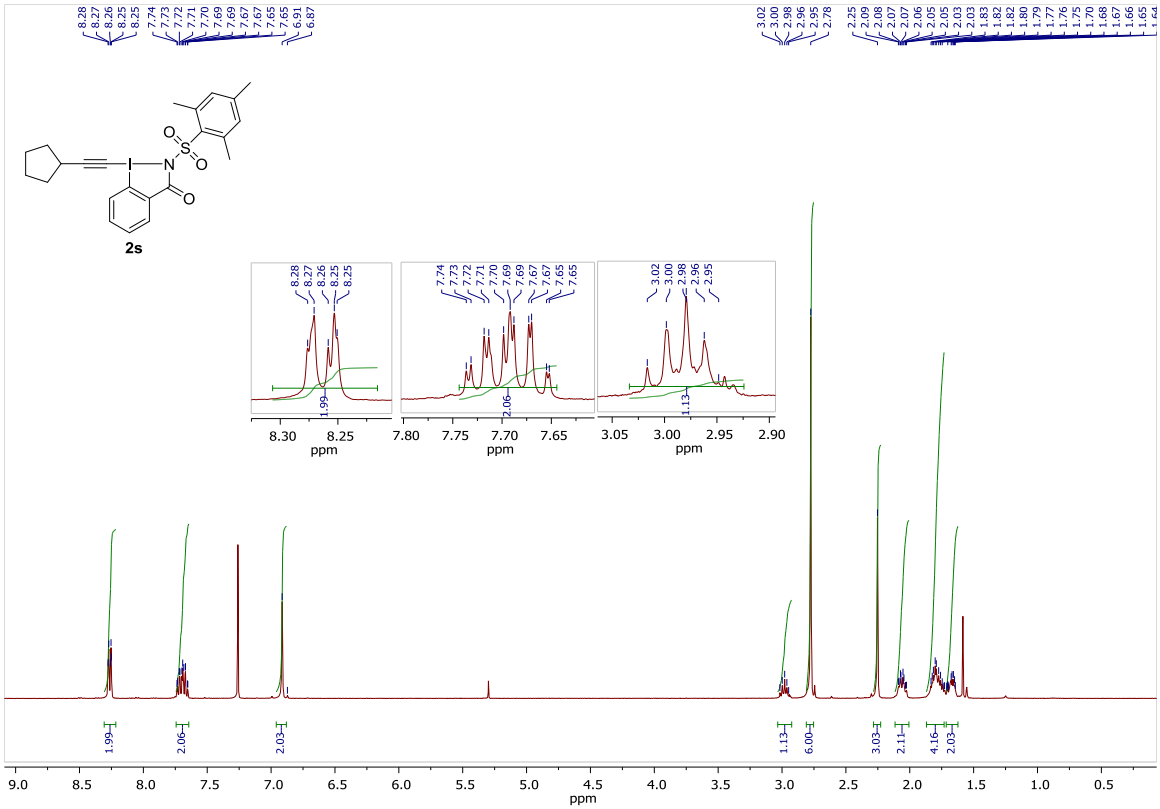
^{13}C-NMR (100 MHz, $CDCl_3$) of compound **2r**



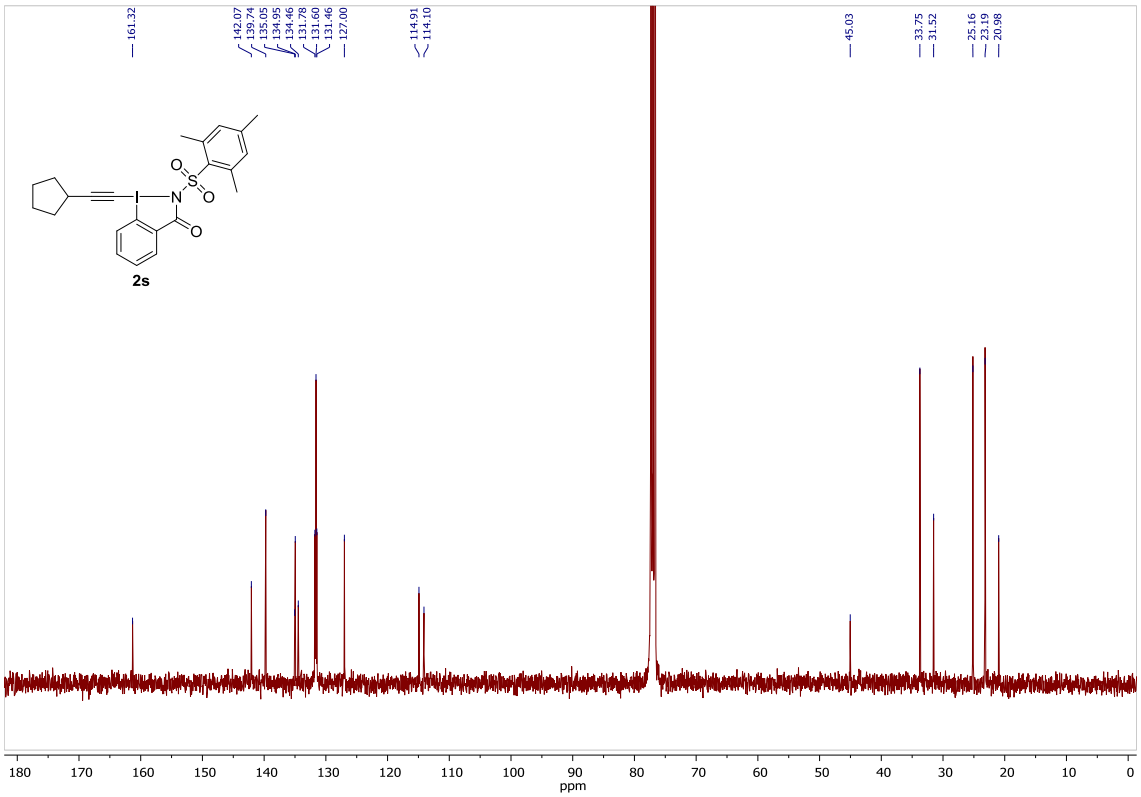
IR of compound **2r**



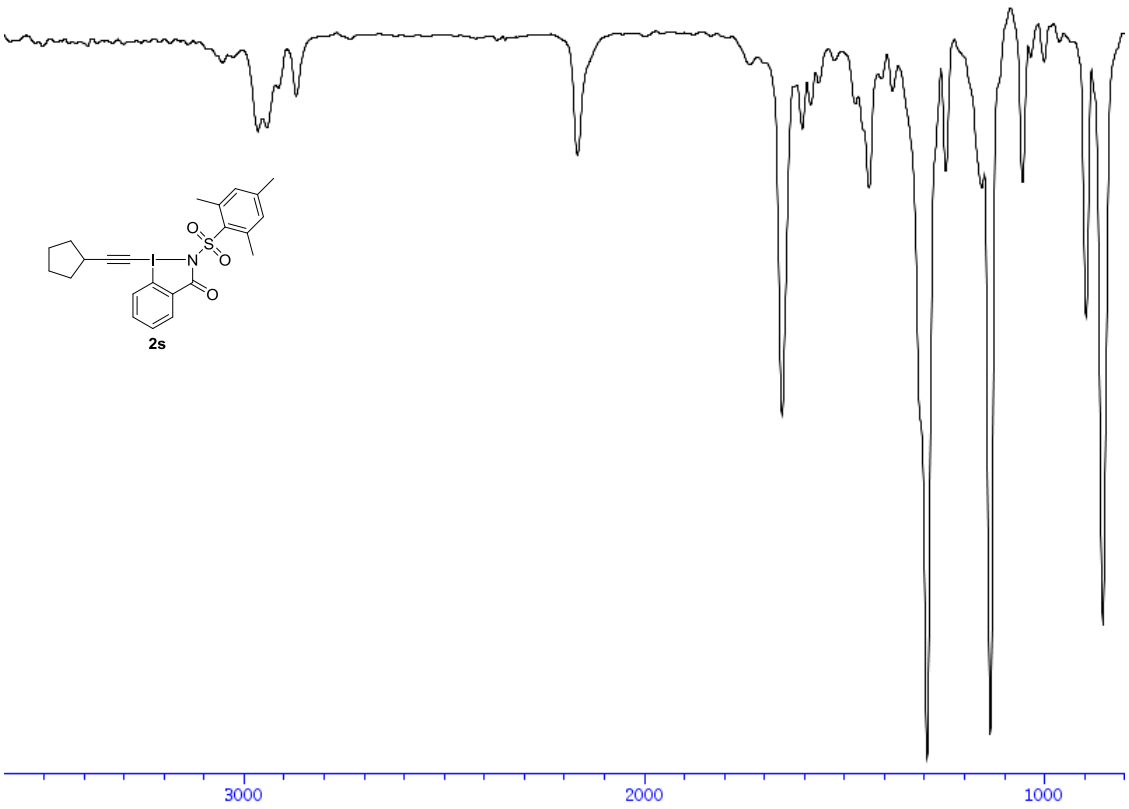
^{1}H-NMR (400 MHz, $CDCl_3$) of compound **2s**



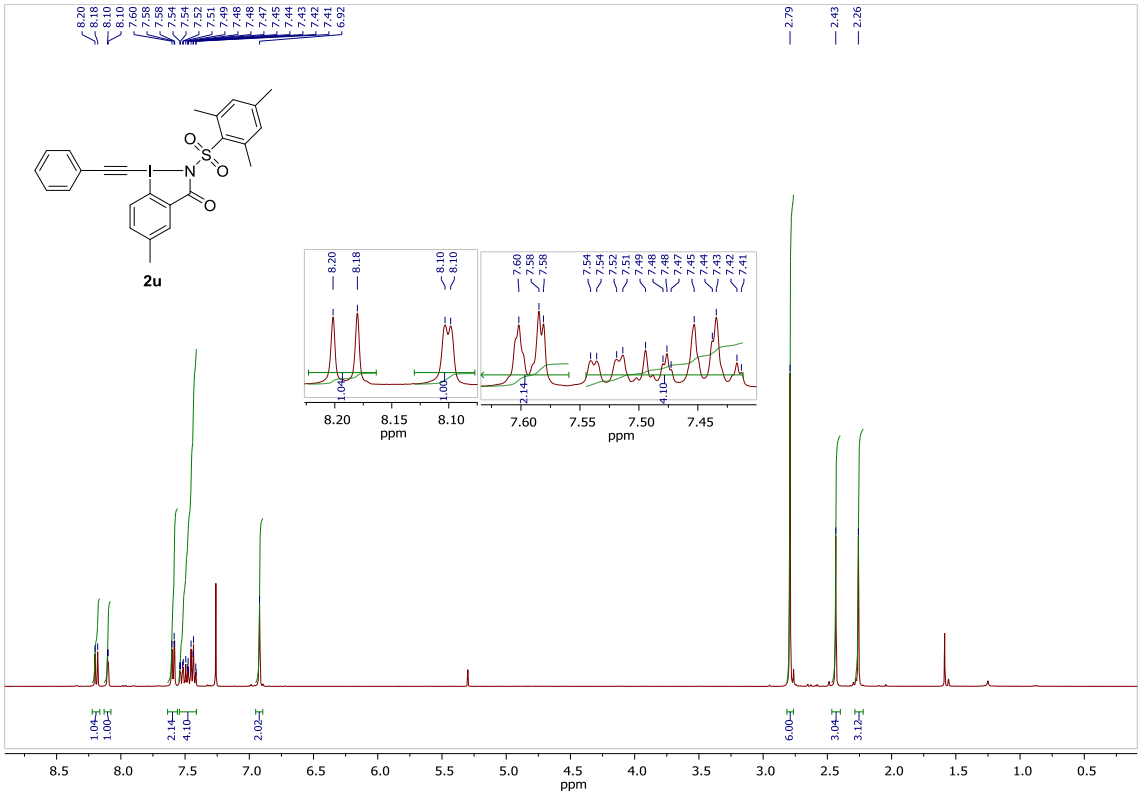
^{13}C-NMR (100 MHz, $CDCl_3$) of compound **2s**



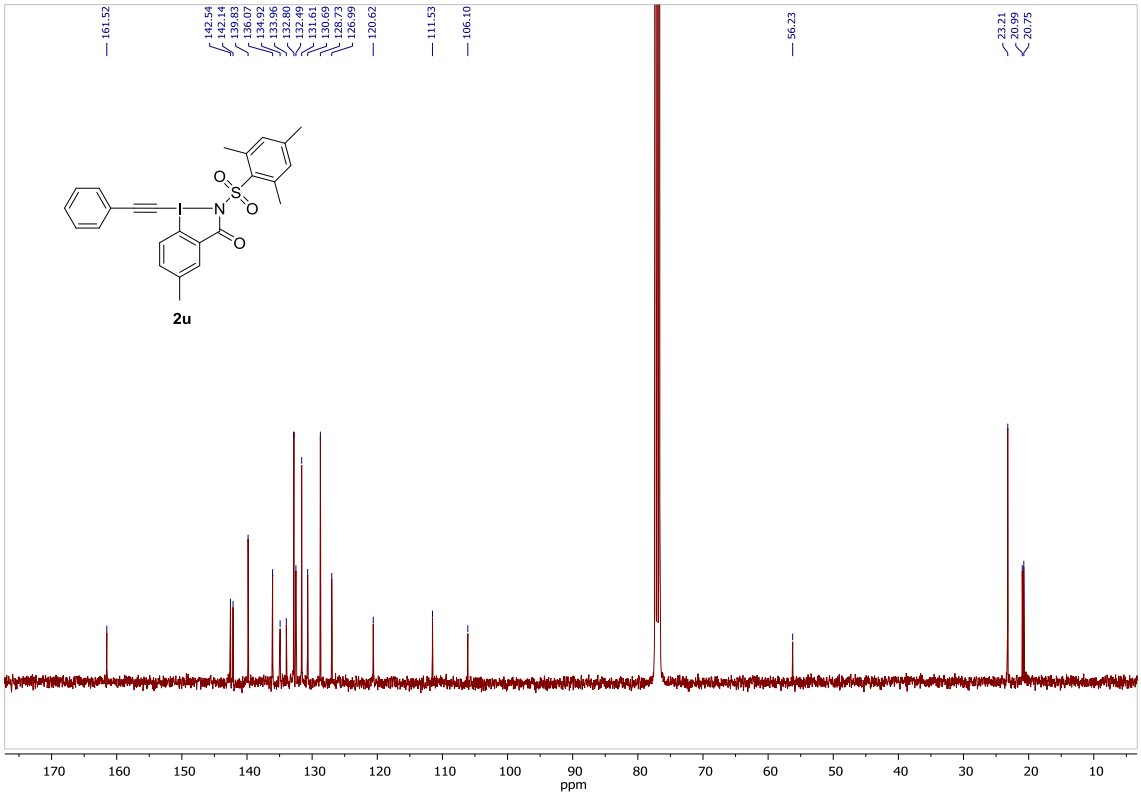
IR of compound **2s**



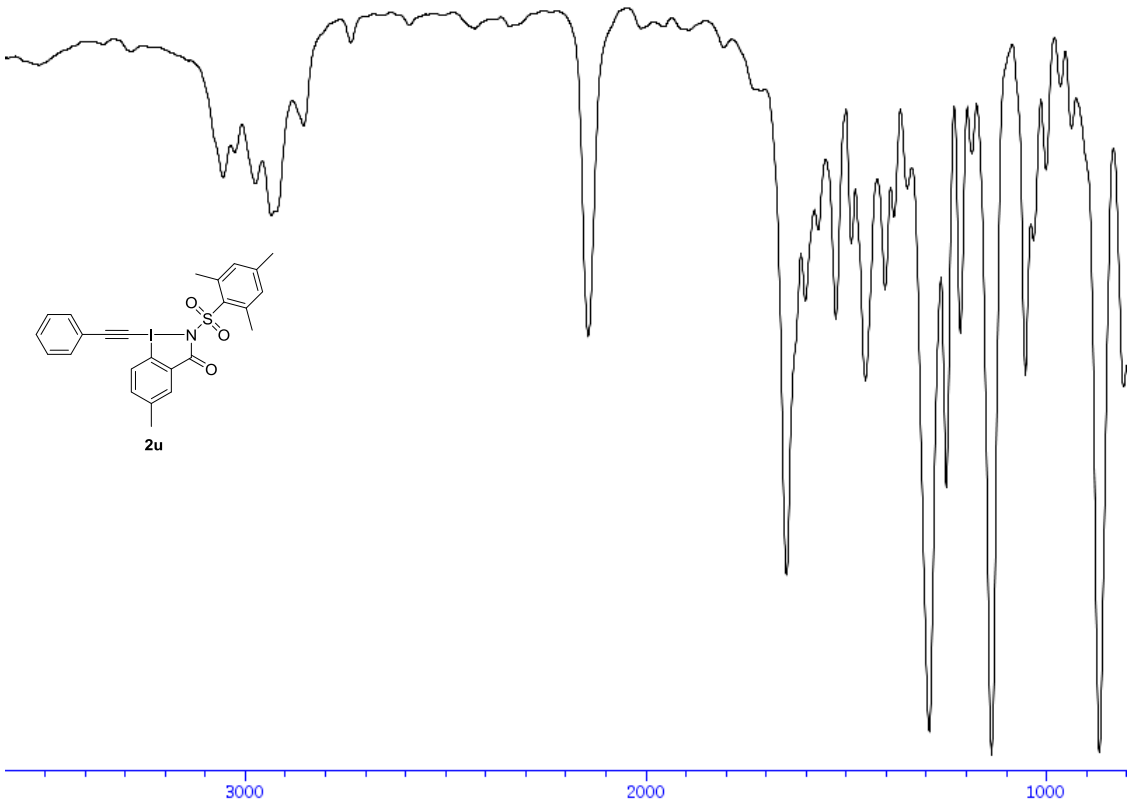
^{1}H-NMR (400 MHz, $CDCl_3$) of compound **2u**



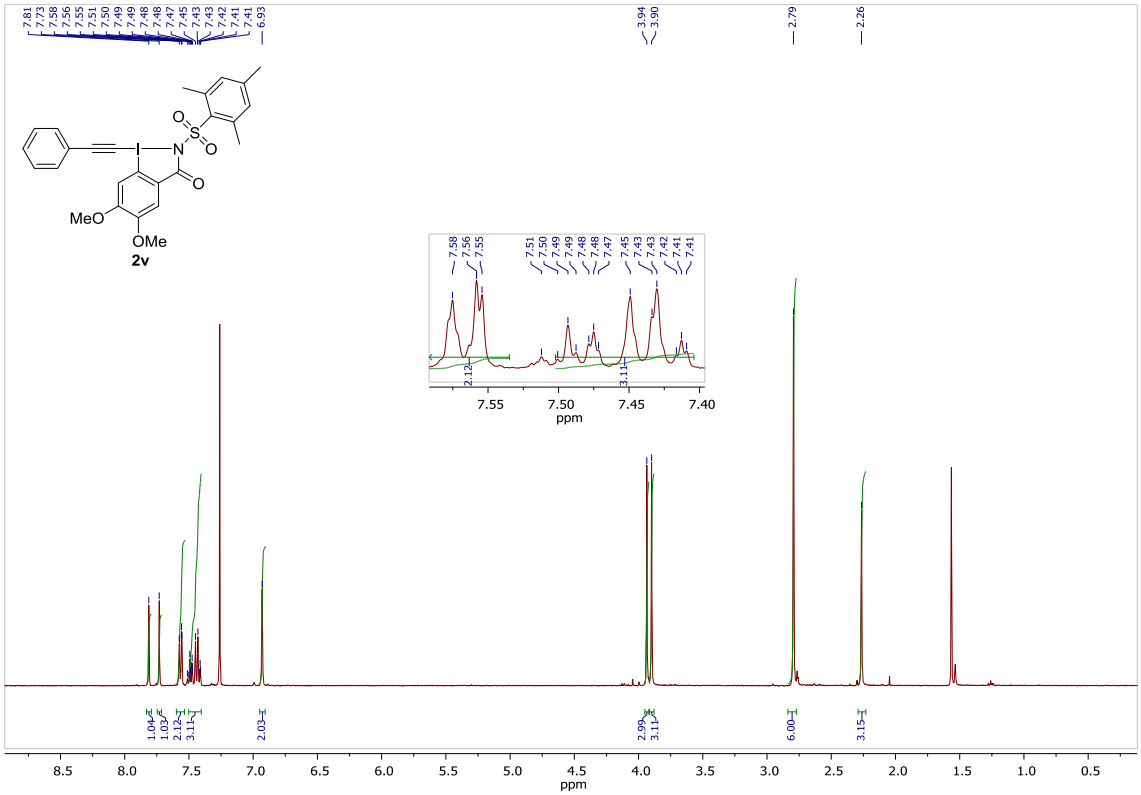
^{13}C-NMR (100 MHz, $CDCl_3$) of compound **2u**



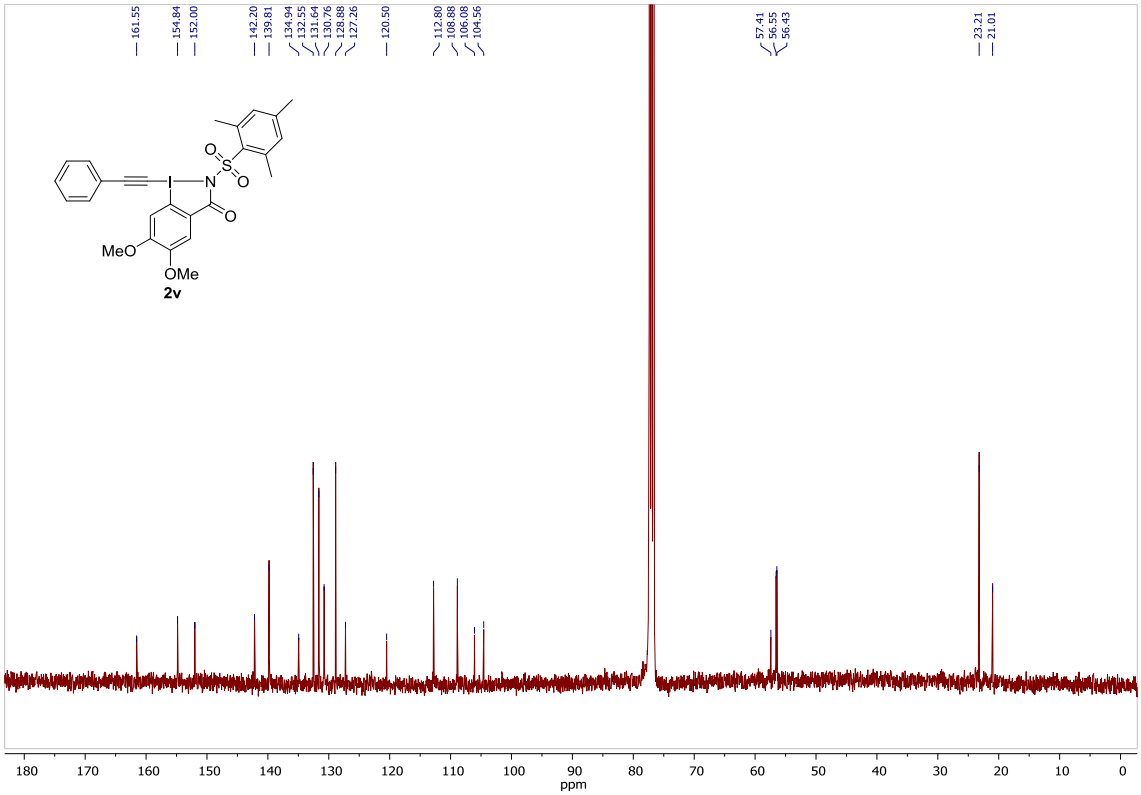
IR of compound **2u**



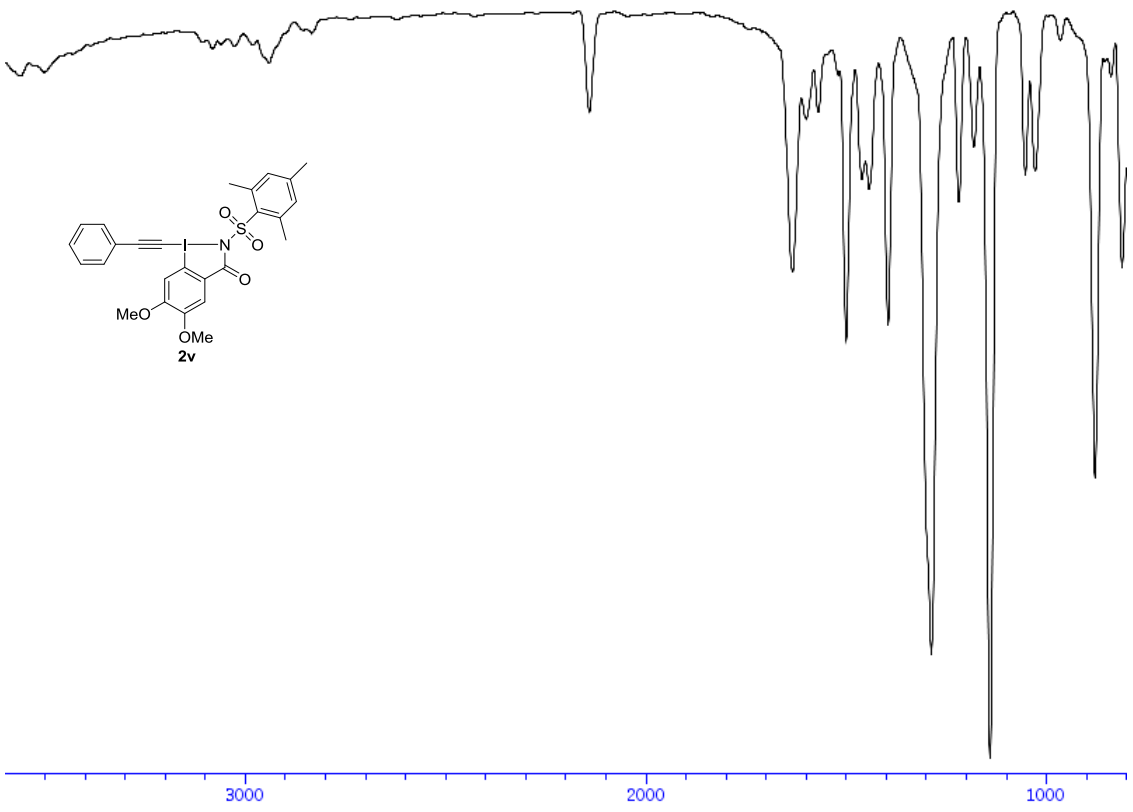
^{1}H-NMR (400 MHz, $CDCl_3$) of compound **2v**



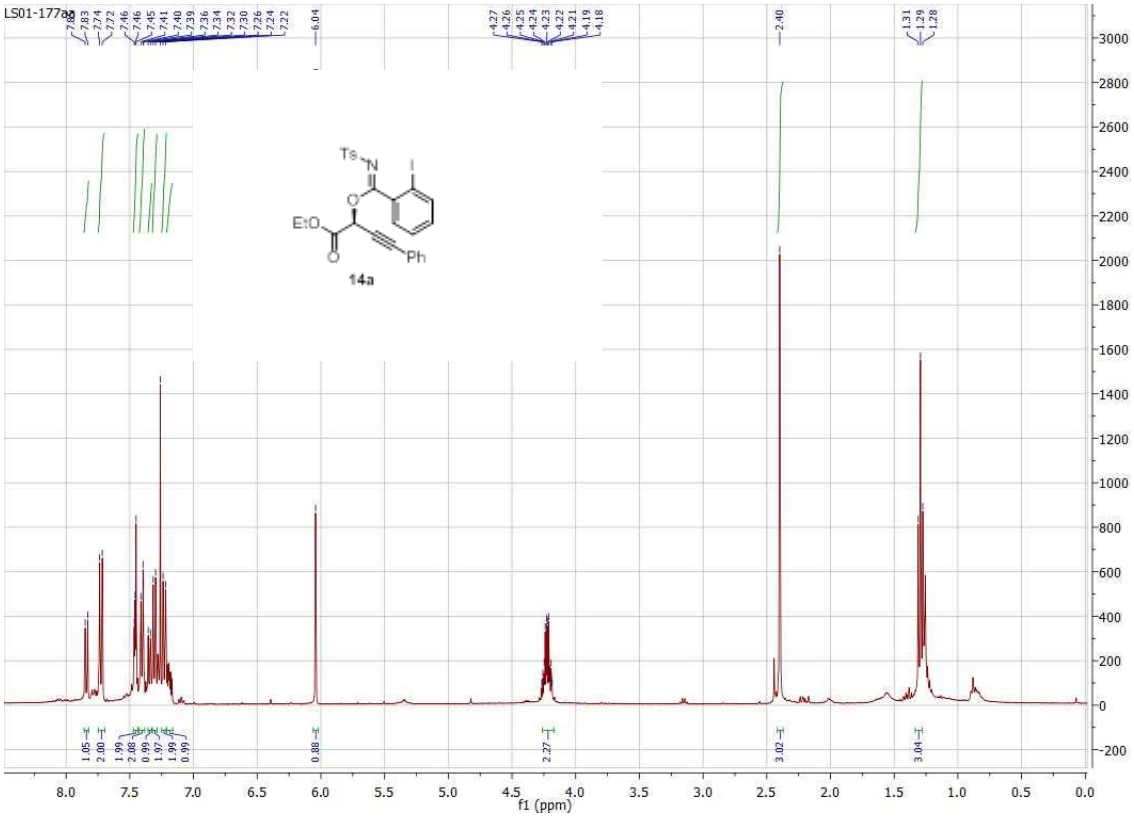
^{13}C-NMR (100 MHz, $CDCl_3$) of compound **2v**



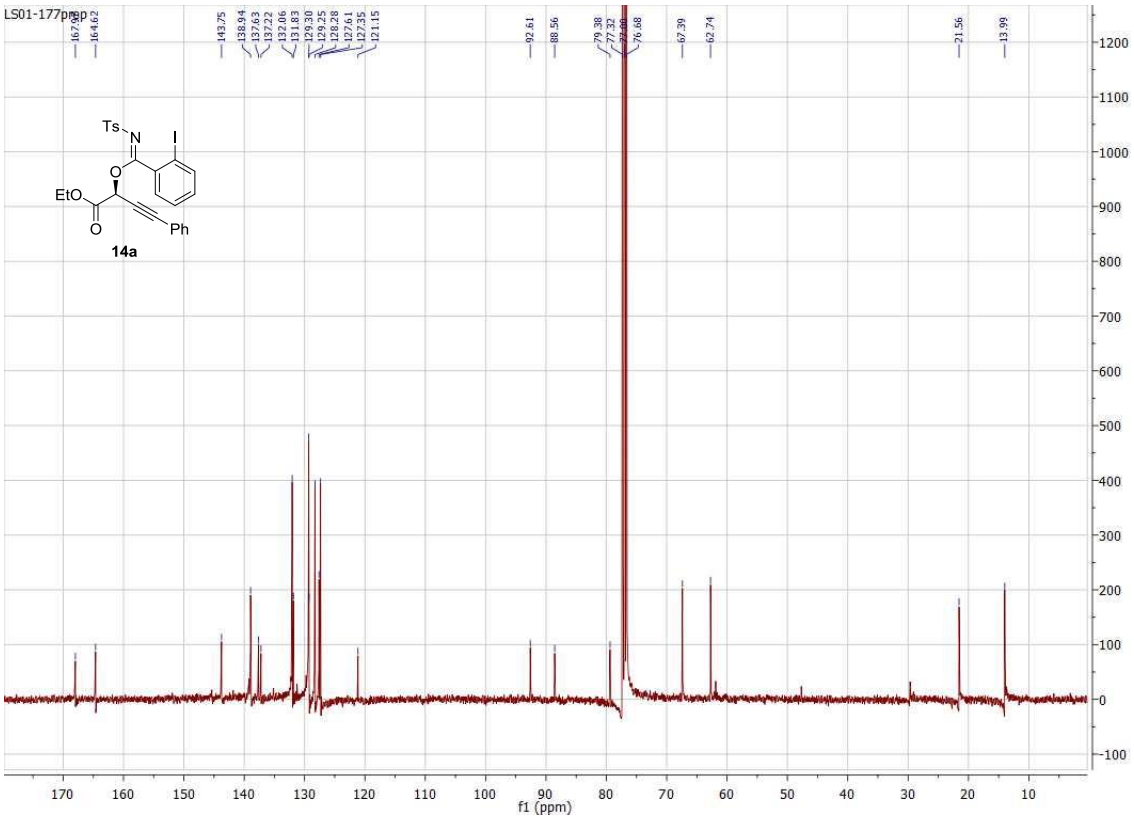
IR of compound **2v**



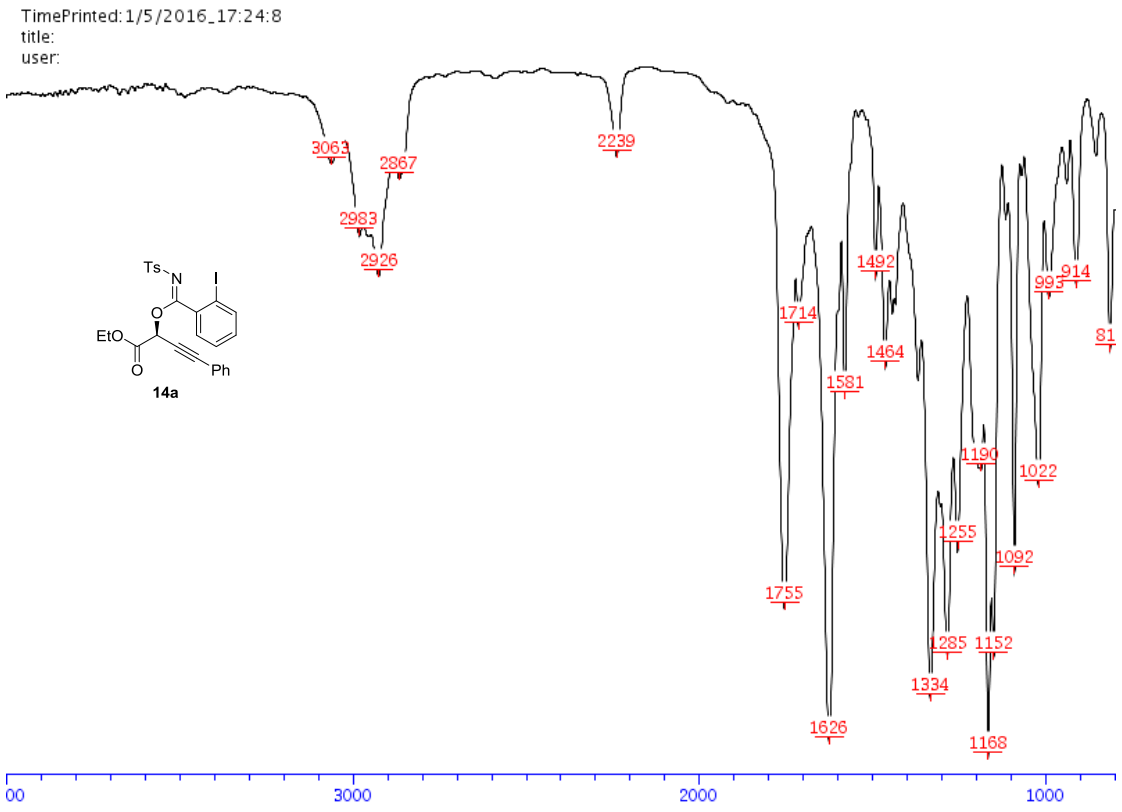
^{1}H-NMR (400 MHz, $CDCl_3$) of compound **14a**



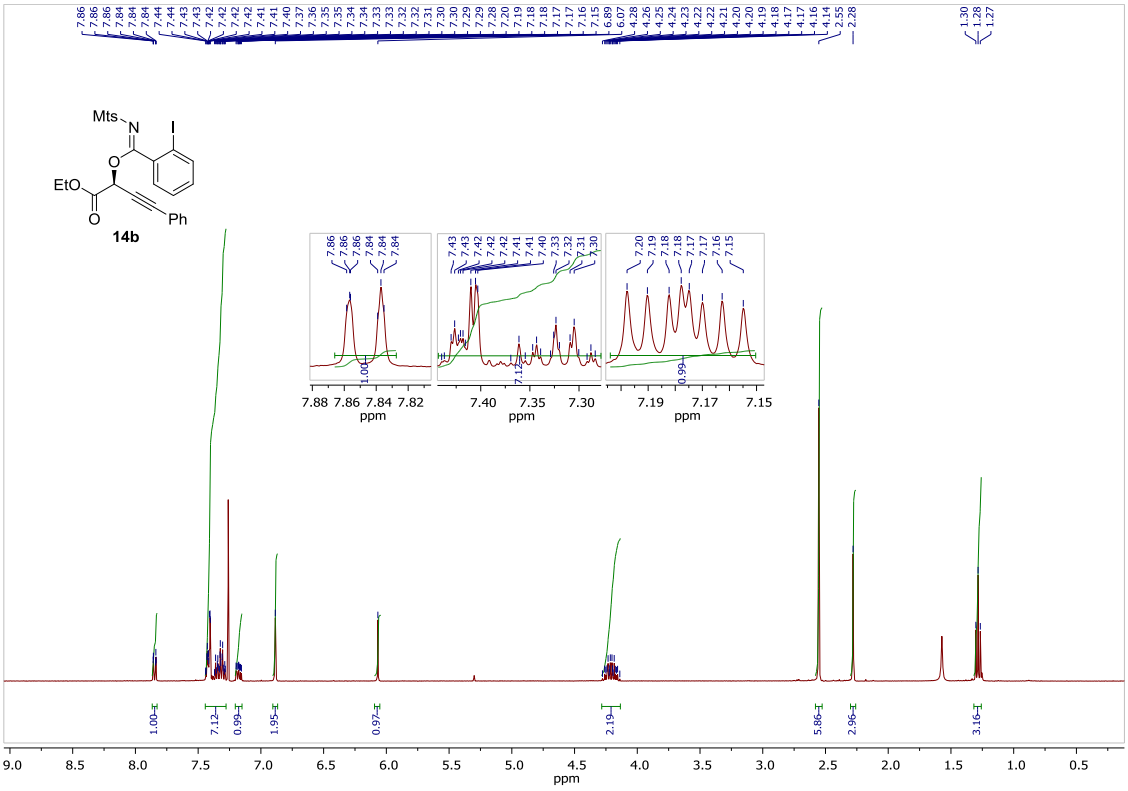
^{13}C-NMR (100 MHz, $CDCl_3$) of compound **14a**



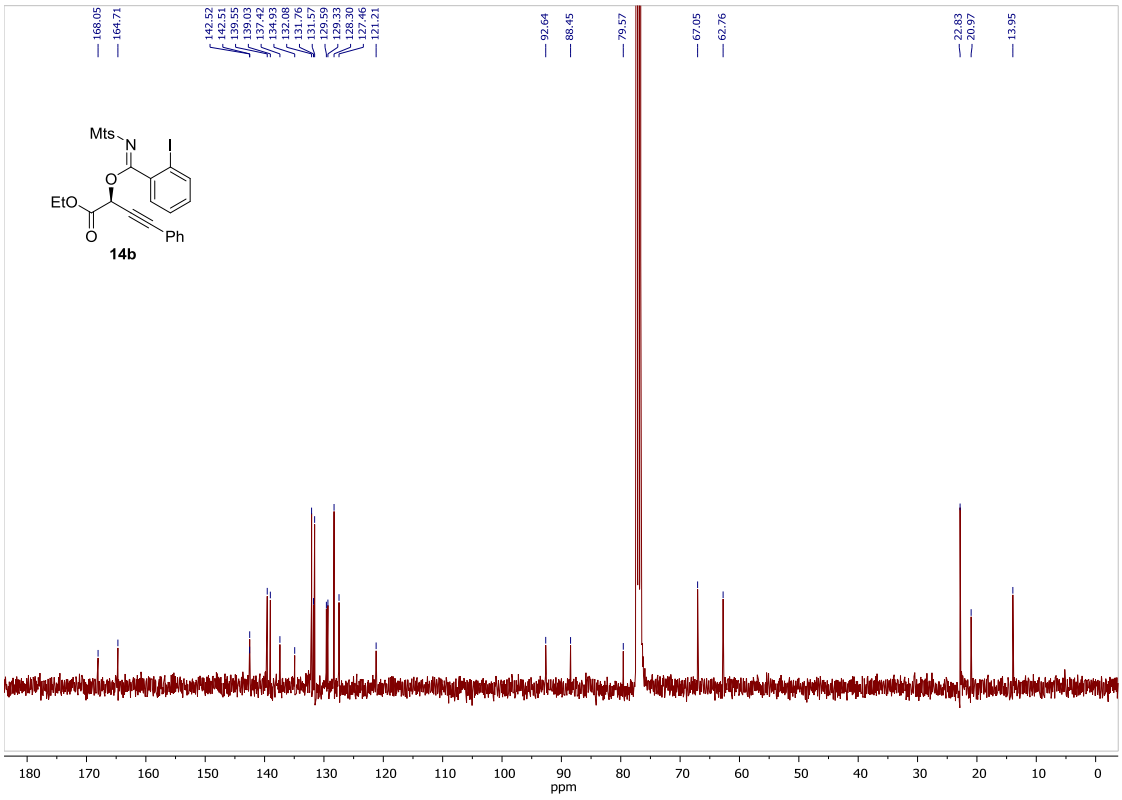
IR of compound **14a**



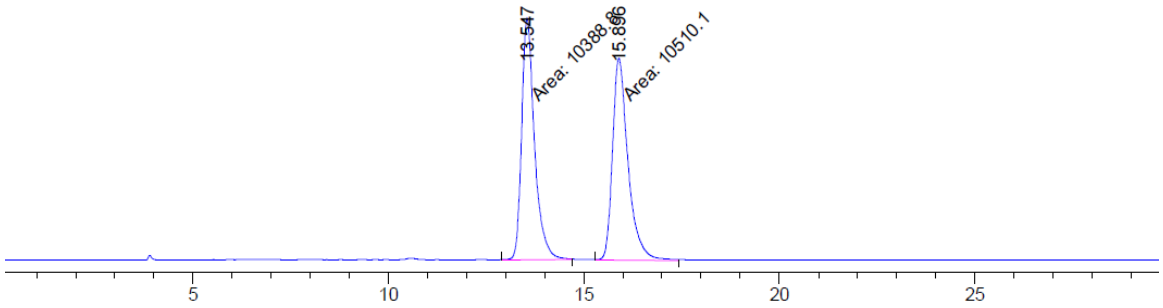
^{1}H-NMR (400 MHz, $CDCl_3$) of compound **14b**



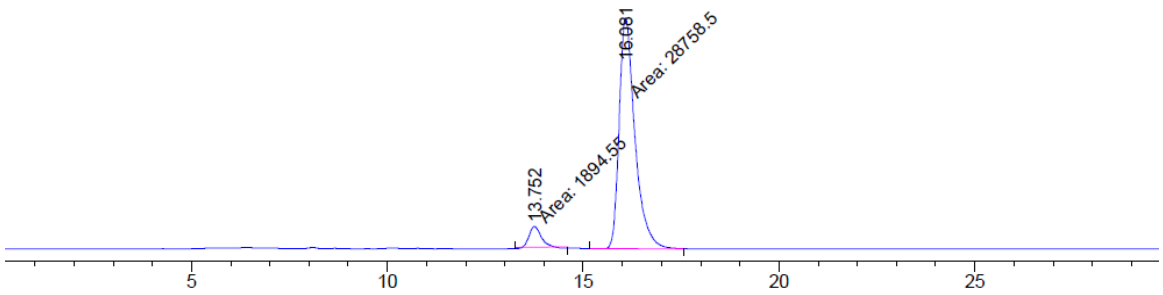
^{13}C-NMR (100 MHz, $CDCl_3$) of compound **14b**



HPLC of compound **14b**

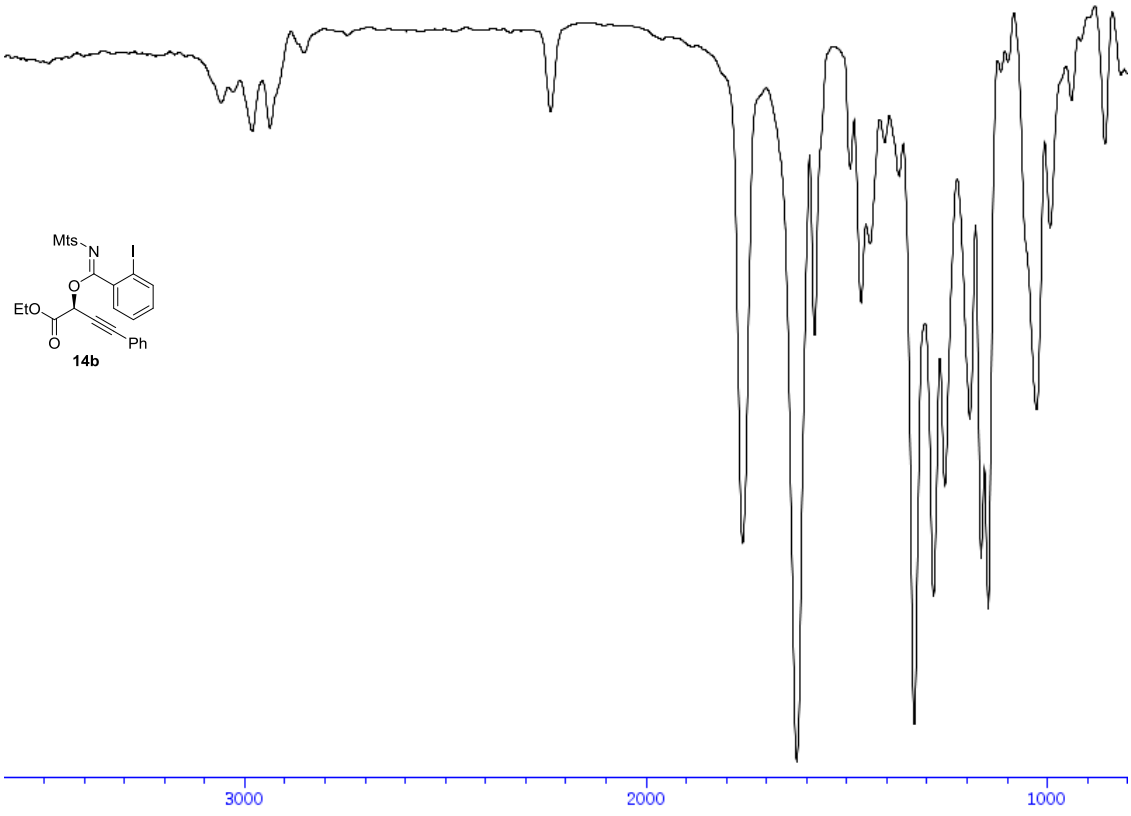


Peak #	RetTime [min]	Type	Width [min]	Area [mAU*s]	Height [mAU]	Area %
1	13.547	MM	0.3828	1.03888e4	452.26245	49.7097
2	15.896	MM	0.4639	1.05101e4	377.59732	50.2903

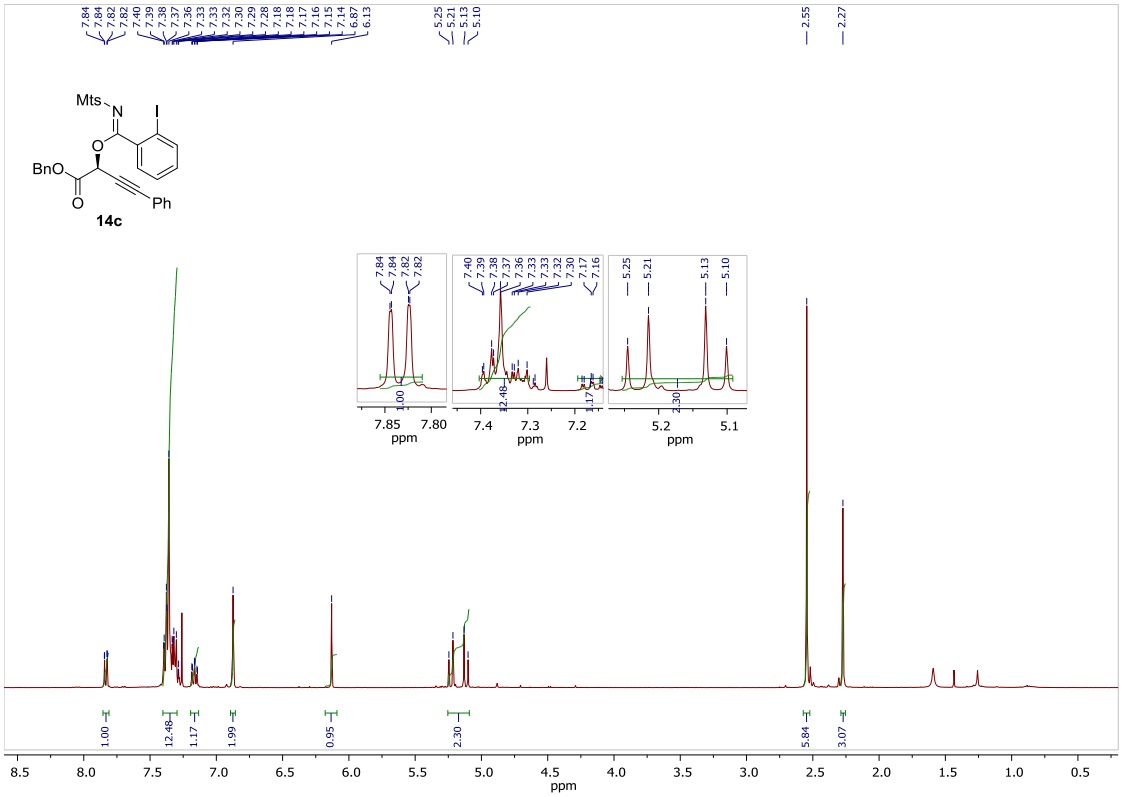


Peak #	RetTime [min]	Type	Width [min]	Area [mAU*s]	Height [mAU]	Area %
1	13.752	MM	0.3443	1894.54541	91.70513	6.1806
2	16.081	MM	0.4663	2.87585e4	1027.95679	93.8194

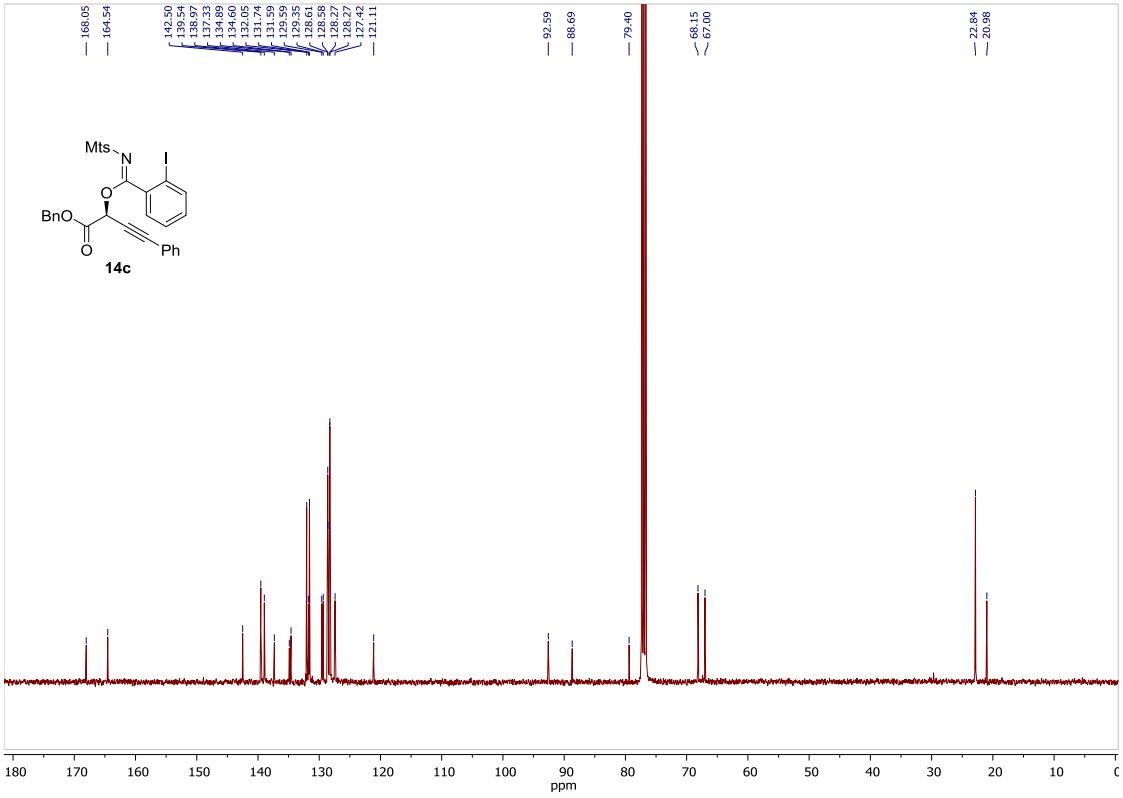
IR of compound **14b**



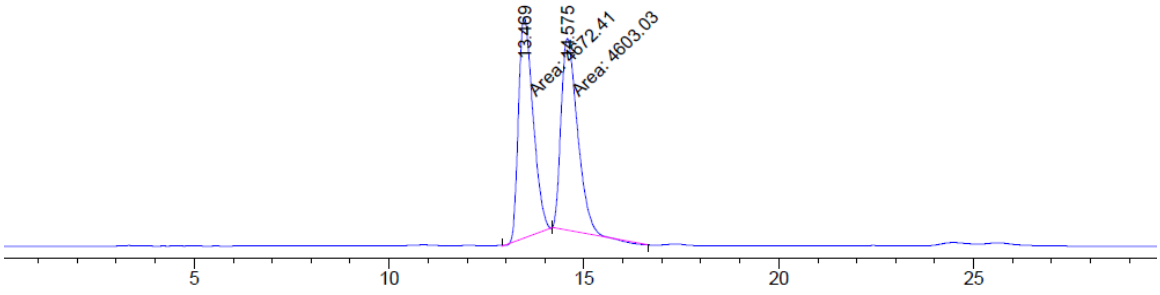
^{1}H-NMR (400 MHz, $CDCl_3$) of compound **14c**



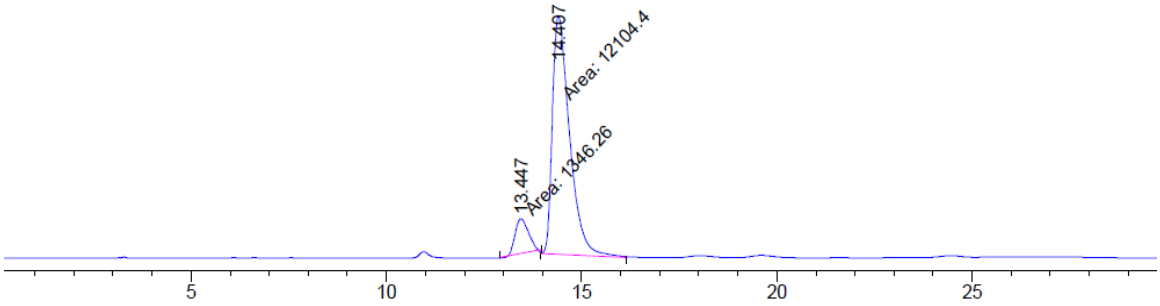
^{13}C-NMR (100 MHz, $CDCl_3$) of compound **14c**



HPLC of compound **14c**

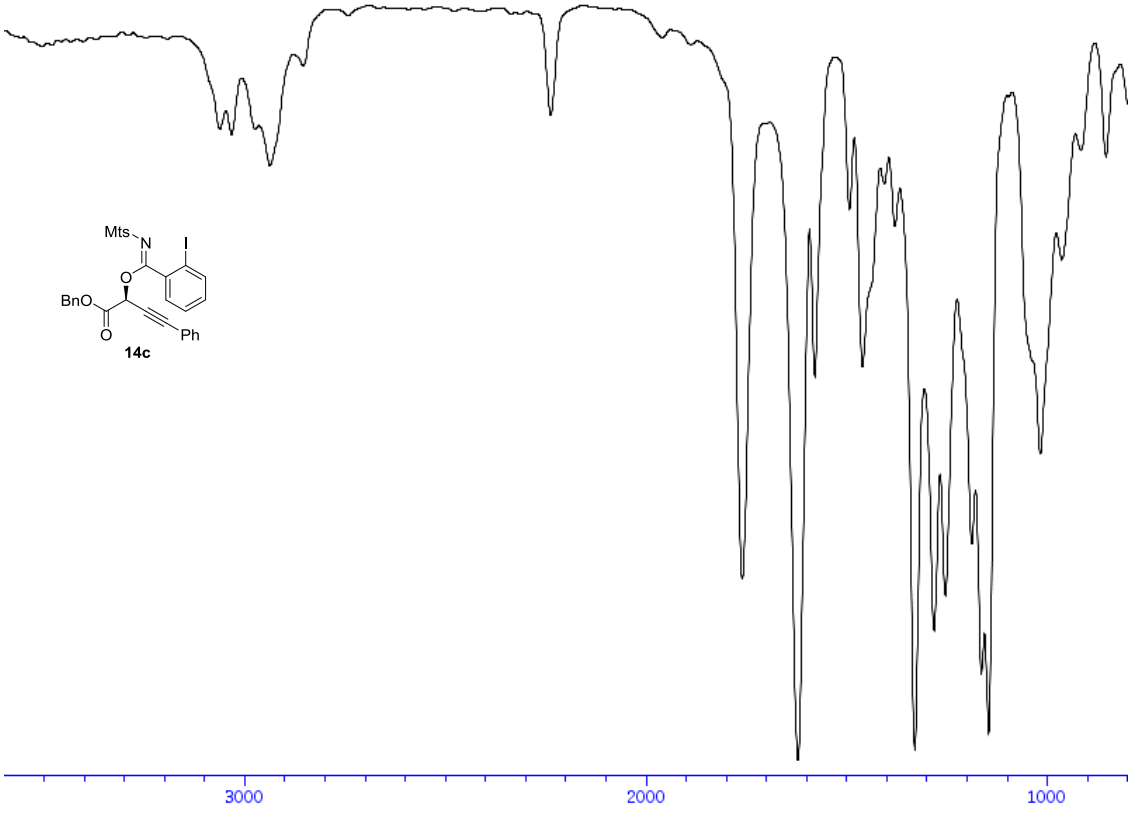


Peak #	RetTime [min]	Type	Width [min]	Area [mAU*s]	Height [mAU]	Area %
1	13.469	MM	0.4316	4672.41211	180.43593	50.3740
2	14.575	MM	0.4915	4603.03125	156.08658	49.6260

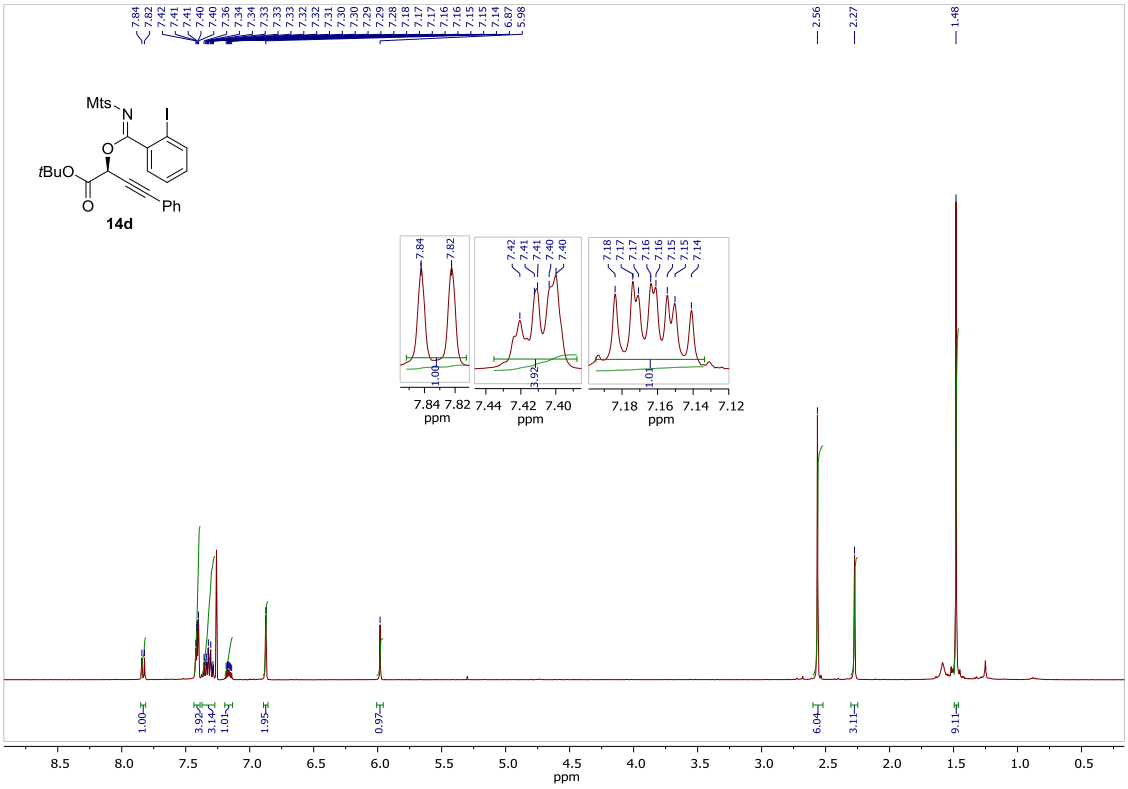


Peak #	RetTime [min]	Type	Width [min]	Area [mAU*s]	Height [mAU]	Area %
1	13.447	MM	0.3915	1346.25659	57.30646	10.0089
2	14.407	MM	0.5109	1.21044e4	394.85516	89.9911

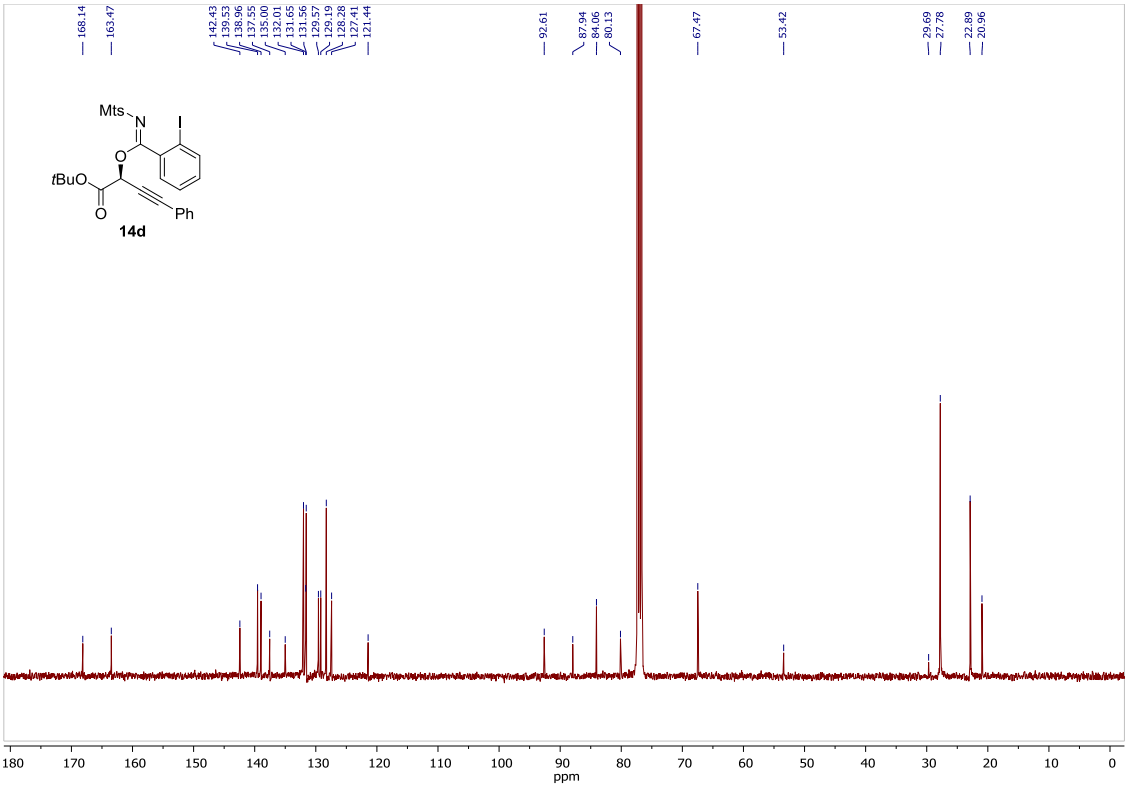
IR of compound **14c**



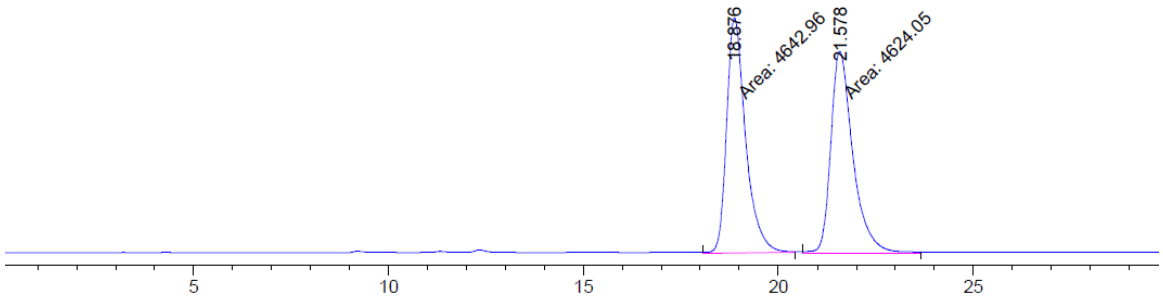
^{1}H-NMR (400 MHz, $CDCl_3$) of compound **14d**



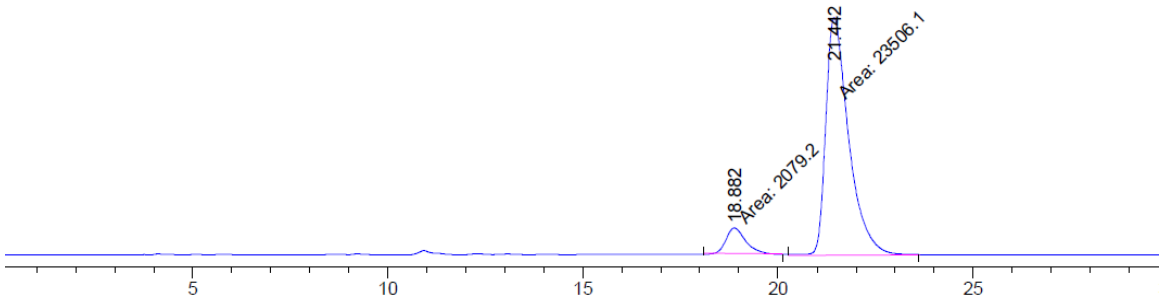
^{13}C-NMR (100 MHz, $CDCl_3$) of compound **14d**



HPLC of compound **14d**

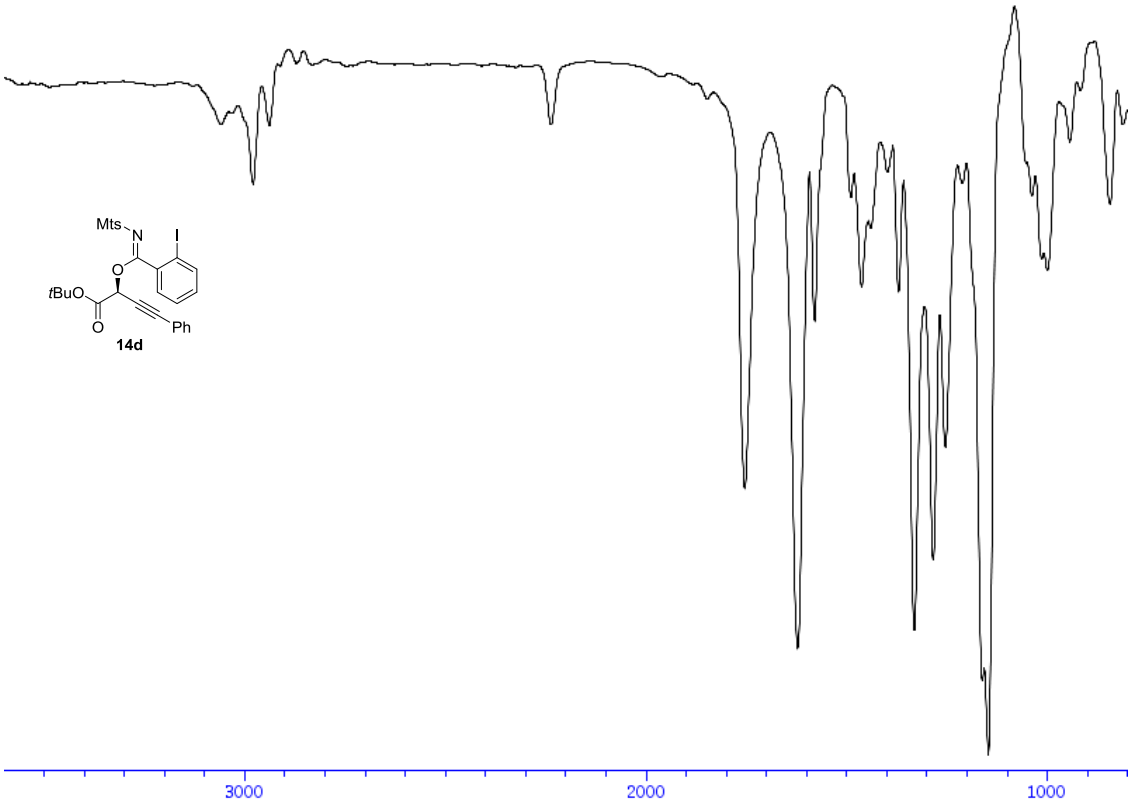


Peak #	RetTime [min]	Type	Width [min]	Area [mAU*s]	Height [mAU]	Area %
1	18.876	MM	0.5666	4642.95654	136.57939	50.1020
2	21.578	MM	0.6583	4624.04688	117.07304	49.8980

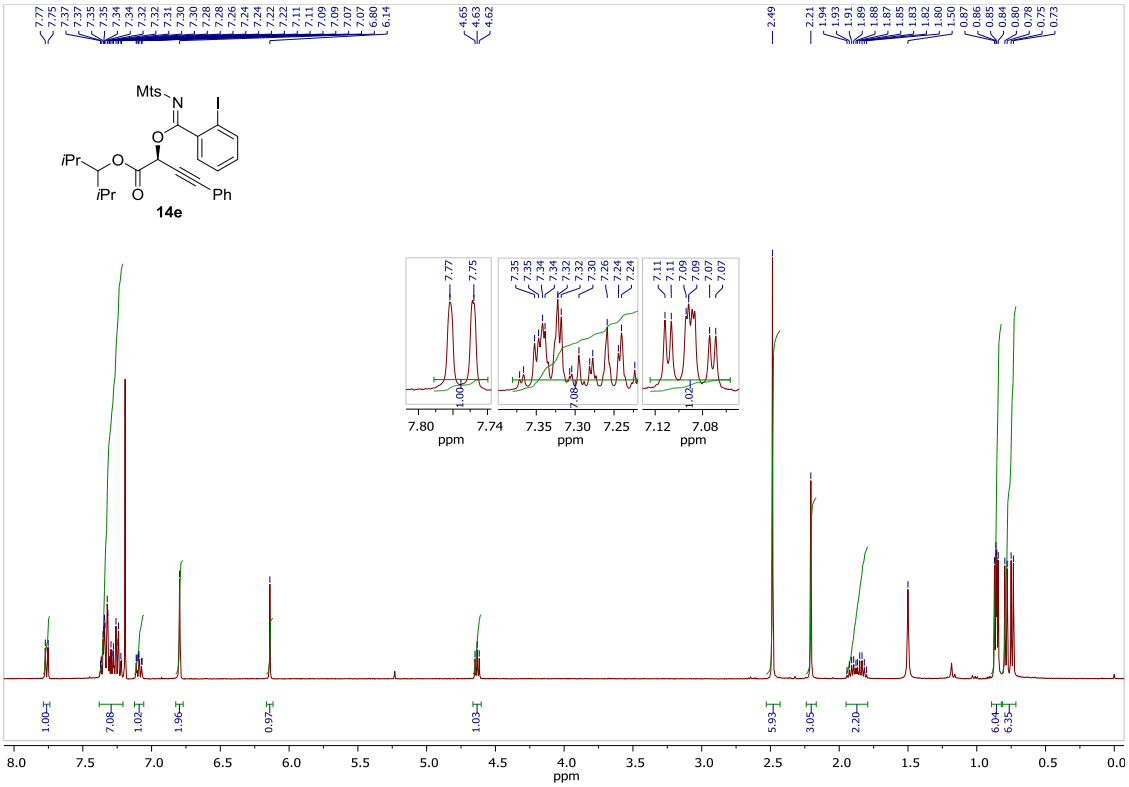


Peak #	RetTime [min]	Type	Width [min]	Area [mAU*s]	Height [mAU]	Area %
1	18.882	MM	0.5642	2079.19824	61.41628	8.1265
2	21.442	MM	0.6829	2.35061e4	573.65594	91.8735

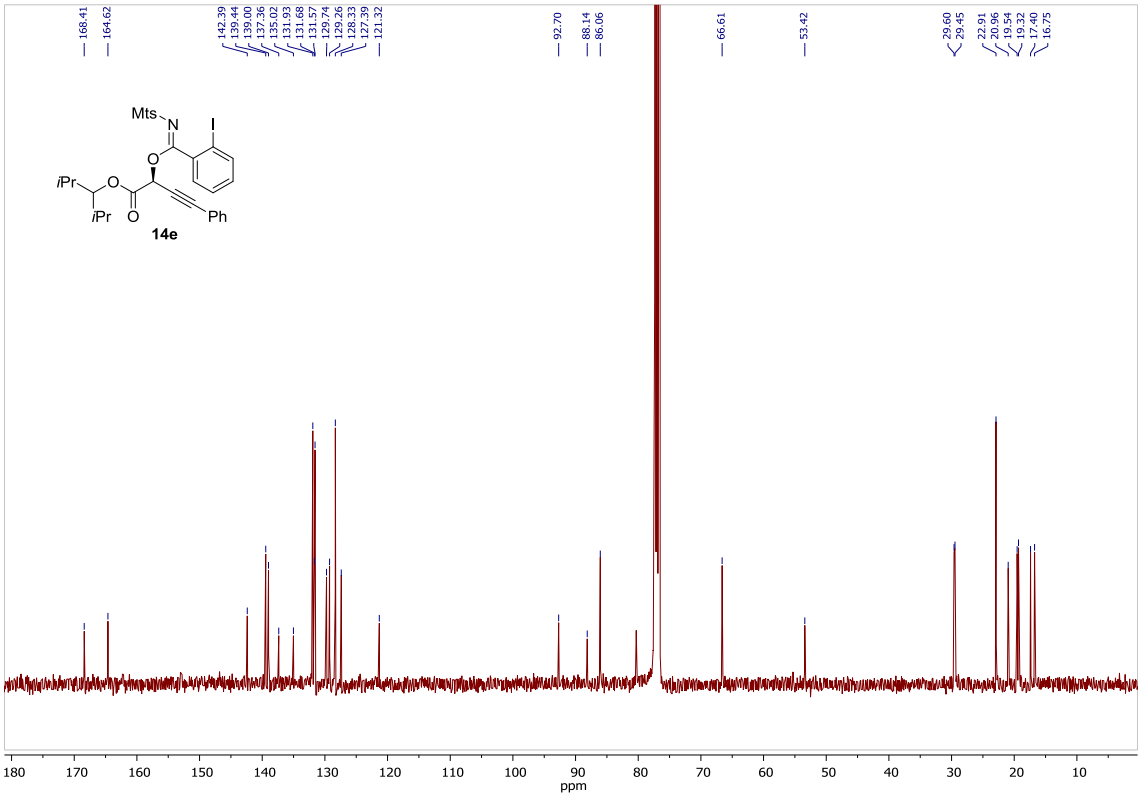
IR of compound **14d**



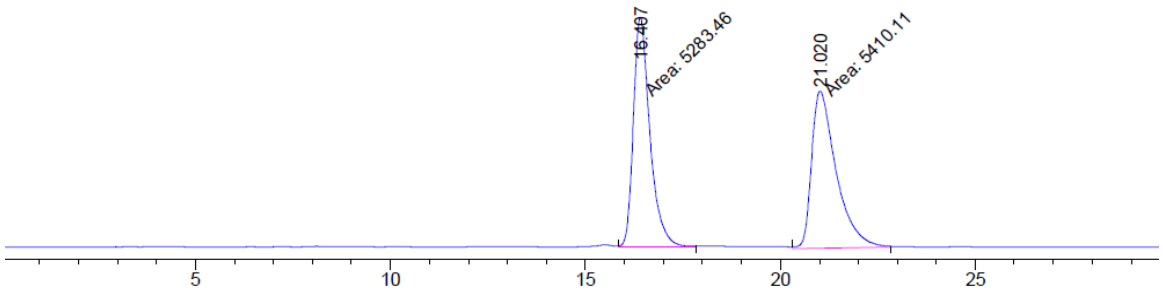
^{1}H-NMR (400 MHz, $CDCl_3$) of compound **14e**



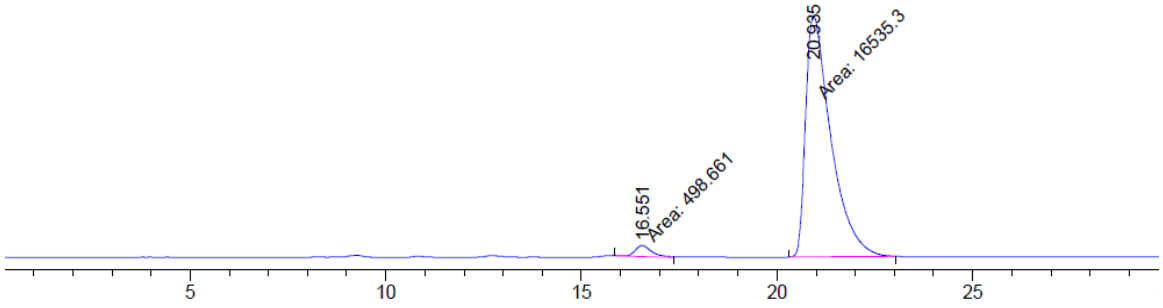
^{13}C-NMR (100 MHz, $CDCl_3$) of compound **14e**



HPLC of compound **14e**

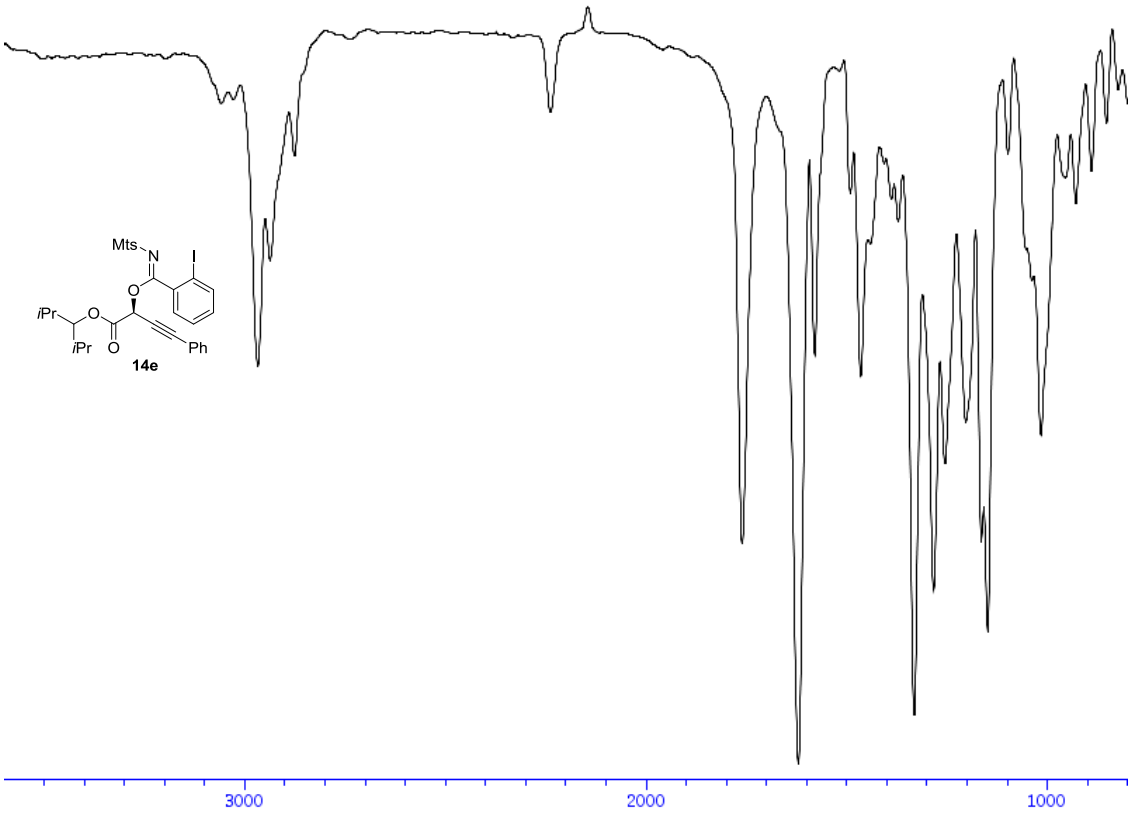


Peak #	RetTime [min]	Type	Width [min]	Area [mAU*s]	Height [mAU]	Area %
1	16.407	MM	0.4906	5283.46338	179.49147	49.4079
2	21.020	MM	0.7325	5410.10693	123.09530	50.5921

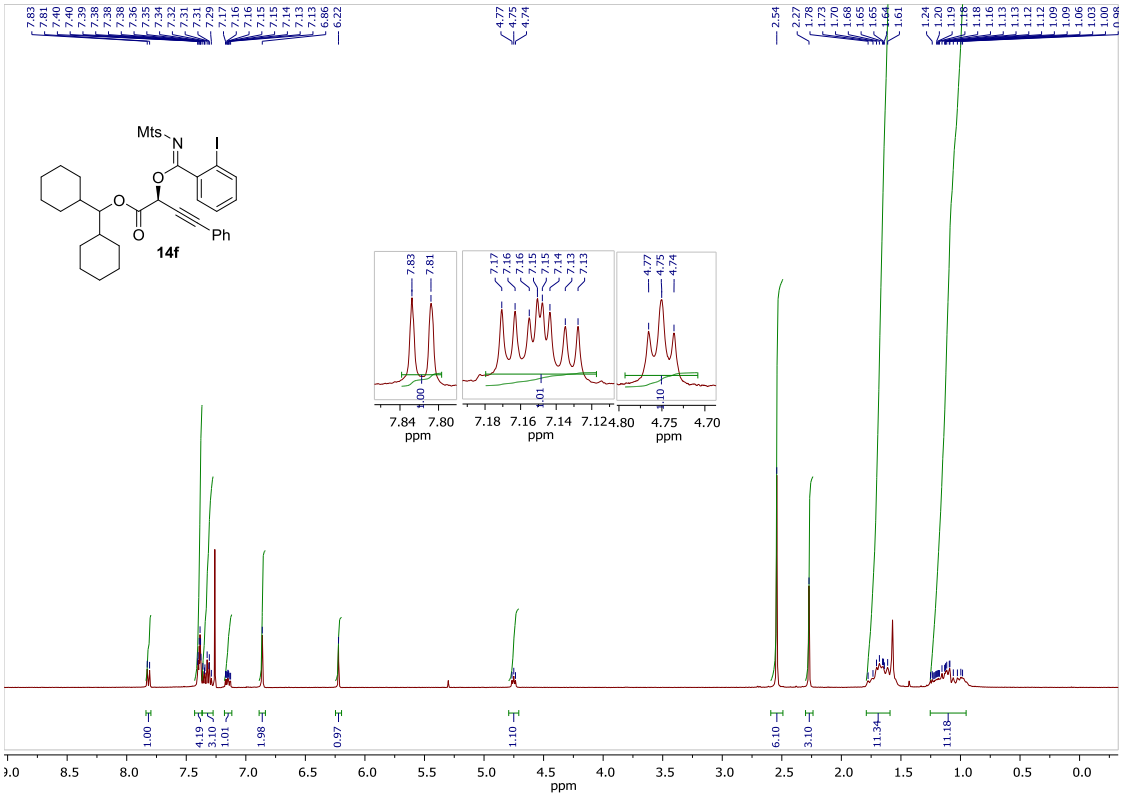


Peak #	RetTime [min]	Type	Width [min]	Area [mAU*s]	Height [mAU]	Area %
1	16.551	MM	0.4933	498.66092	16.84625	2.9274
2	20.935	MM	0.7512	1.65353e4	366.85864	97.0726

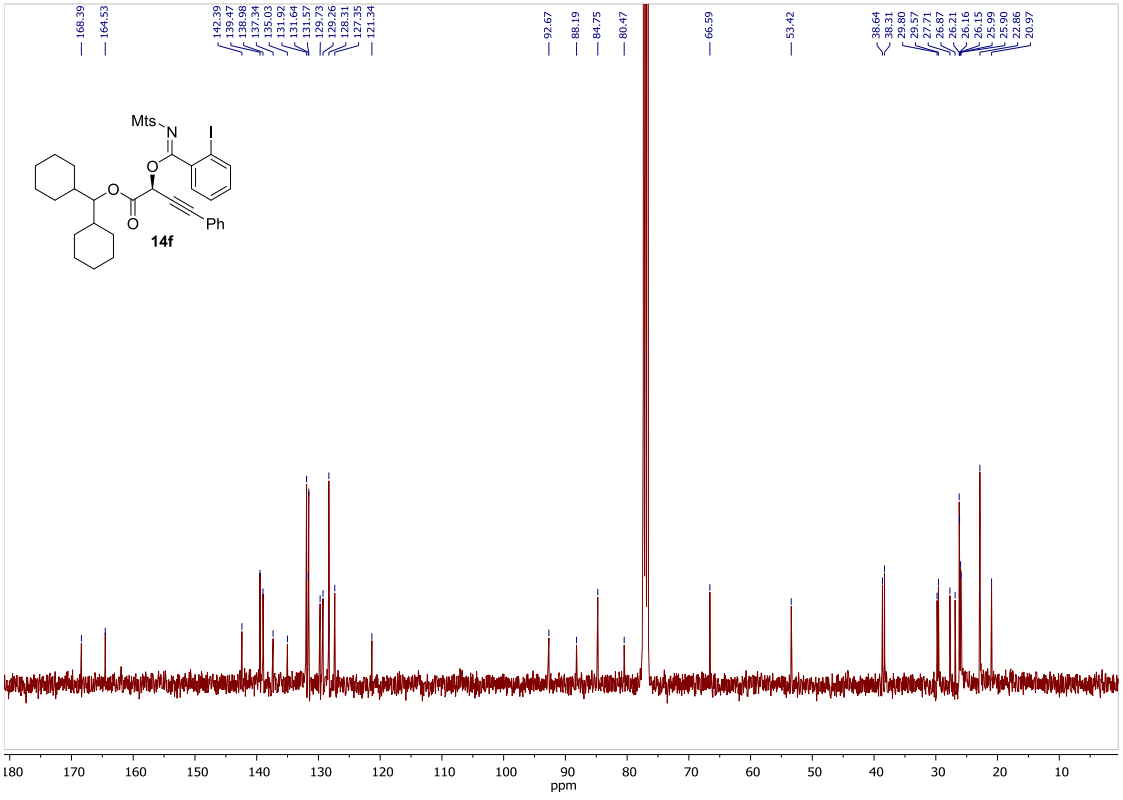
IR of compound **14e**



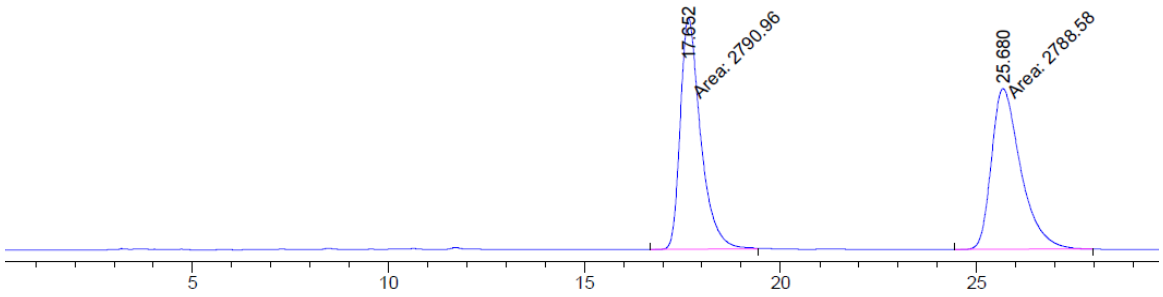
^{1}H-NMR (400 MHz, $CDCl_3$) of compound **14f**



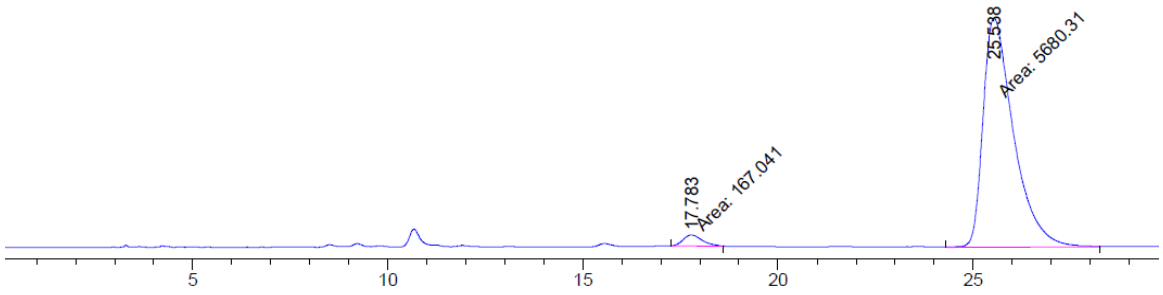
^{13}C-NMR (100 MHz, $CDCl_3$) of compound **14f**



HPLC of compound **14f**

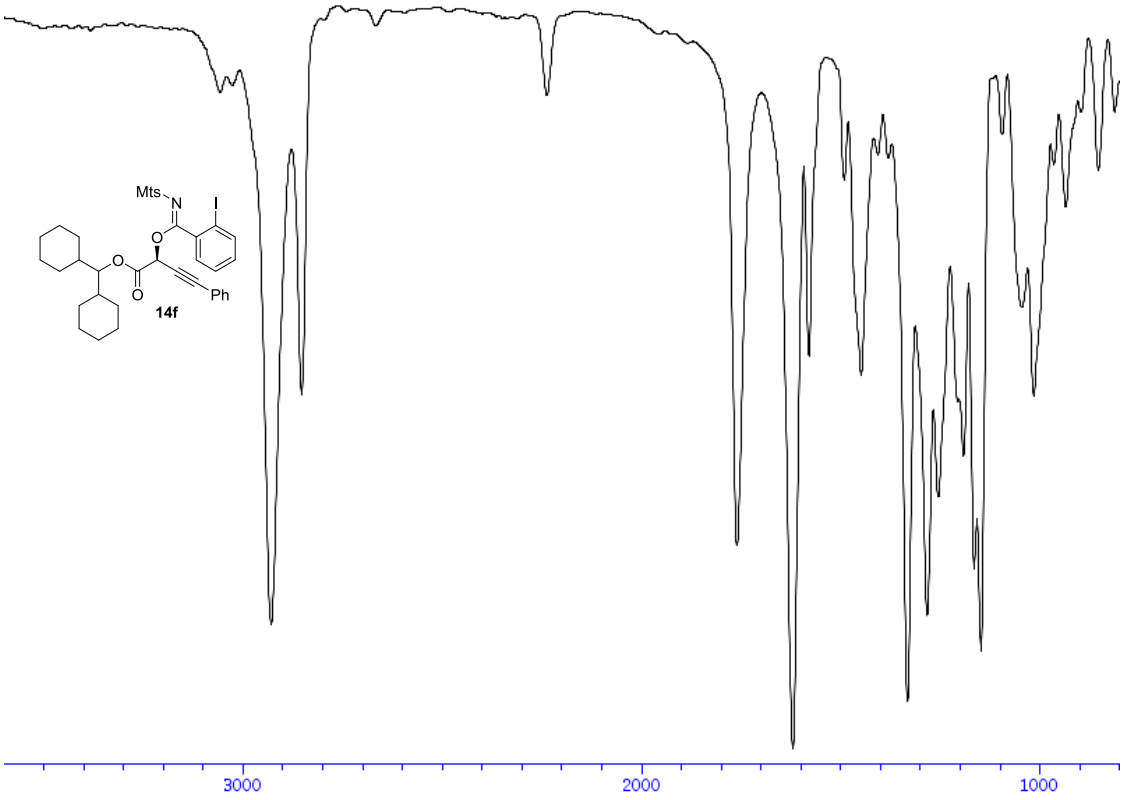


Peak #	RetTime [min]	Type	Width [min]	Area [mAU*s]	Height [mAU]	Area %
1	17.652	MM	0.6013	2790.95996	77.36147	50.0213
2	25.680	MM	0.8653	2788.58301	53.71205	49.9787

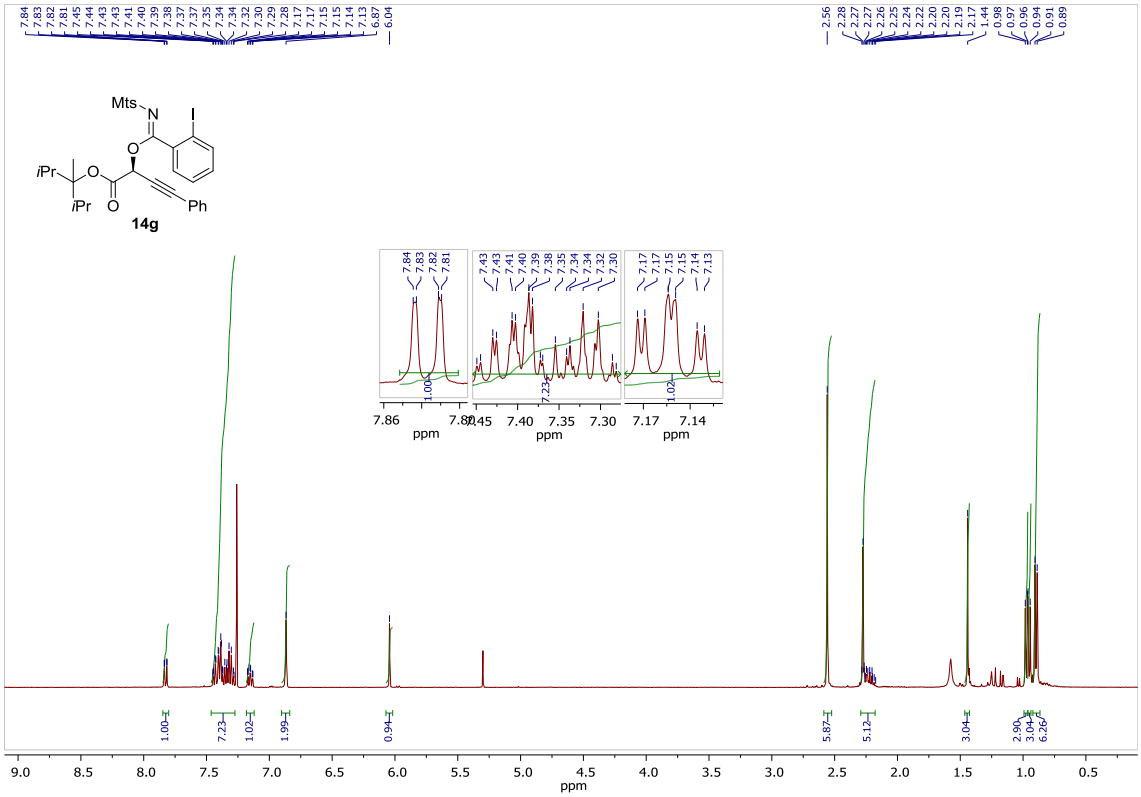


Peak #	RetTime [min]	Type	Width [min]	Area [mAU*s]	Height [mAU]	Area %
1	17.783	MM	0.5595	167.04128	4.97625	2.8567
2	25.538	MM	0.9092	5680.30566	104.12856	97.1433

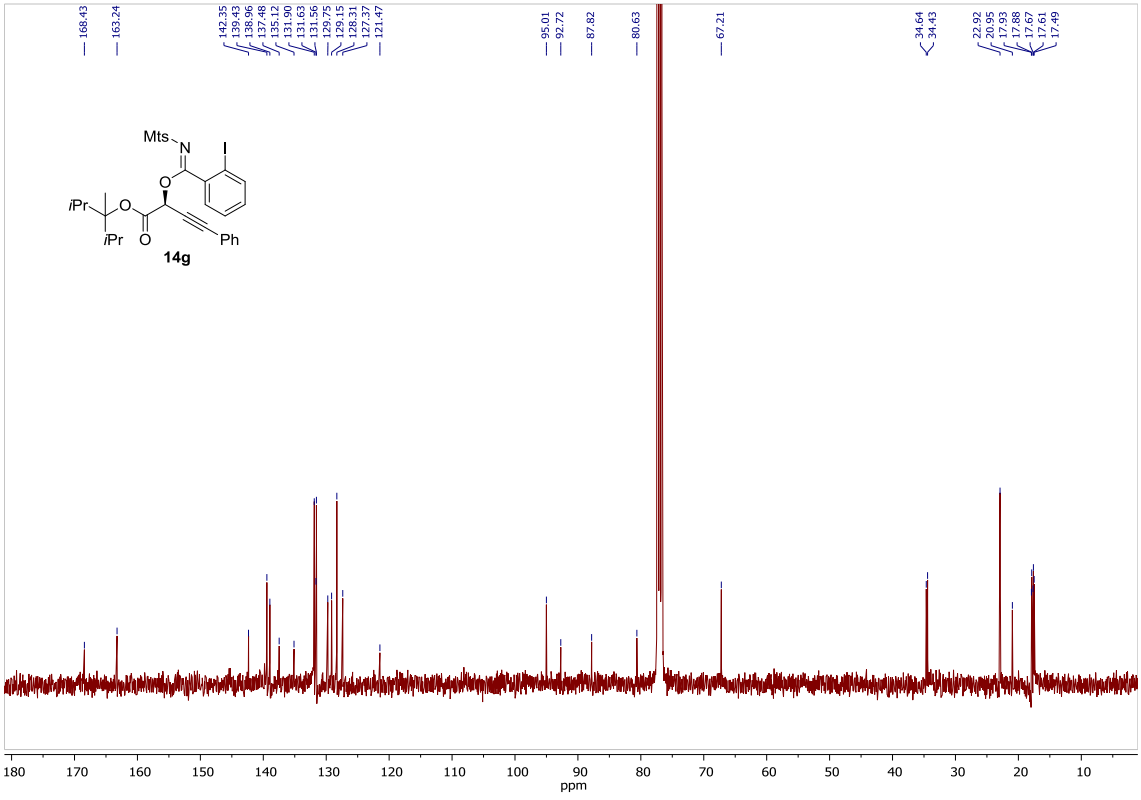
IR of compound **14f**



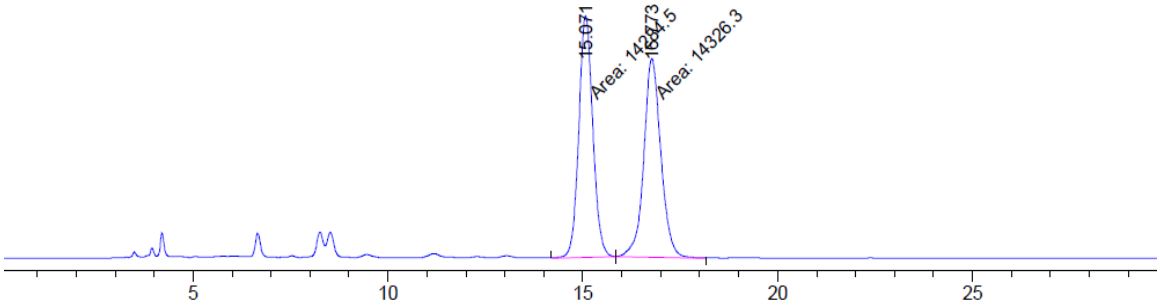
^{1}H-NMR (400 MHz, $CDCl_3$) of compound **14g**



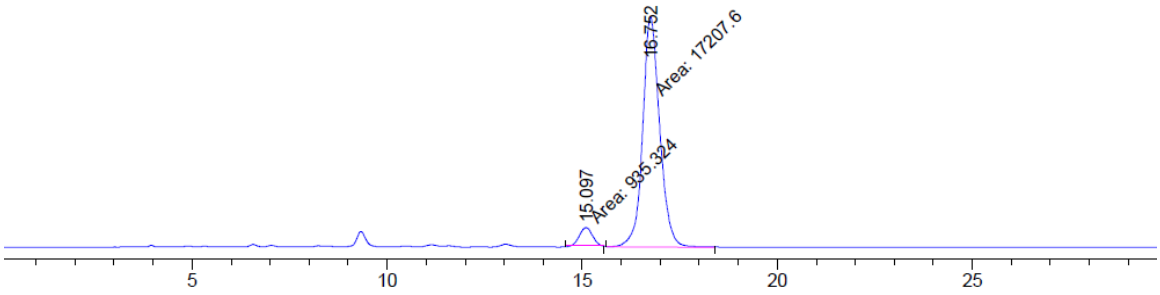
^{13}C-NMR (100 MHz, $CDCl_3$) of compound **14g**



HPLC of compound **14g**

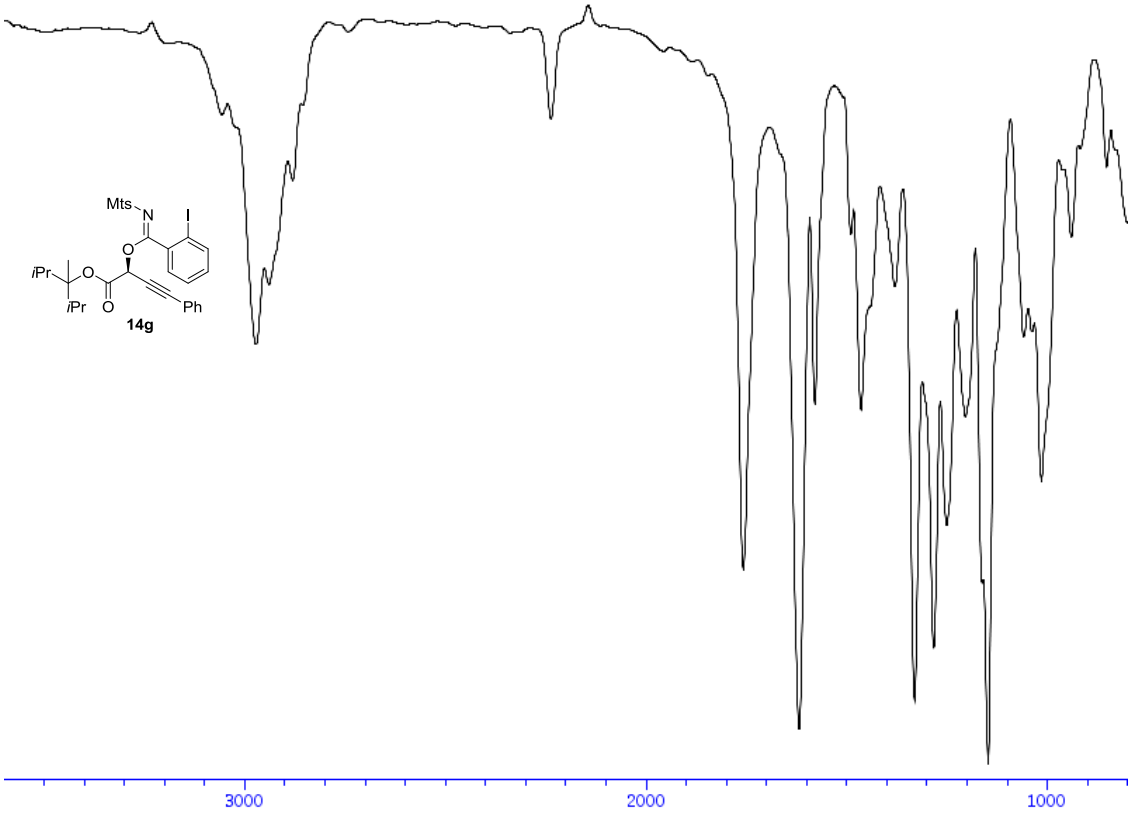


Peak #	RetTime [min]	Type	Width [min]	Area [mAU*s]	Height [mAU]	Area %
1	15.071	MM	0.4174	1.42845e4	570.35419	49.9269
2	16.773	MM	0.5090	1.43263e4	469.09814	50.0731

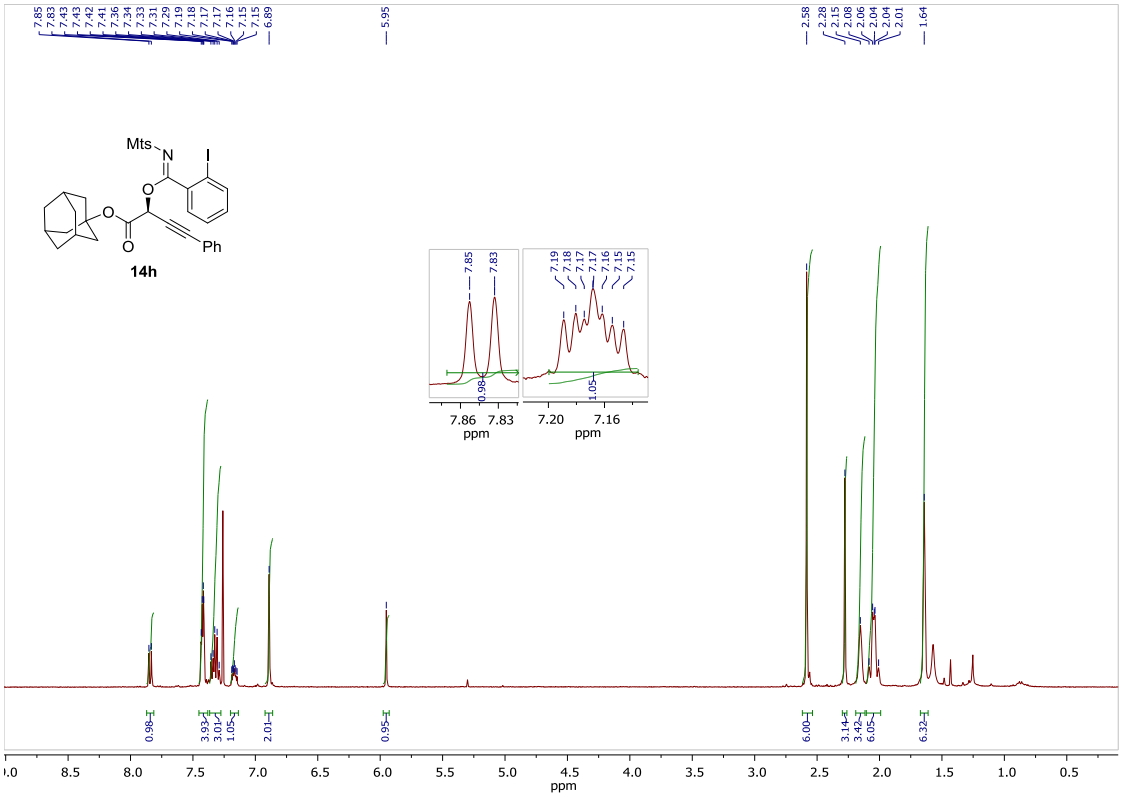


Peak #	RetTime [min]	Type	Width [min]	Area [mAU*s]	Height [mAU]	Area %
1	15.097	MM	0.3620	935.32355	43.05840	5.1553
2	16.752	MM	0.5046	1.72076e4	568.34613	94.8447

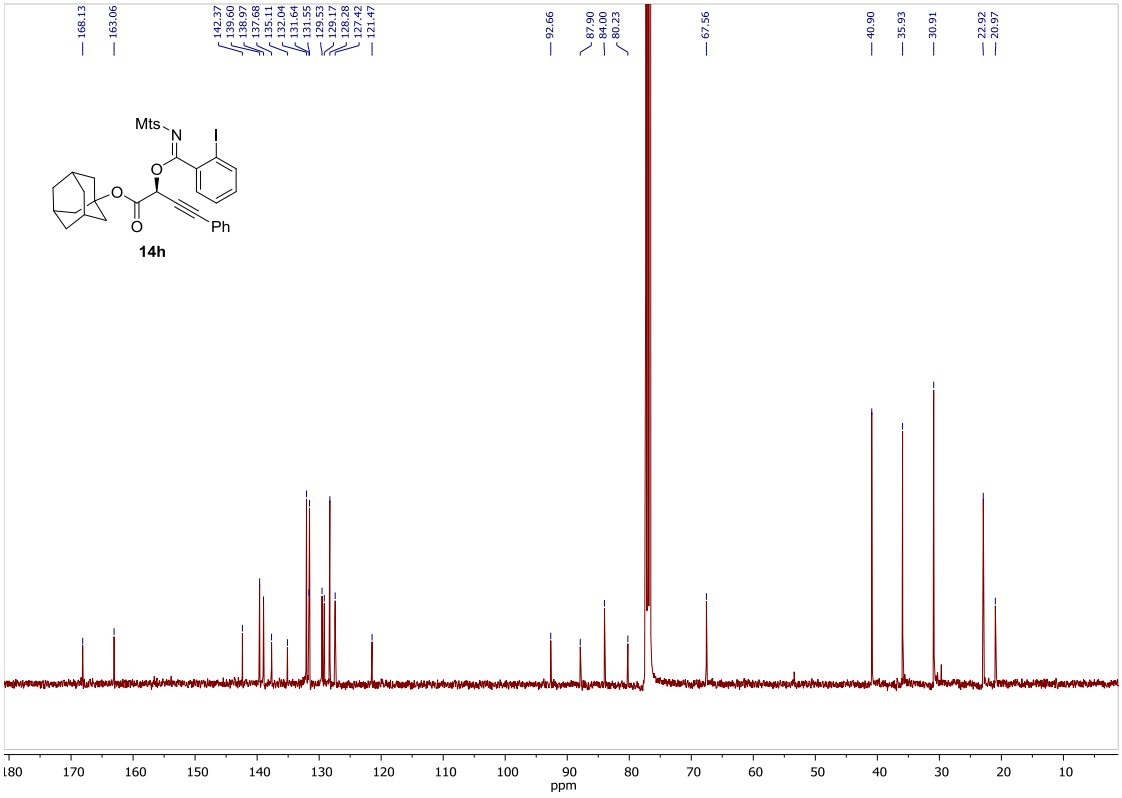
IR of compound **14g**



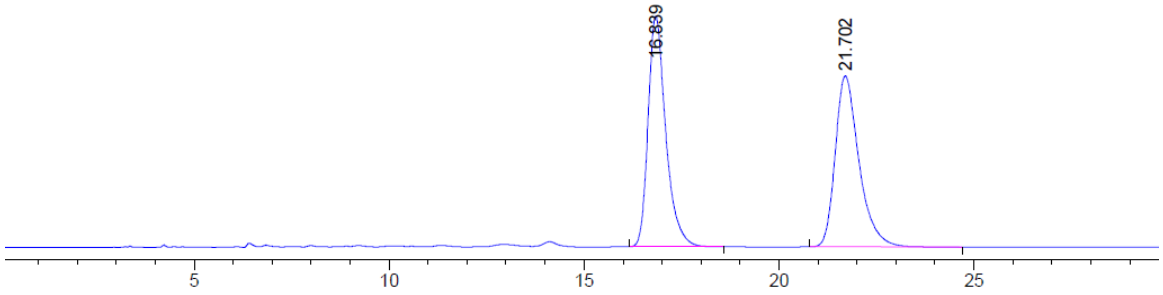
^{1}H-NMR (400 MHz, $CDCl_3$) of compound **14h**



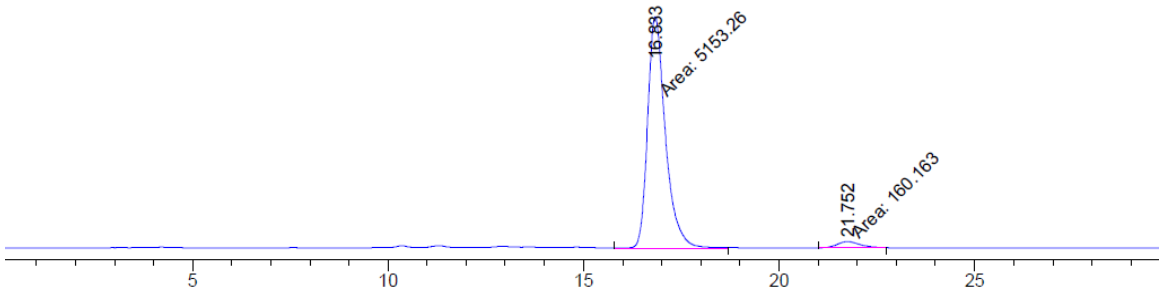
^{13}C-NMR (100 MHz, $CDCl_3$) of compound **14h**



HPLC of compound **14h**

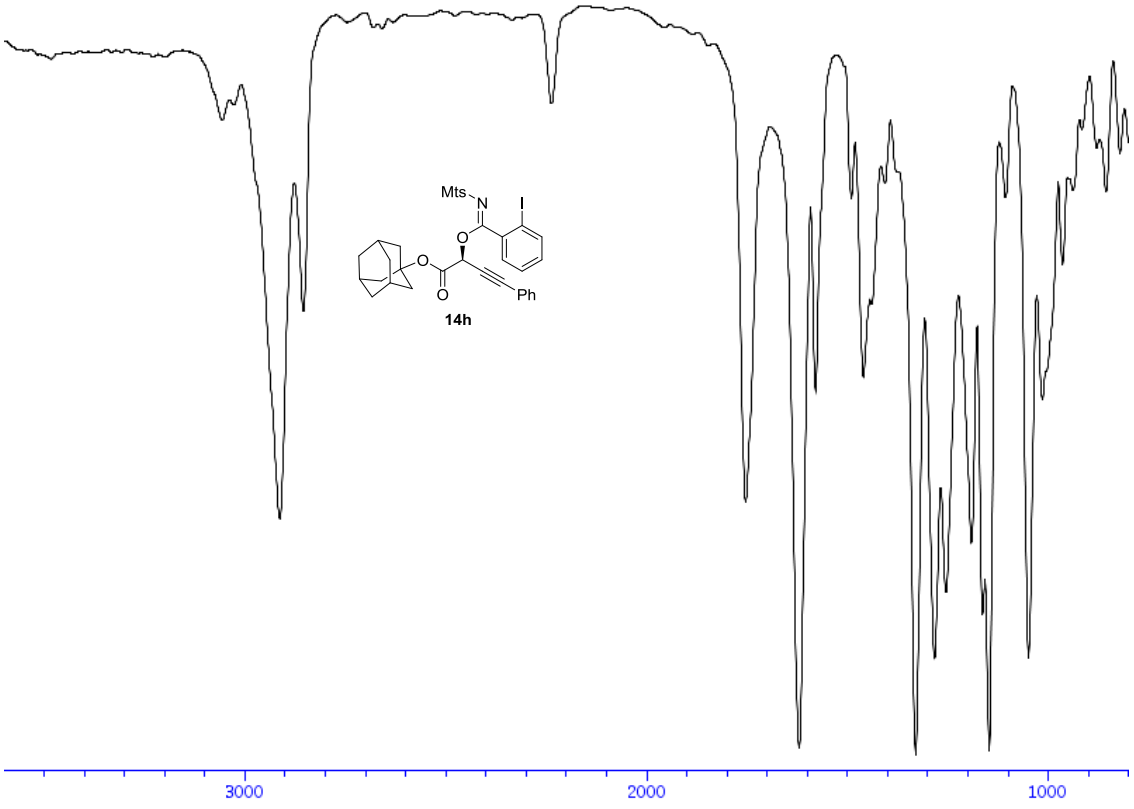


Peak #	RetTime [min]	Type	Width [min]	Area [mAU*s]	Height [mAU]	Area %
1	16.839	BB	0.4749	2563.26416	81.51652	49.9923
2	21.702	BB	0.6414	2564.05518	60.38333	50.0077

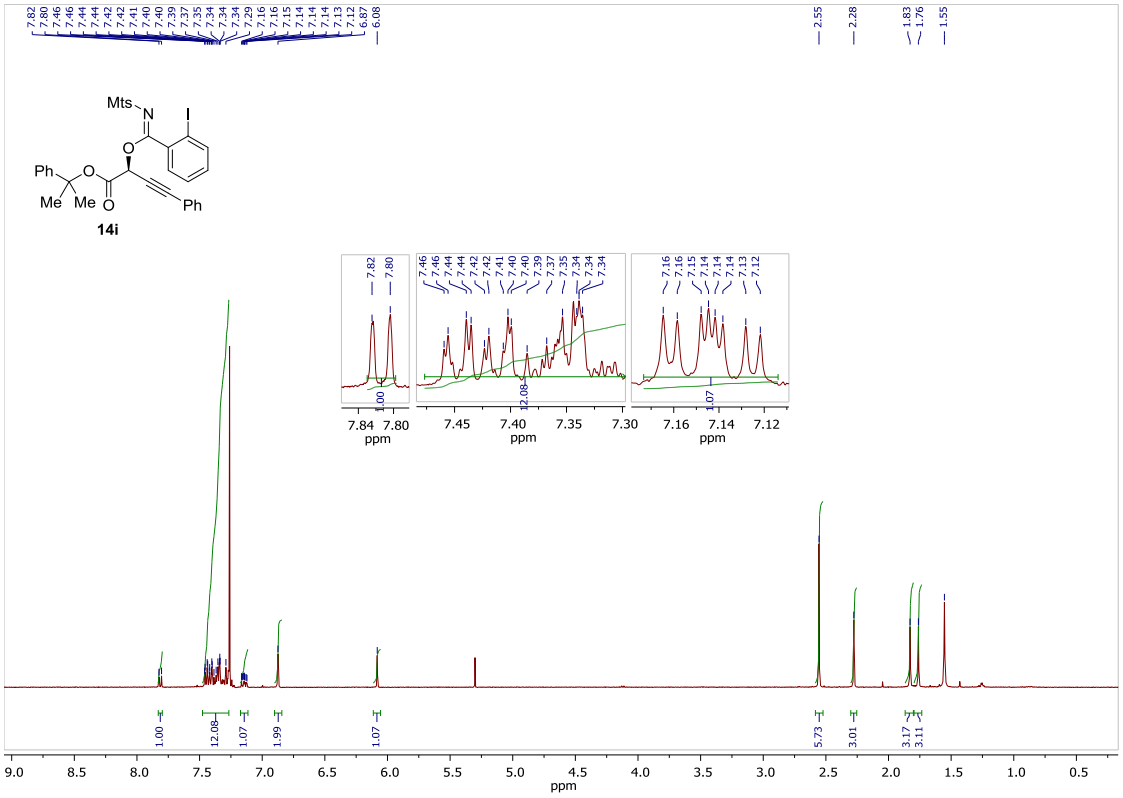


Peak #	RetTime [min]	Type	Width [min]	Area [mAU*s]	Height [mAU]	Area %
1	16.833	MM	0.5266	5153.25586	163.09471	96.9857
2	21.752	MM	0.6356	160.16348	4.19962	3.0143

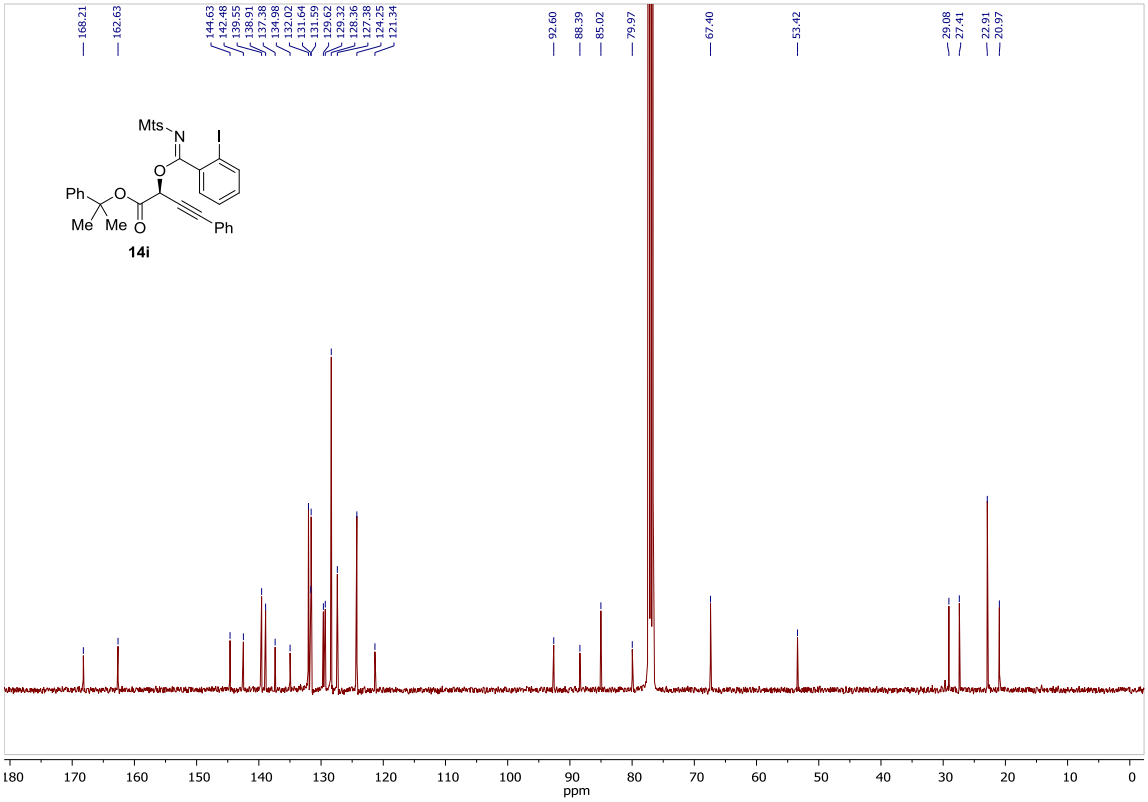
IR of compound **14h**



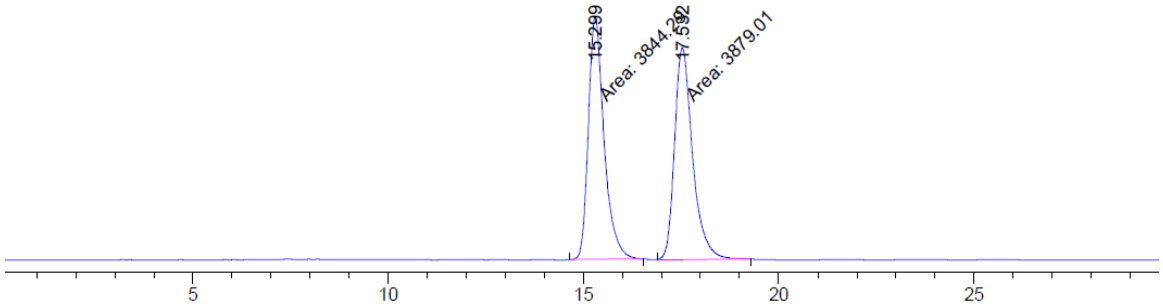
^{1}H-NMR (400 MHz, $CDCl_3$) of compound **14i**



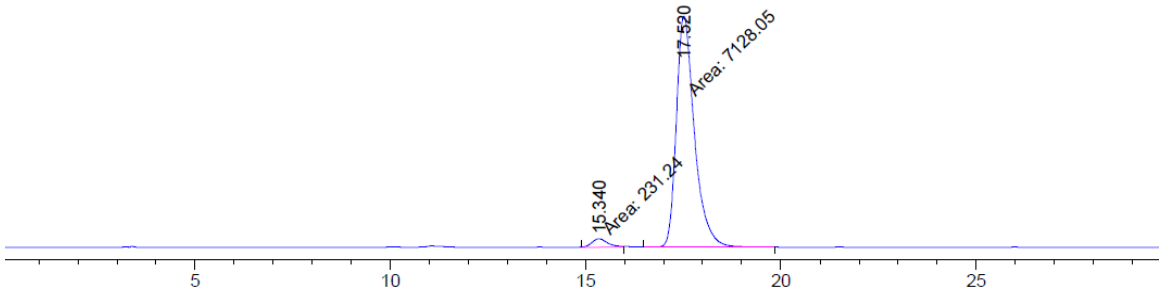
^{13}C-NMR (100 MHz, $CDCl_3$) of compound **14i**



HPLC of compound **14i**

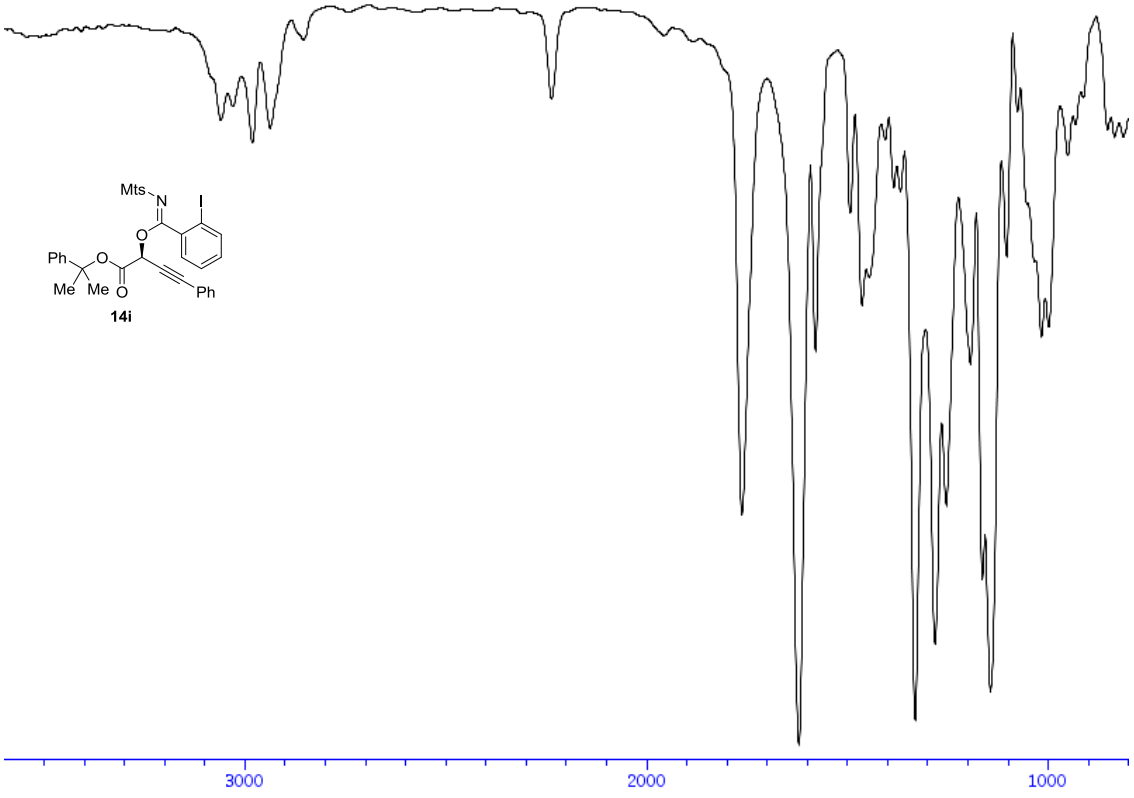


Peak #	RetTime [min]	Type	Width [min]	Area [mAU*s]	Height [mAU]	Area %
1	15.299	MM	0.4655	3844.29224	137.64803	49.7752
2	17.532	MM	0.5364	3879.01025	120.51623	50.2248

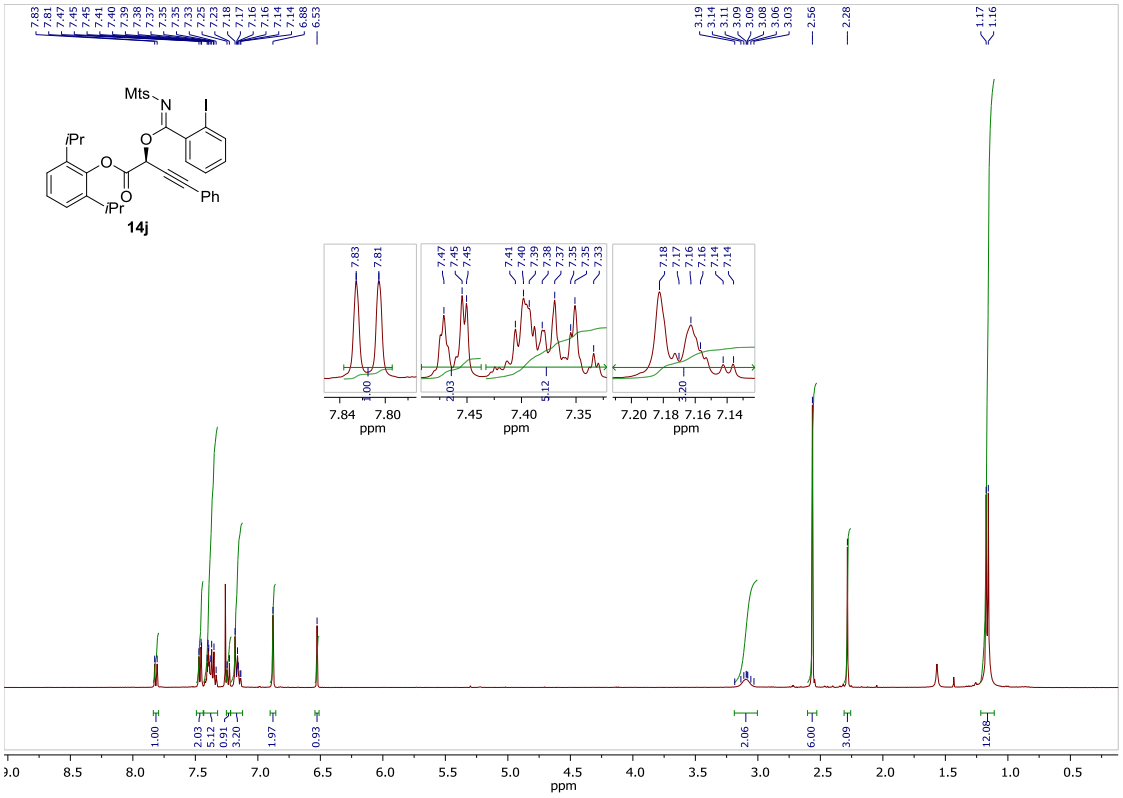


Peak #	RetTime [min]	Type	Width [min]	Area [mAU*s]	Height [mAU]	Area %
1	15.340	MM	0.4658	231.24036	8.27390	3.1422
2	17.520	MM	0.5354	7128.05273	221.89154	96.8578

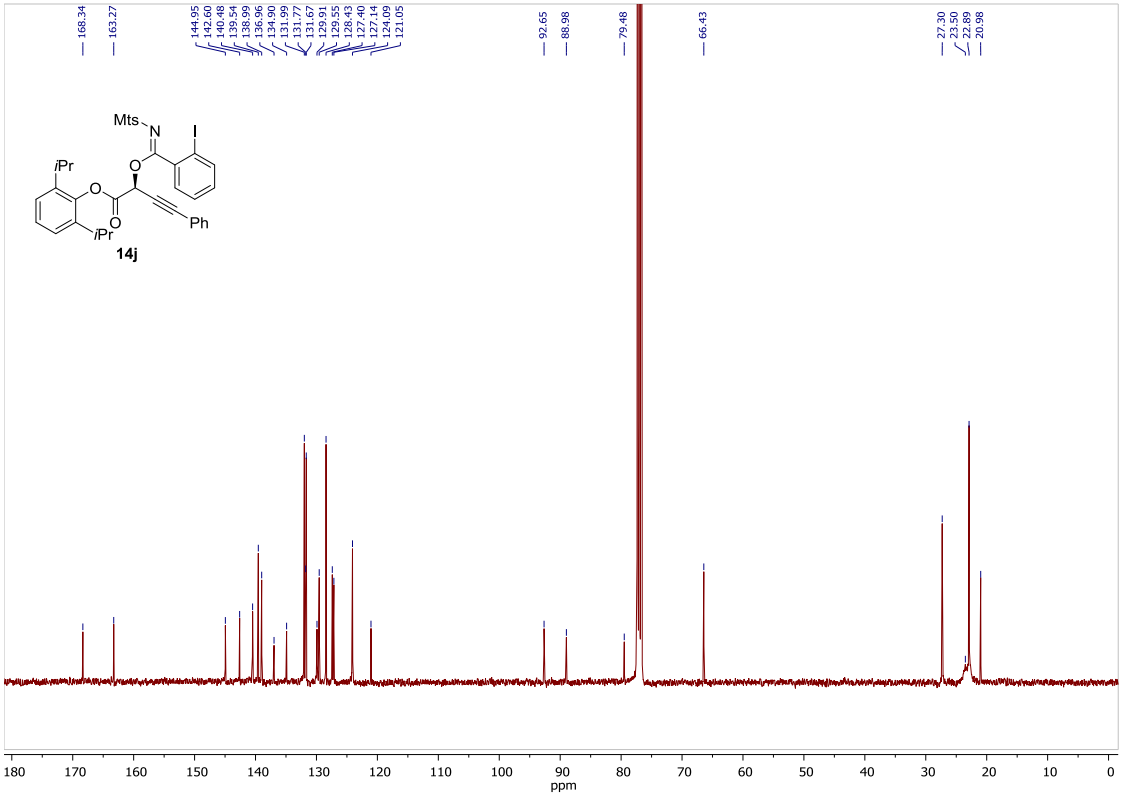
IR of compound **14i**



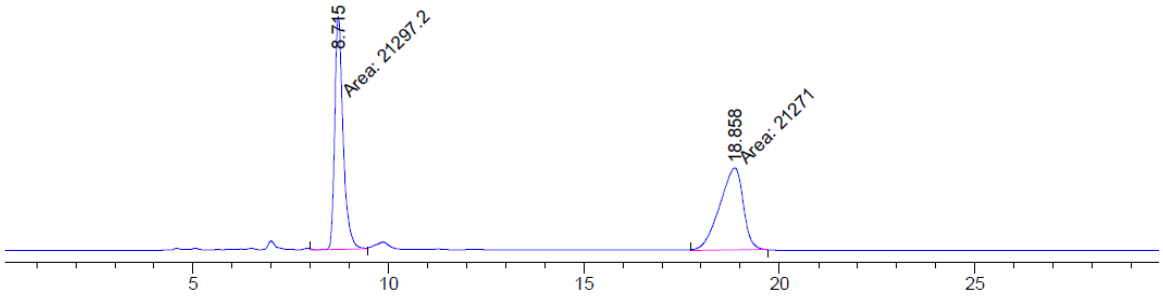
^{1}H-NMR (400 MHz, $CDCl_3$) of compound **14j**



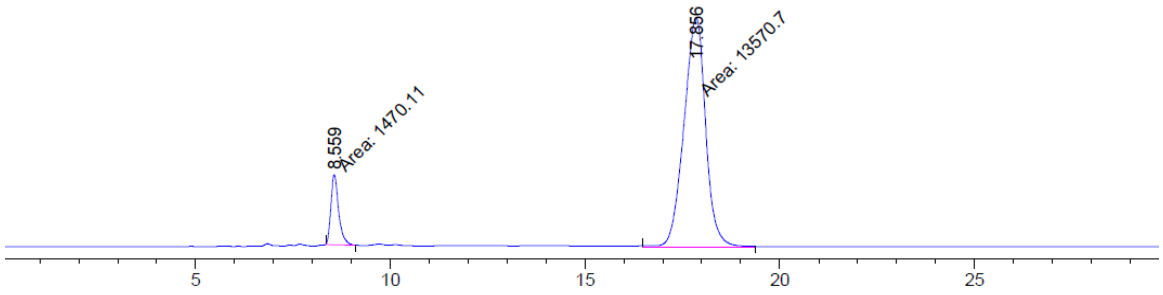
^{13}C-NMR (100 MHz, $CDCl_3$) of compound **14j**



HPLC of compound **14j**

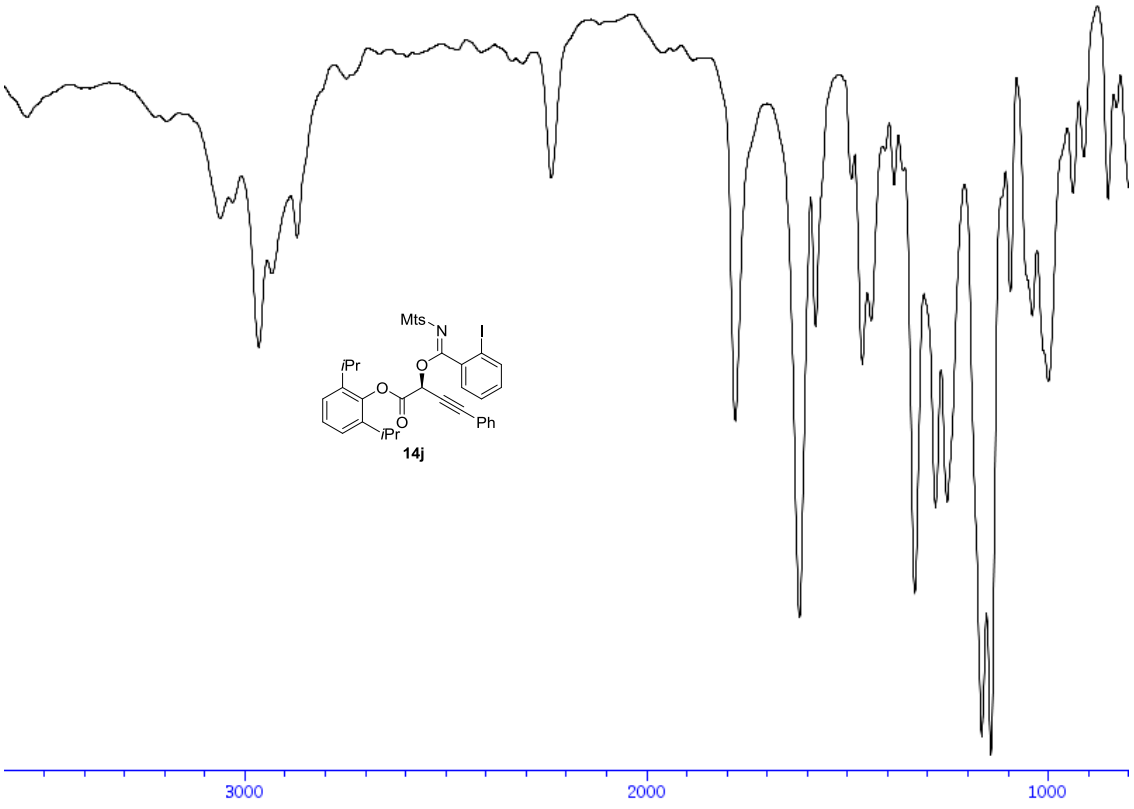


Peak #	RetTime [min]	Type	Width [min]	Area [mAU*s]	Height [mAU]	Area %
1	8.715	MM	0.2469	2.12972e4	1437.39636	50.0307
2	18.858	MM	0.7014	2.12710e4	505.46405	49.9693

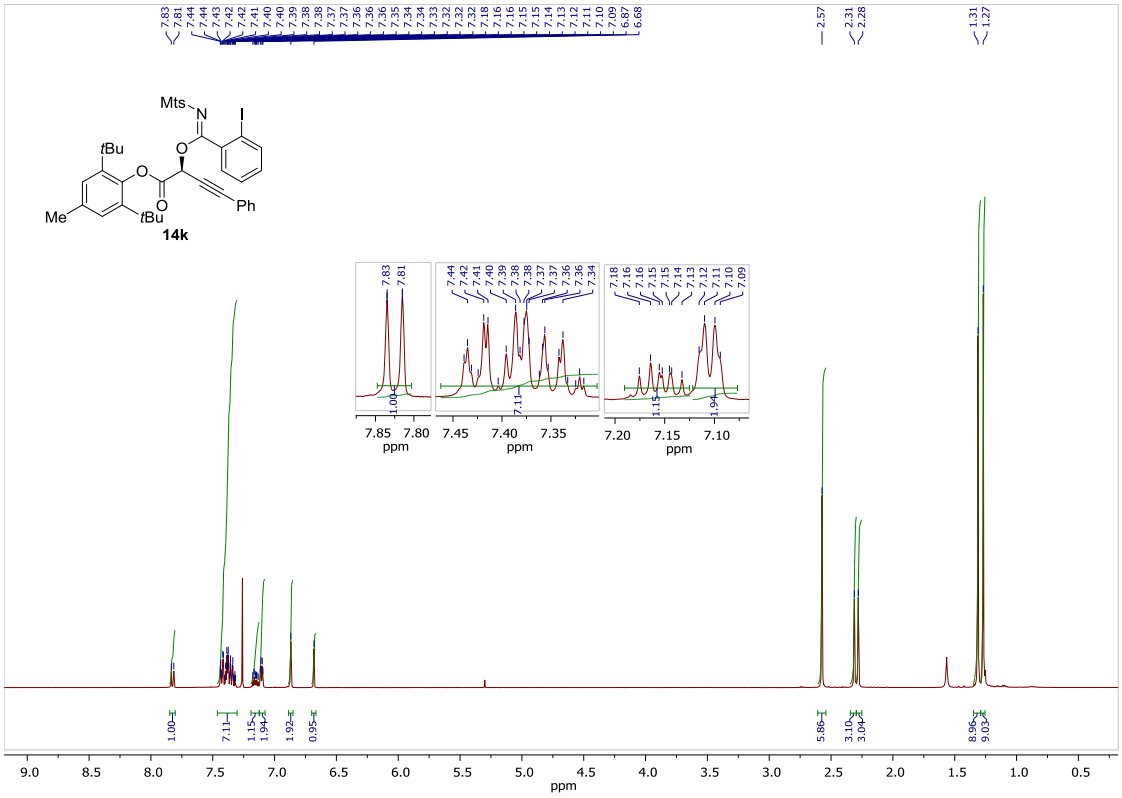


Peak #	RetTime [min]	Type	Width [min]	Area [mAU*s]	Height [mAU]	Area %
1	8.559	MM	0.2295	1470.11060	106.78429	9.7742
2	17.856	MM	0.6437	1.35707e4	351.35812	90.2258

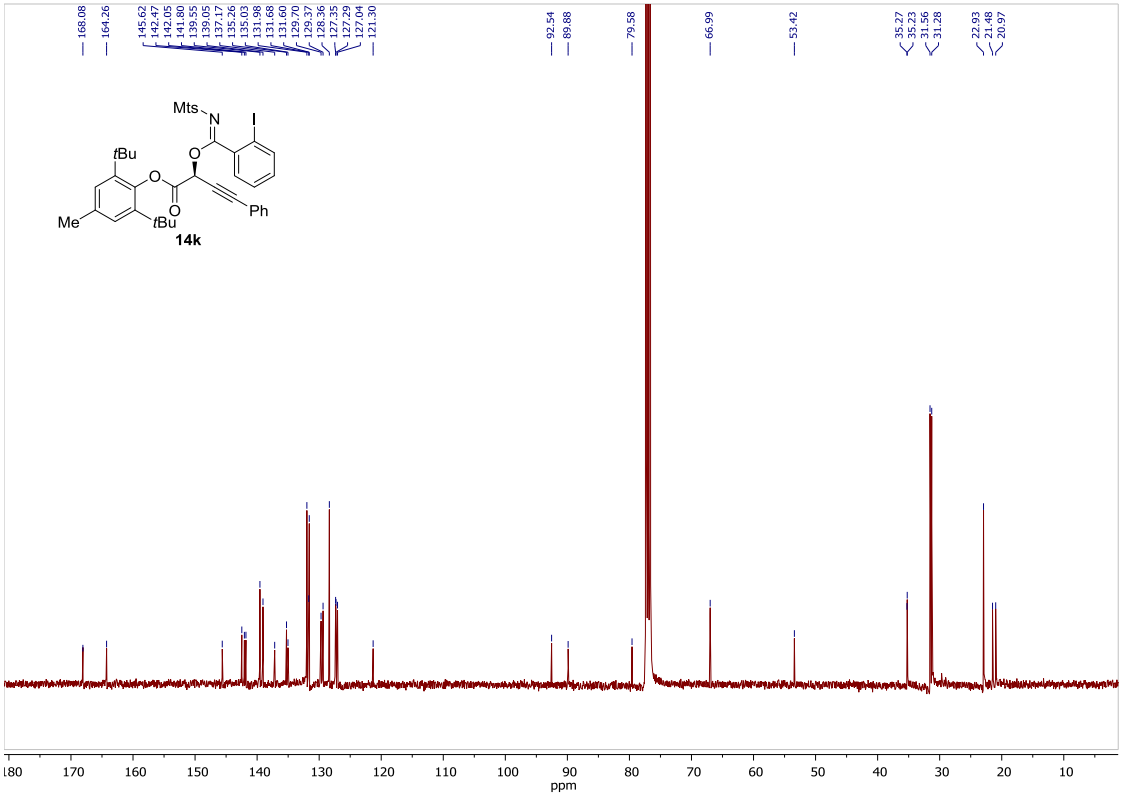
IR of compound **14j**



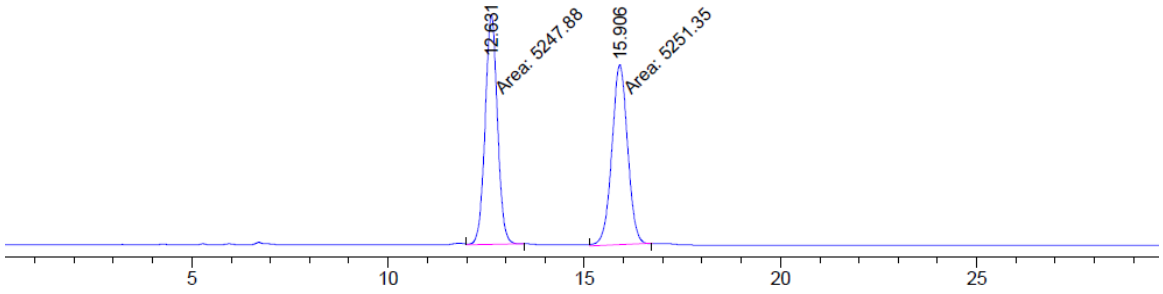
^{1}H-NMR (400 MHz, $CDCl_3$) of compound **14k**



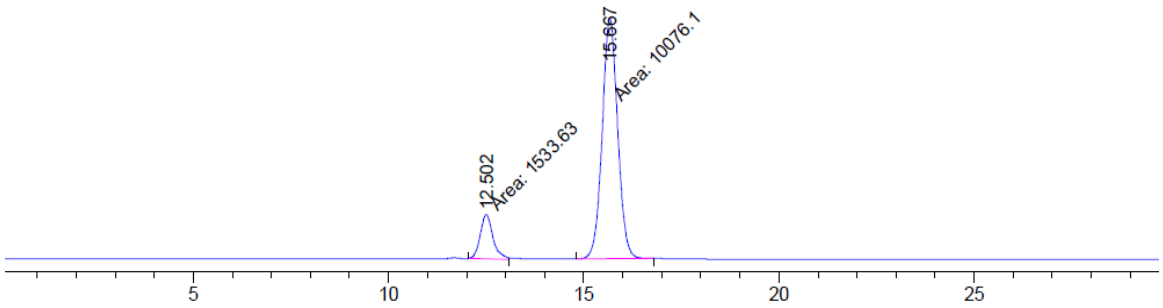
^{13}C-NMR (100 MHz, $CDCl_3$) of compound **14k**



HPLC of compound **14k**

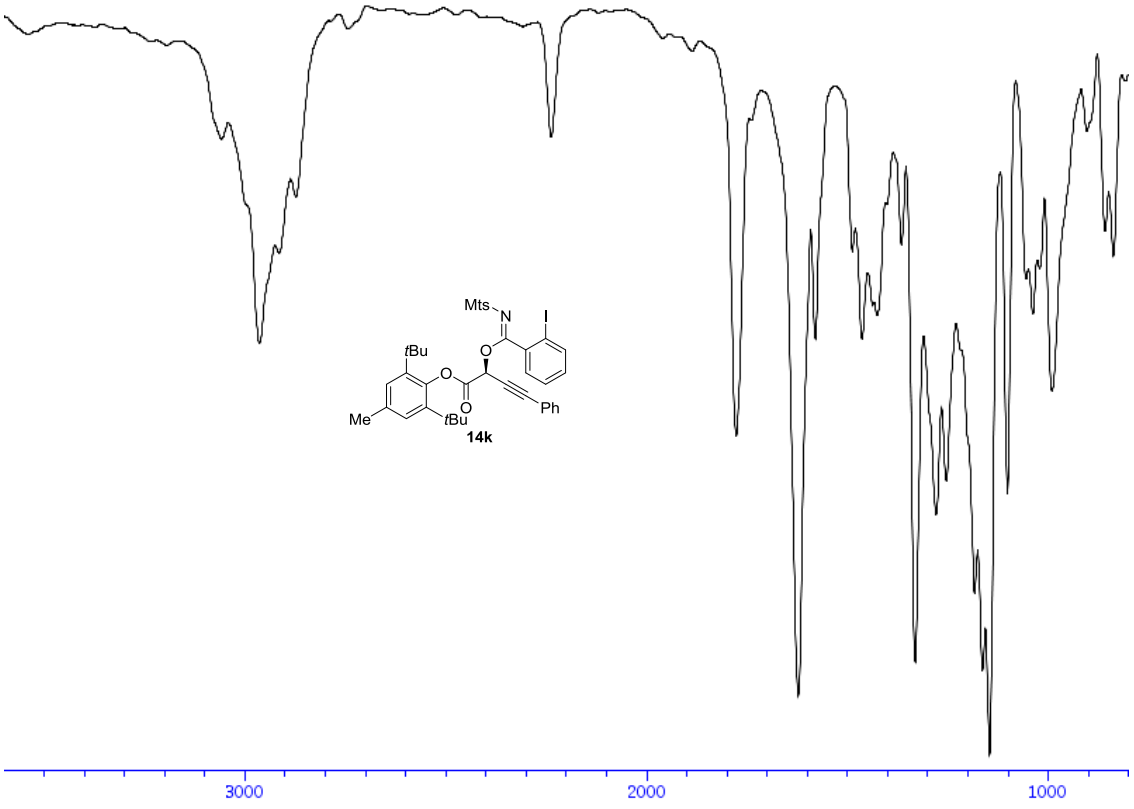


Peak #	RetTime [min]	Type	Width [min]	Area [mAU*s]	Height [mAU]	Area %
1	12.631	MM	0.3637	5247.87939	240.48375	49.9835
2	15.906	MM	0.4653	5251.34766	188.09402	50.0165

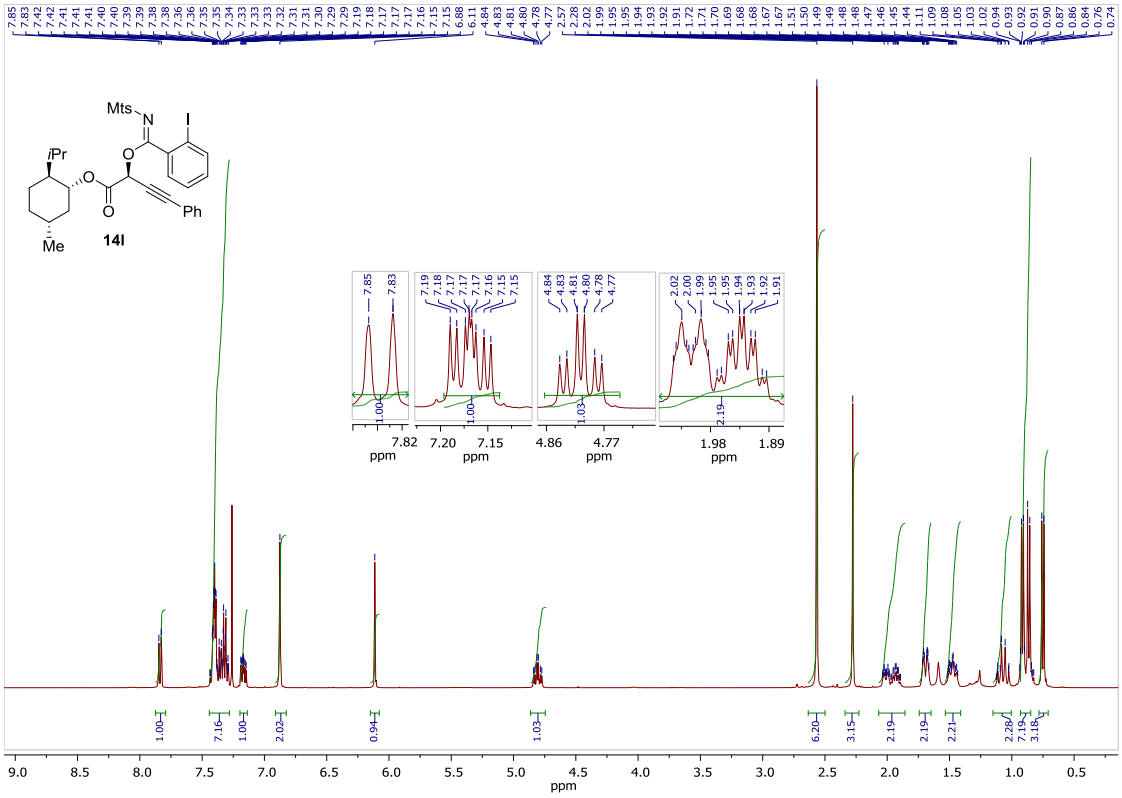


Peak #	RetTime [min]	Type	Width [min]	Area [mAU*s]	Height [mAU]	Area %
1	12.502	MM	0.3786	1533.63477	67.50656	13.2100
2	15.667	MM	0.4580	1.00761e4	366.67584	86.7900

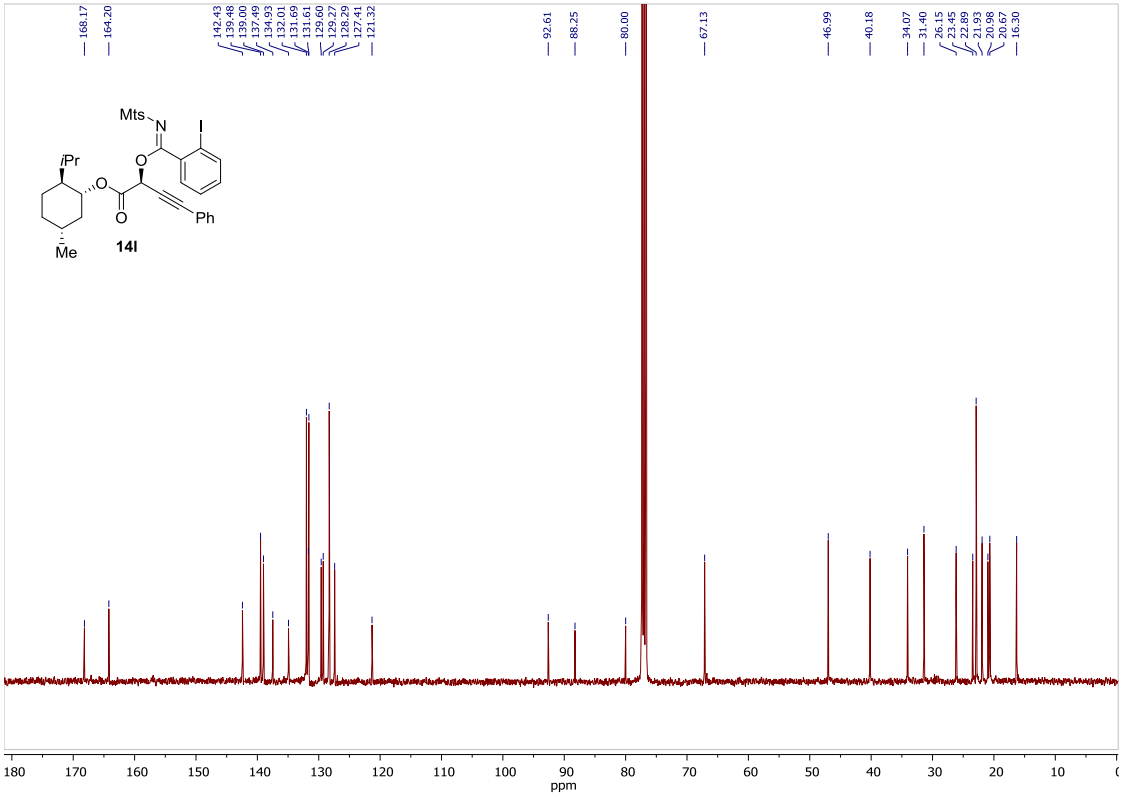
IR of compound **14k**



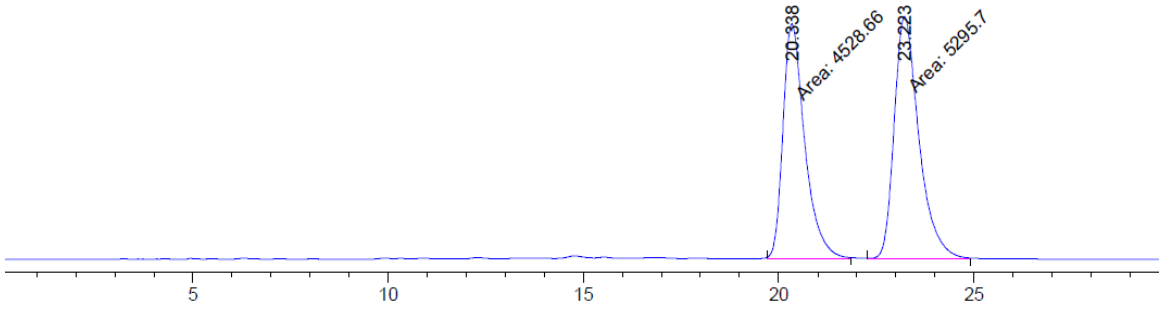
^{1}H-NMR (400 MHz, $CDCl_3$) of compound **14l**



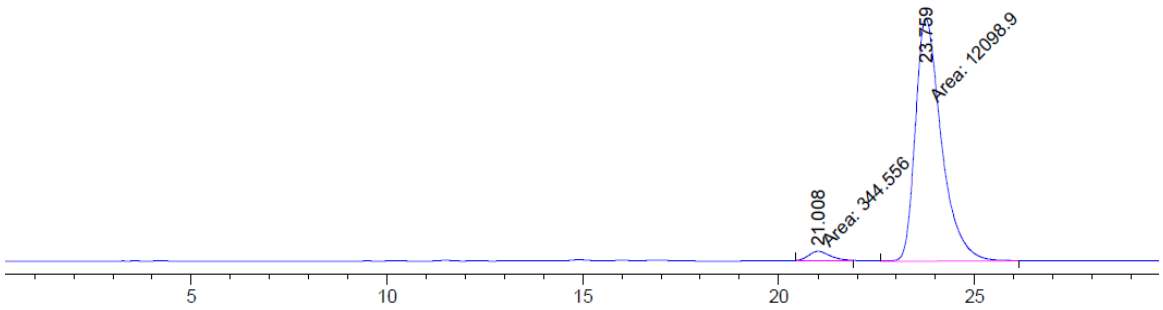
^{13}C-NMR (100 MHz, $CDCl_3$) of compound **14l**



HPLC of compound **14l**

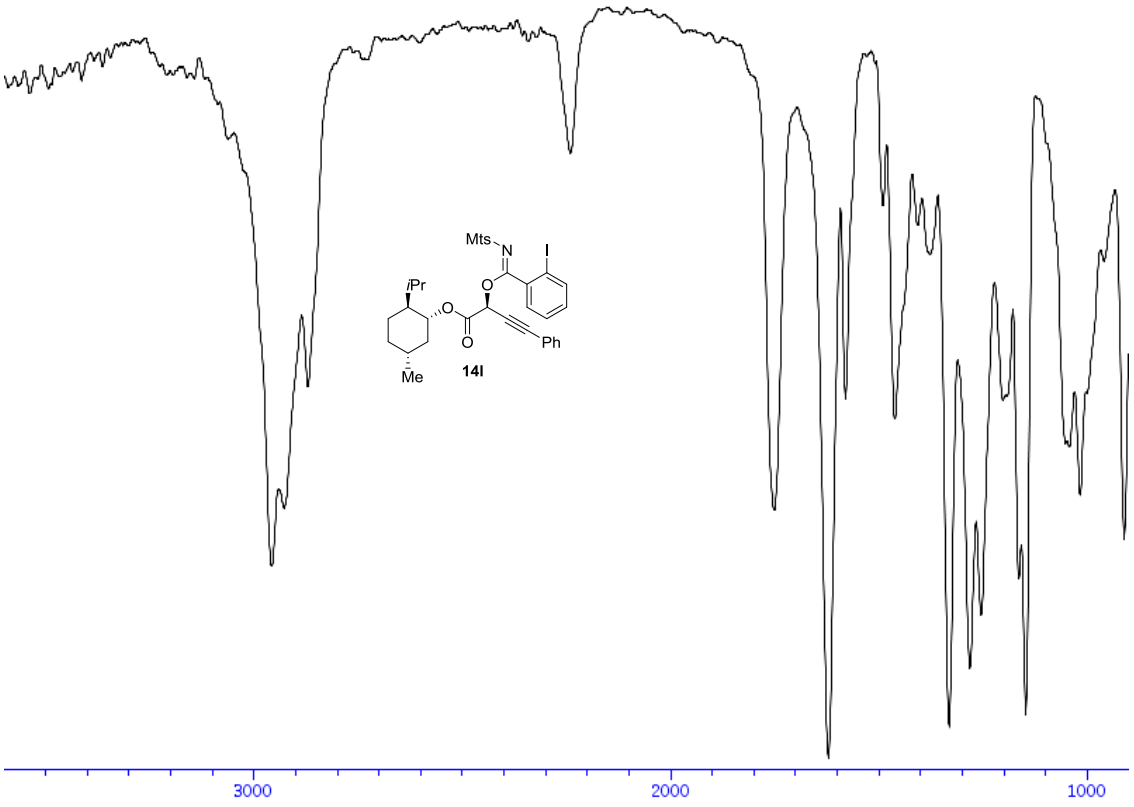


Peak #	RetTime [min]	Type	Width [min]	Area [mAU*s]	Height [mAU]	Area %
1	20.338	MM	0.6434	4528.65771	117.31321	46.0962
2	23.223	MM	0.7301	5295.69922	120.88832	53.9038

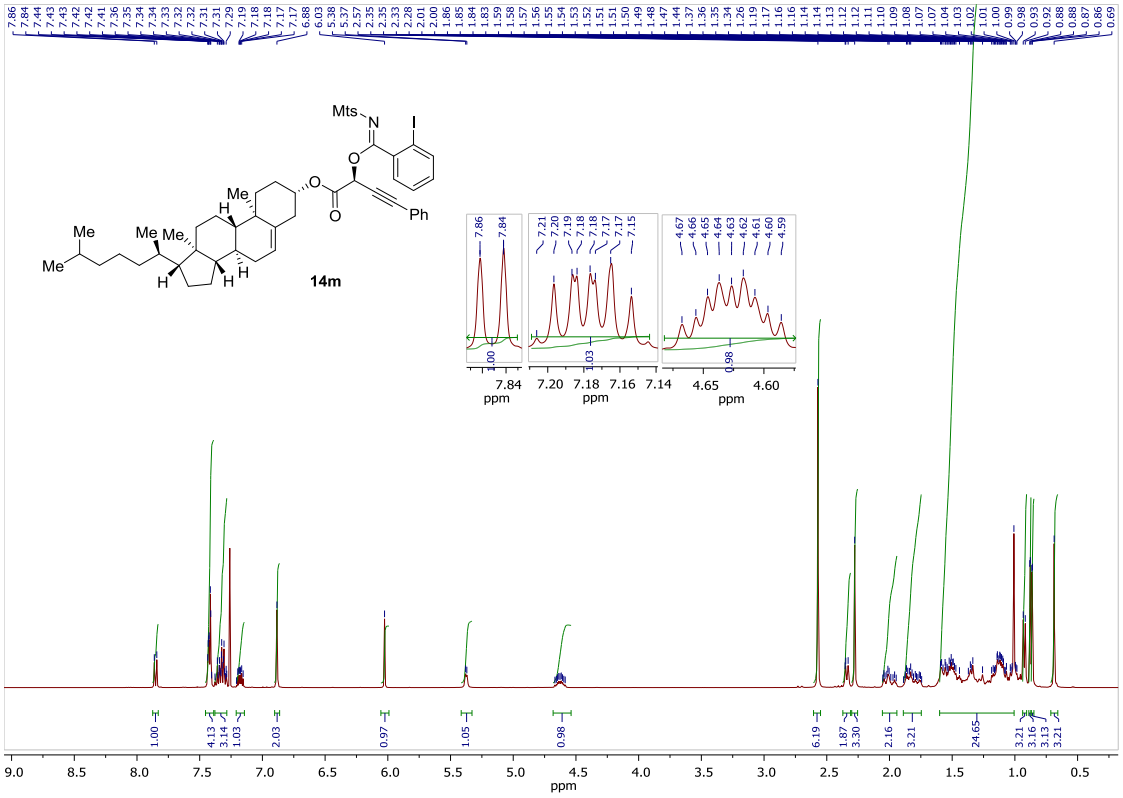


Peak #	RetTime [min]	Type	Width [min]	Area [mAU*s]	Height [mAU]	Area %
1	21.008	MM	0.5967	344.55612	9.62341	2.7690
2	23.759	MM	0.7727	1.20989e4	260.97653	97.2310

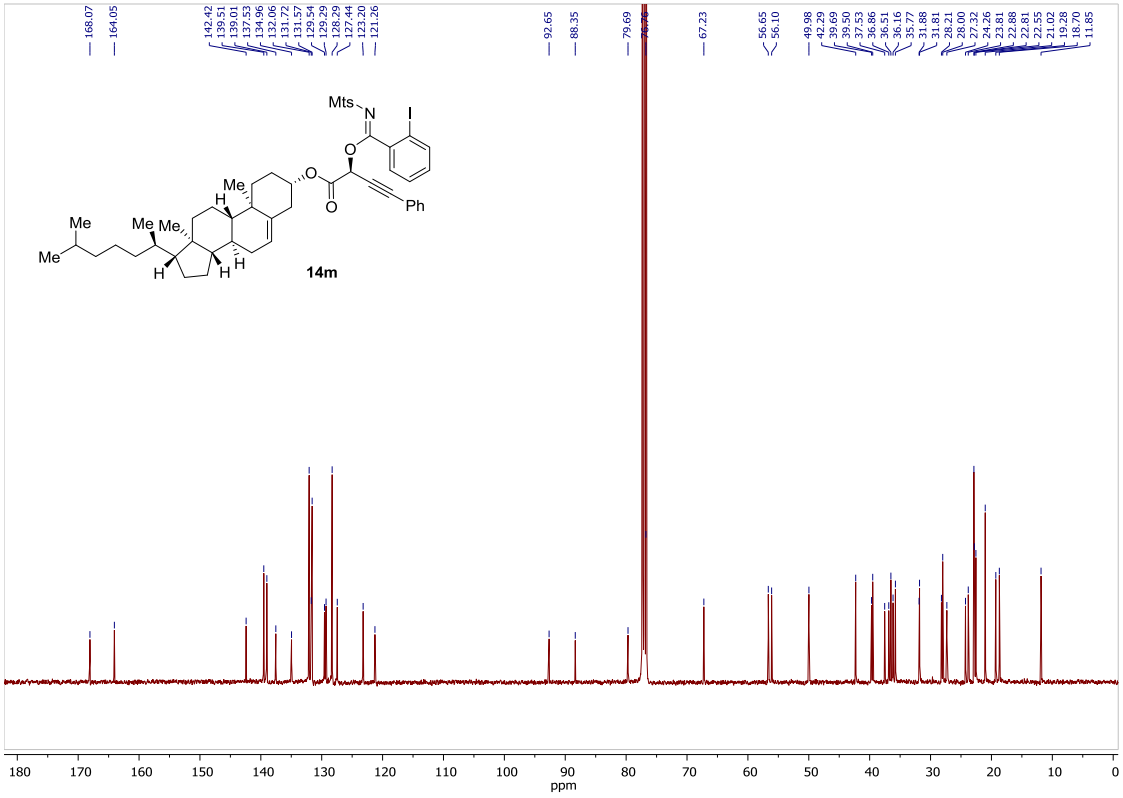
IR of compound **14l**



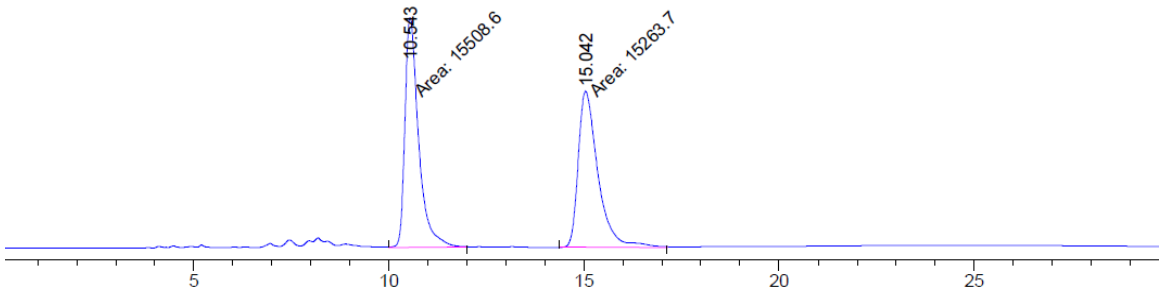
^{1}H-NMR (400 MHz, $CDCl_3$) of compound **14m**



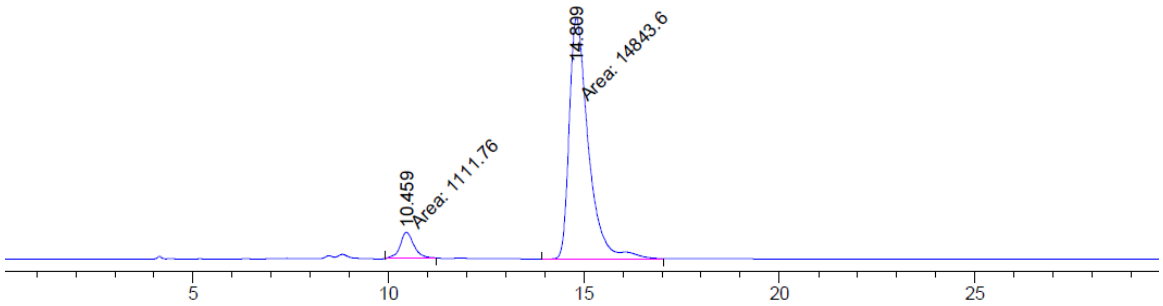
^{13}C-NMR (100 MHz, $CDCl_3$) of compound **14m**



HPLC of compound **14m**

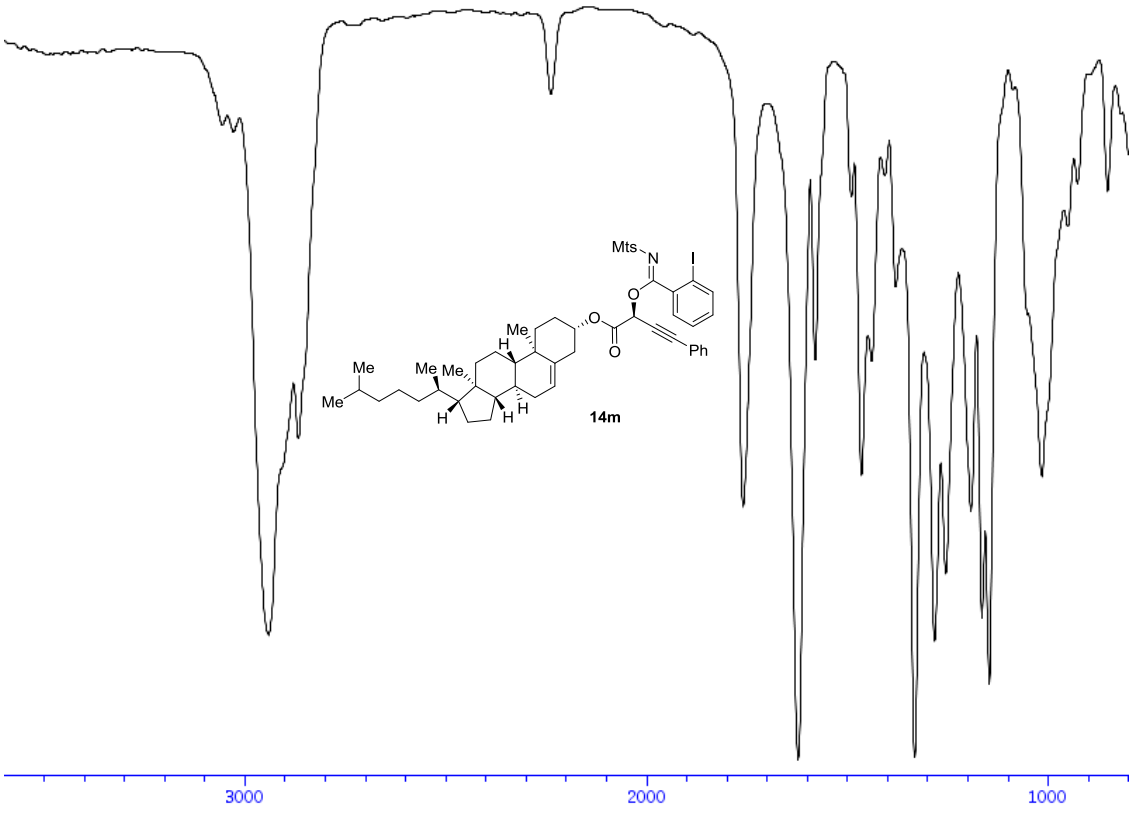


Peak #	RetTime [min]	Type	Width [min]	Area [mAU*s]	Height [mAU]	Area %
1	10.543	MM	0.4058	1.55086e4	636.95068	50.3979
2	15.042	MM	0.5890	1.52637e4	431.91330	49.6021

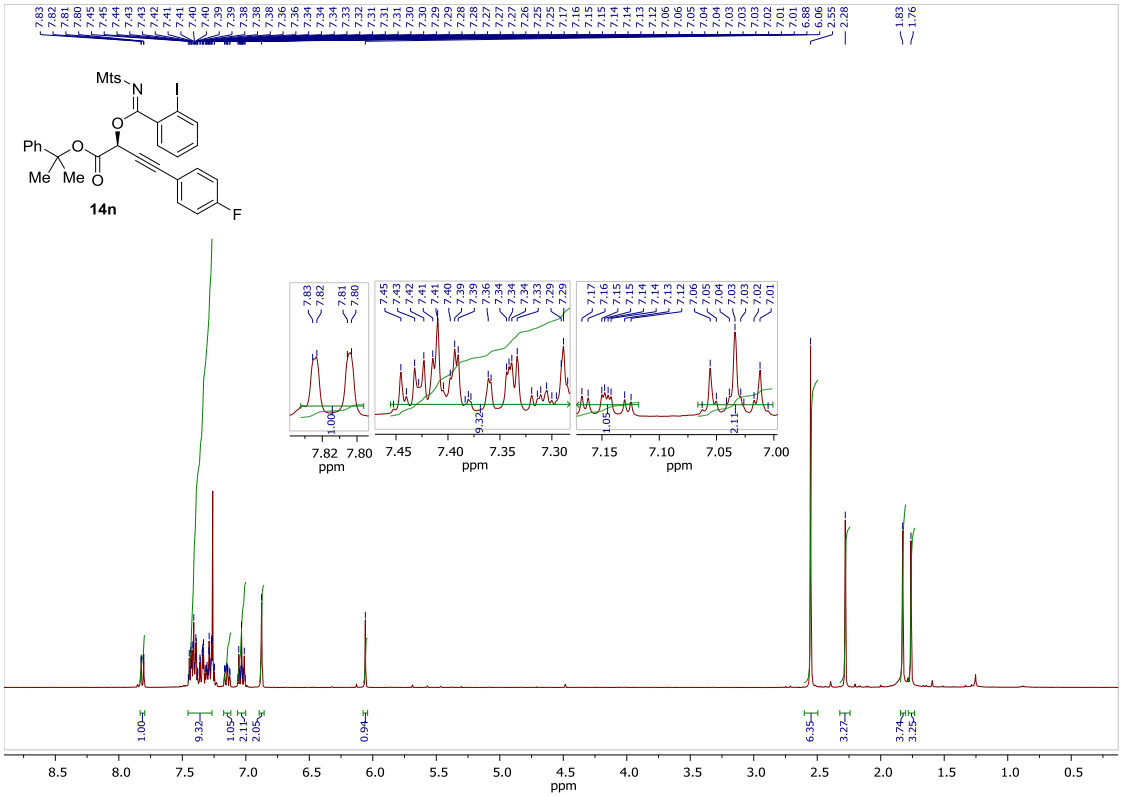


Peak #	RetTime [min]	Type	Width [min]	Area [mAU*s]	Height [mAU]	Area %
1	10.459	MM	0.3993	1111.75940	46.40980	6.9679
2	14.809	MM	0.5719	1.48436e4	432.58713	93.0321

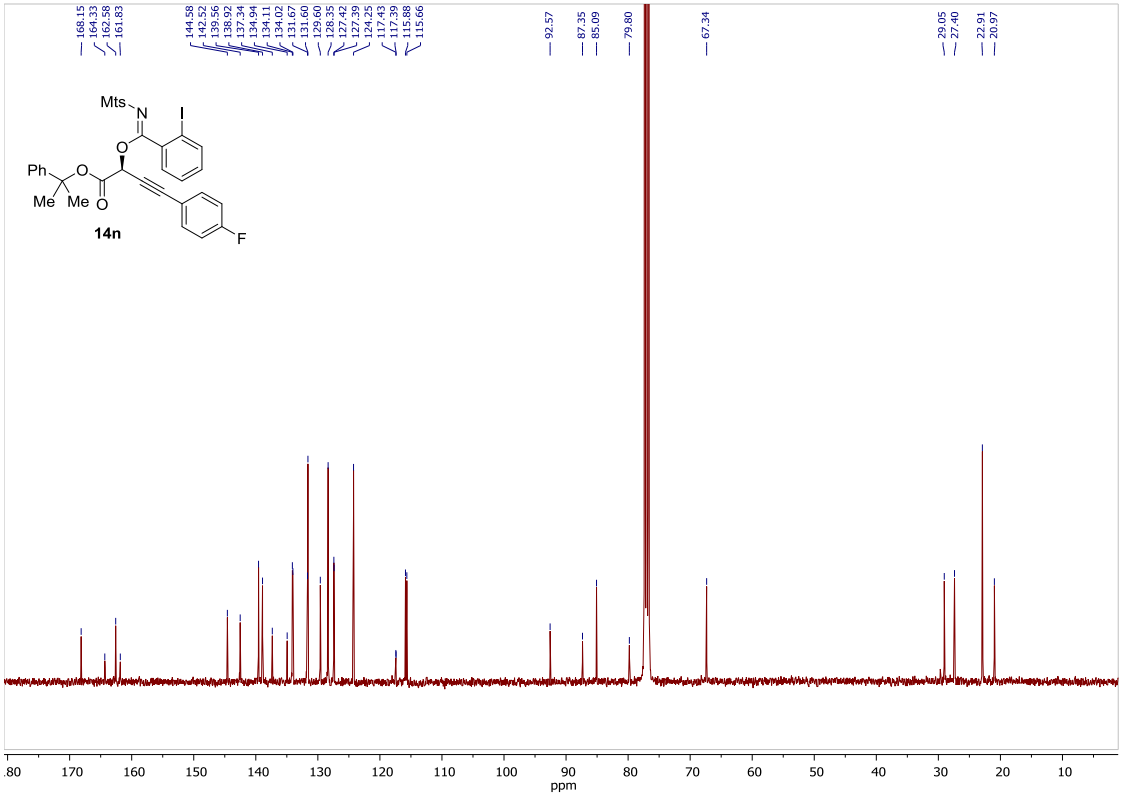
IR of compound **14m**



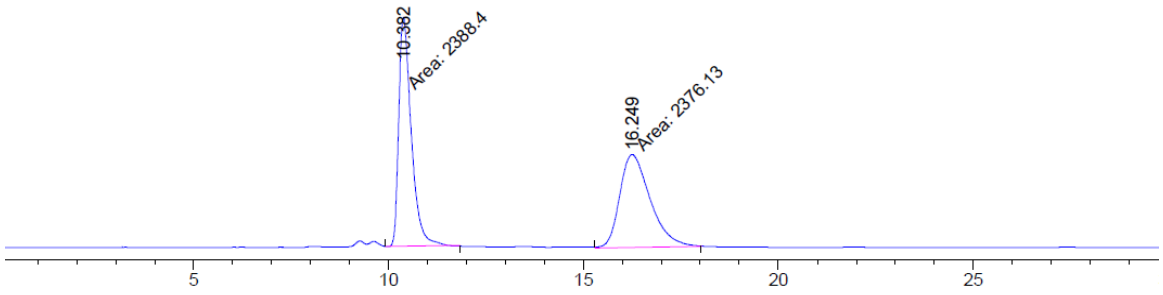
^{1}H-NMR (400 MHz, $CDCl_3$) of compound **14n**



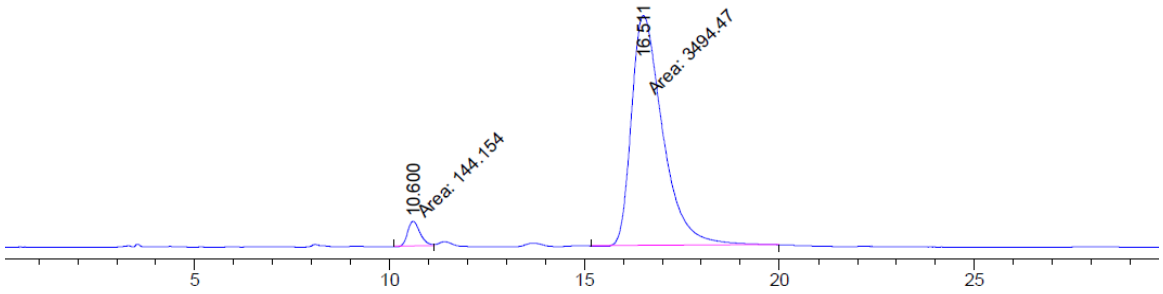
^{13}C-NMR (100 MHz, $CDCl_3$) of compound **14n**



HPLC of compound **14n**

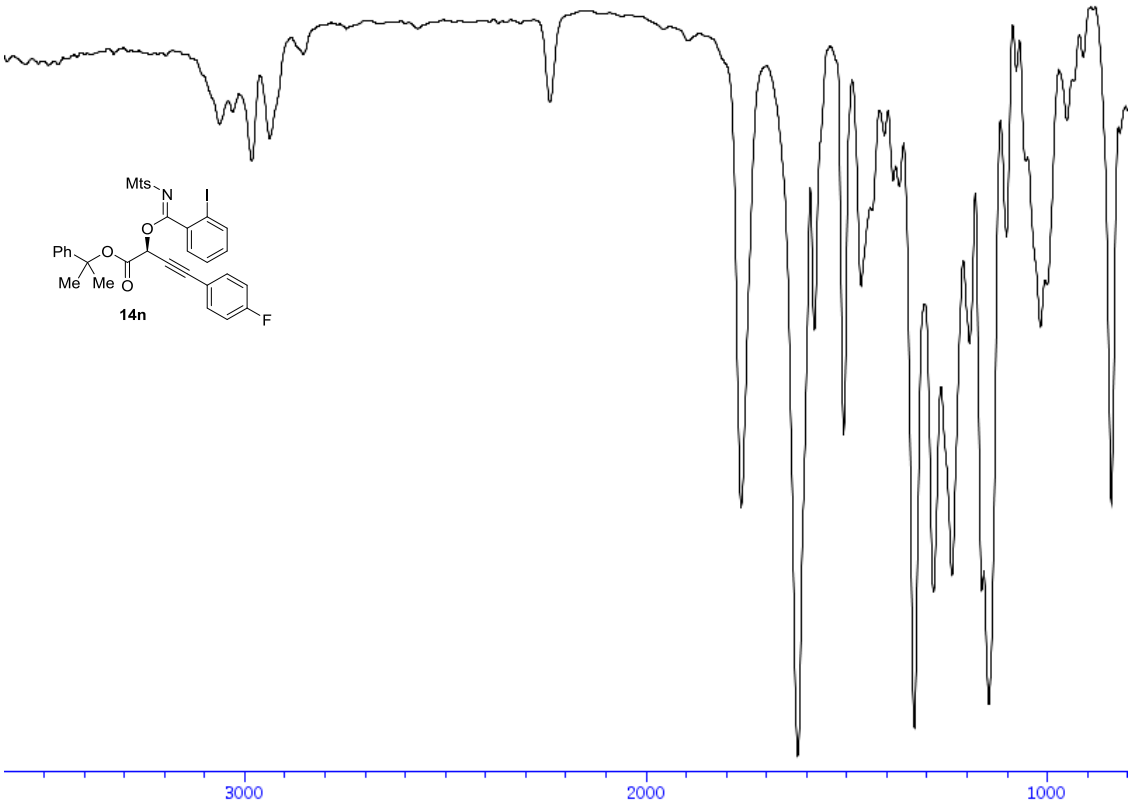


Peak #	RetTime [min]	Type	Width [min]	Area [mAU*s]	Height [mAU]	Area %
1	10.382	MM	0.3713	2388.39575	107.19816	50.1287
2	16.249	MM	0.9090	2376.12988	43.56669	49.8713

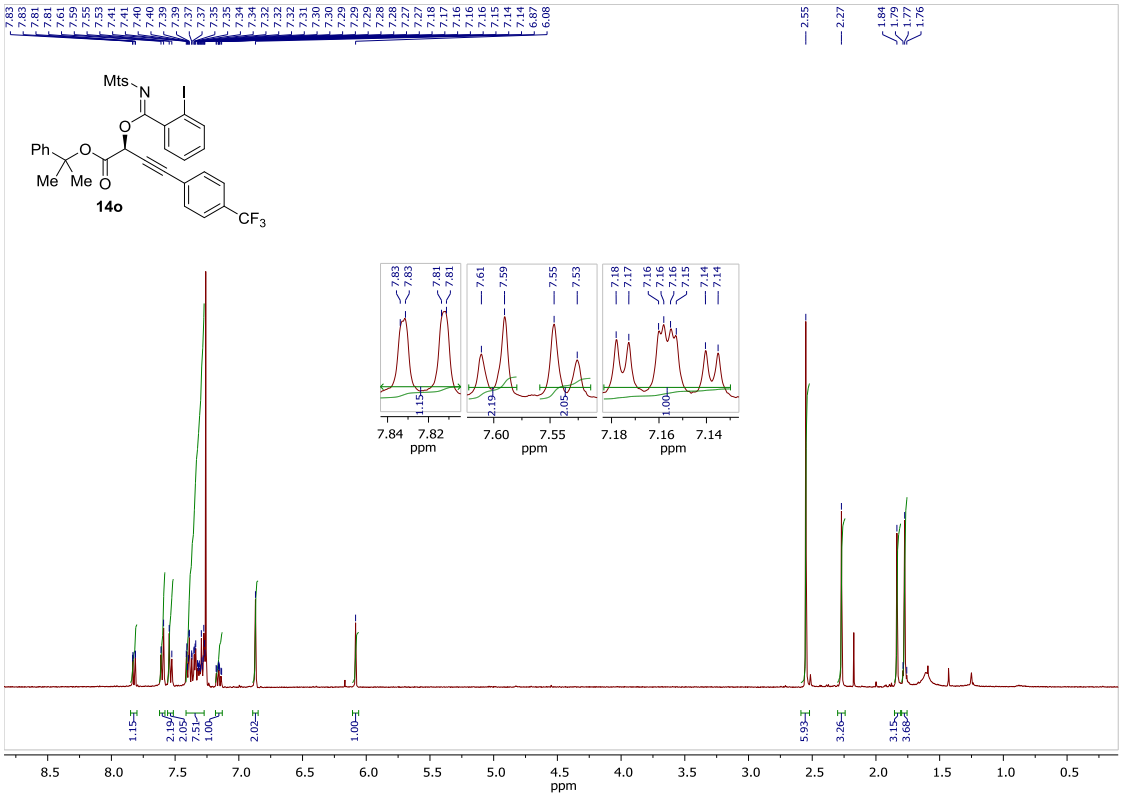


Peak #	RetTime [min]	Type	Width [min]	Area [mAU*s]	Height [mAU]	Area %
1	10.600	MM	0.3594	144.15353	6.68413	3.9618
2	16.511	MM	0.9283	3494.47144	62.73778	96.0382

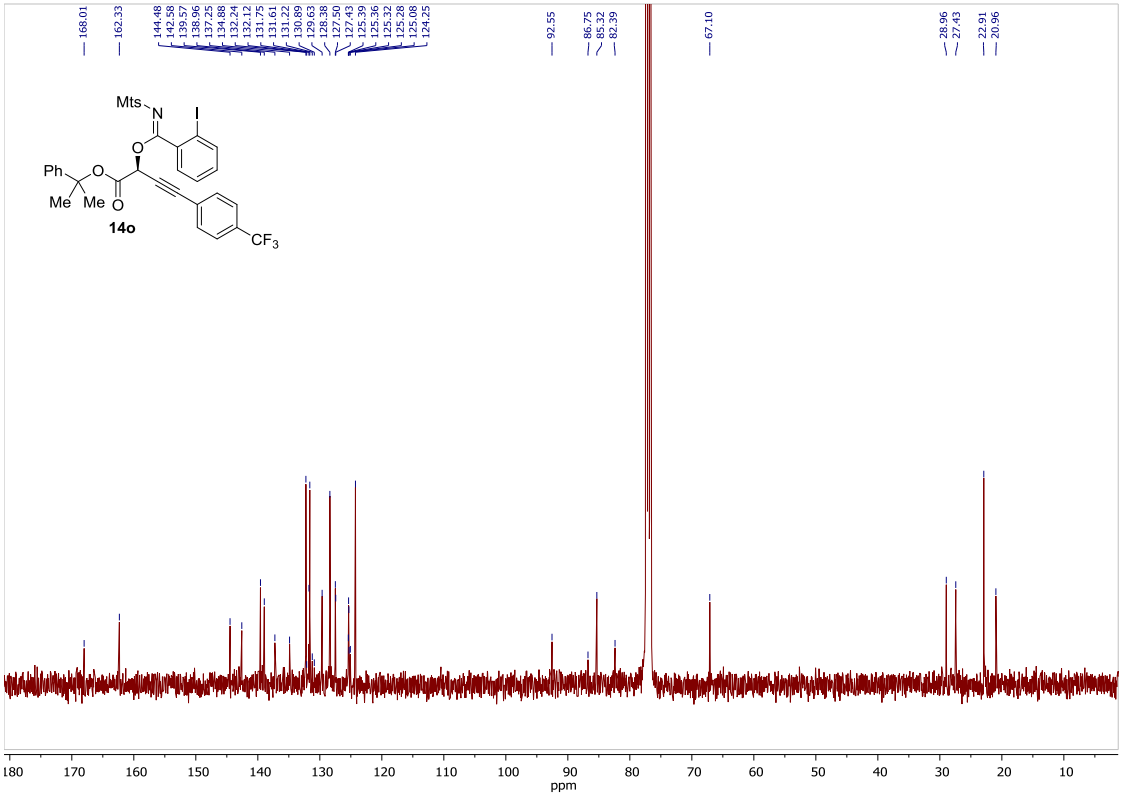
IR of compound **14n**



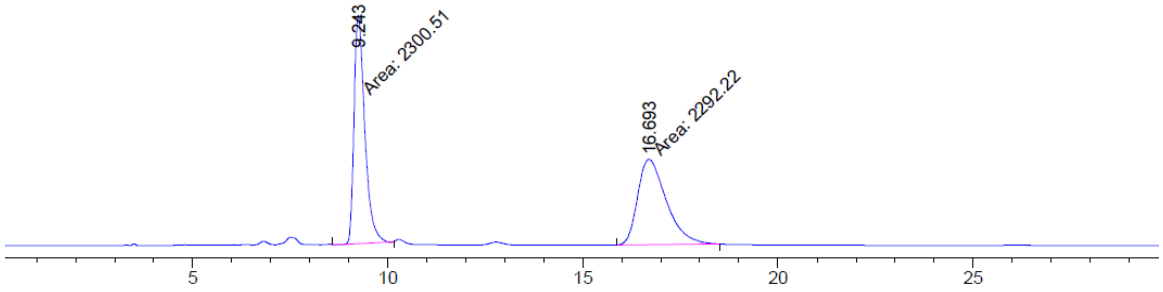
^{1}H-NMR (400 MHz, $CDCl_3$) of compound **14o**



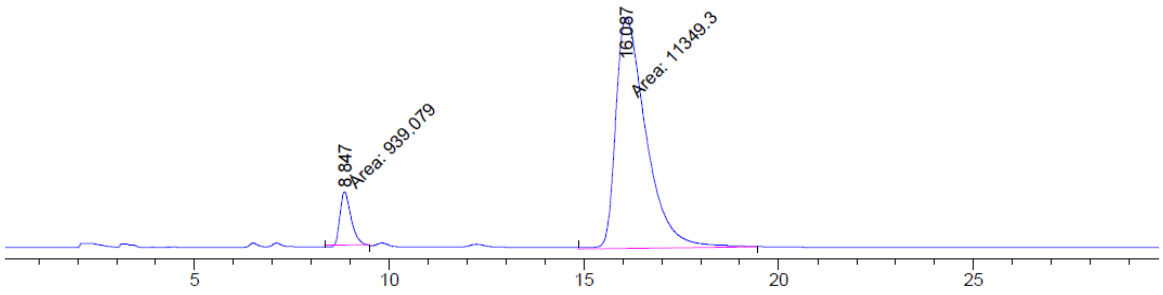
^{13}C-NMR (100 MHz, $CDCl_3$) of compound **14o**



HPLC of compound **14o**

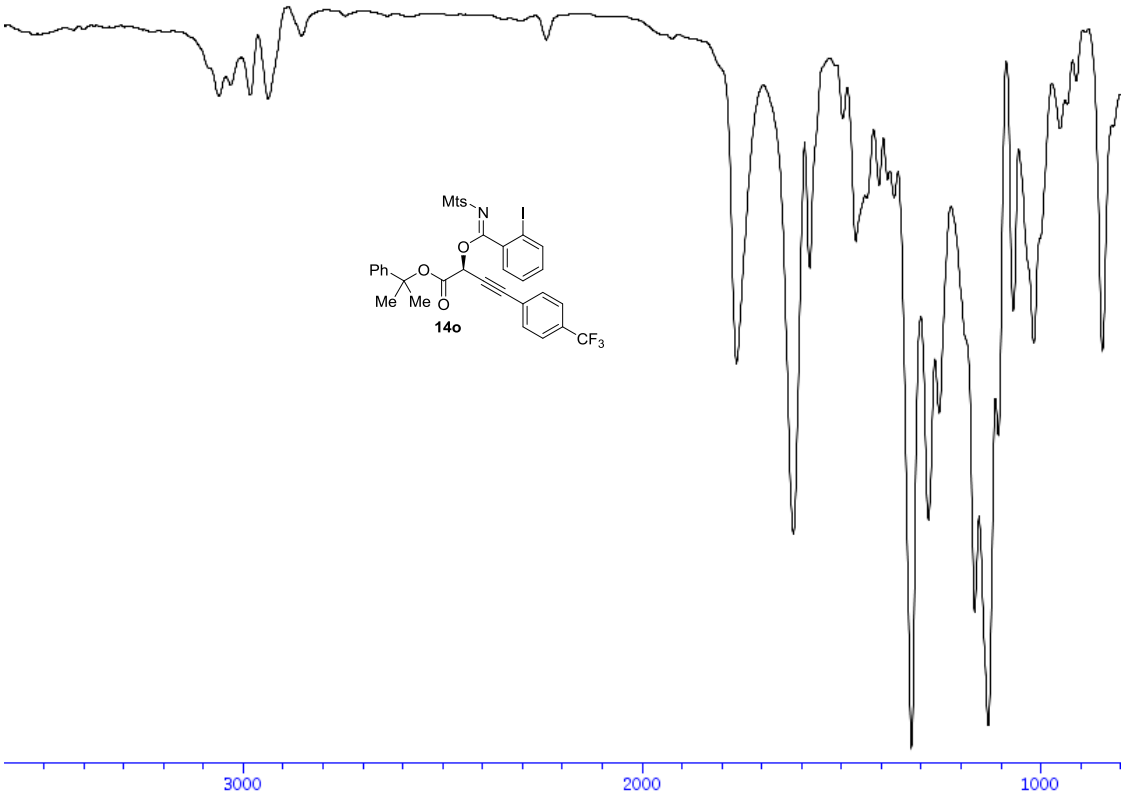


Peak #	RetTime [min]	Type	Width [min]	Area [mAU*s]	Height [mAU]	Area %
1	9.243	MM	0.3188	2300.50684	120.27290	50.0902
2	16.693	MM	0.8504	2292.21802	44.92265	49.9098

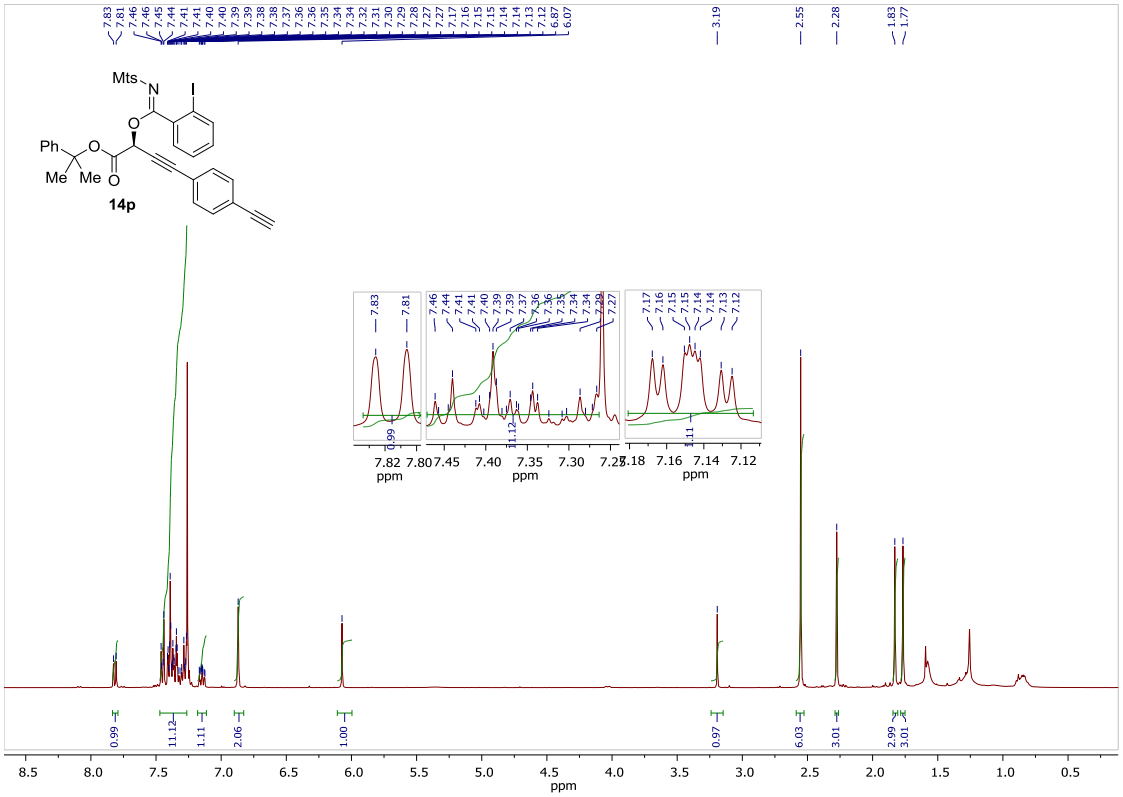


Peak #	RetTime [min]	Type	Width [min]	Area [mAU*s]	Height [mAU]	Area %
1	8.847	MM	0.3256	939.07904	48.06764	7.6420
2	16.087	MM	0.9054	1.13493e4	208.90898	92.3580

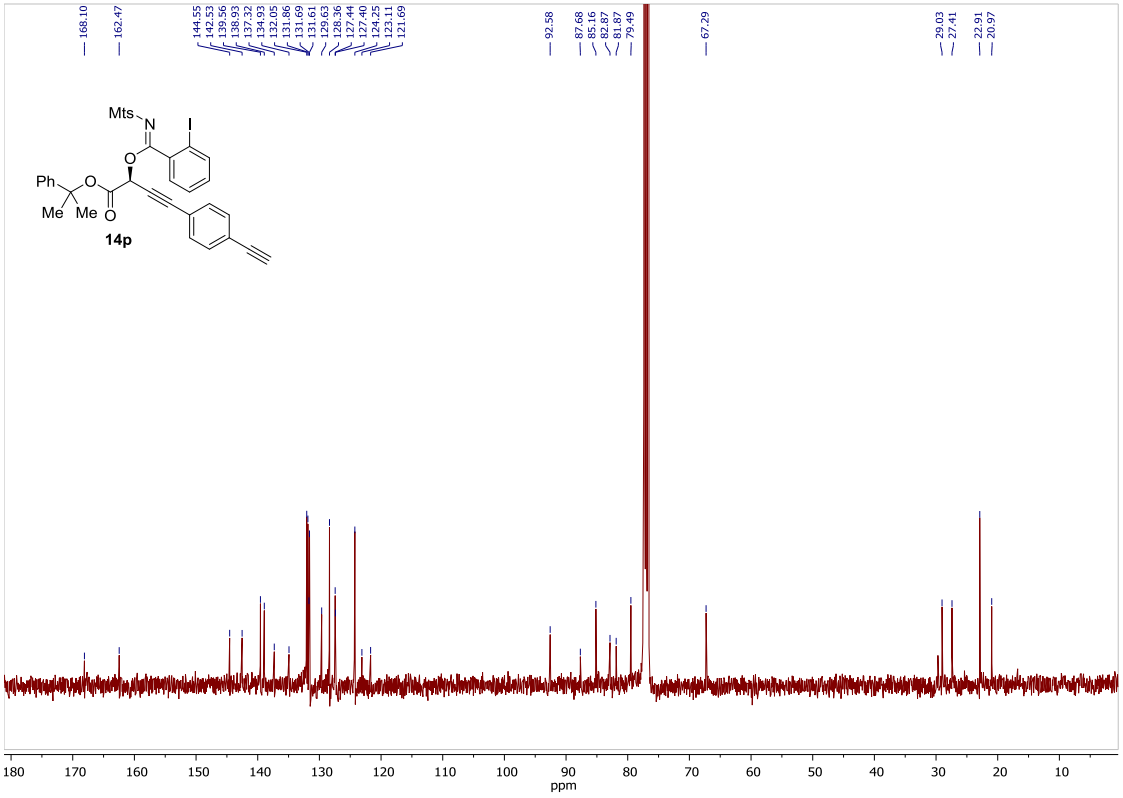
IR of compound **14o**



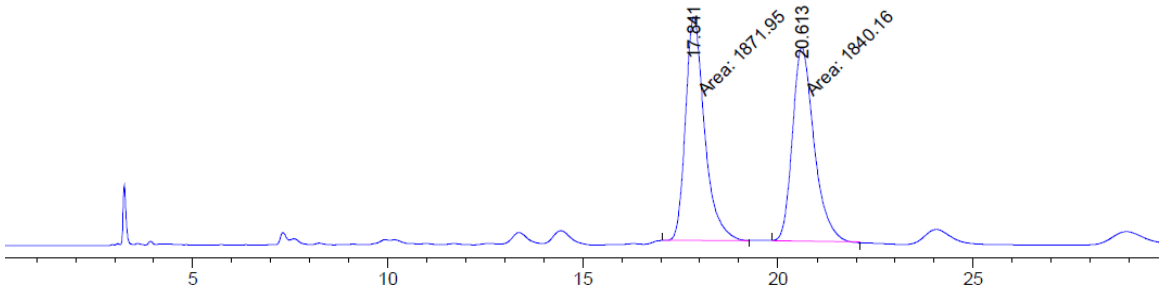
^{1}H-NMR (400 MHz, $CDCl_3$) of compound **14p**



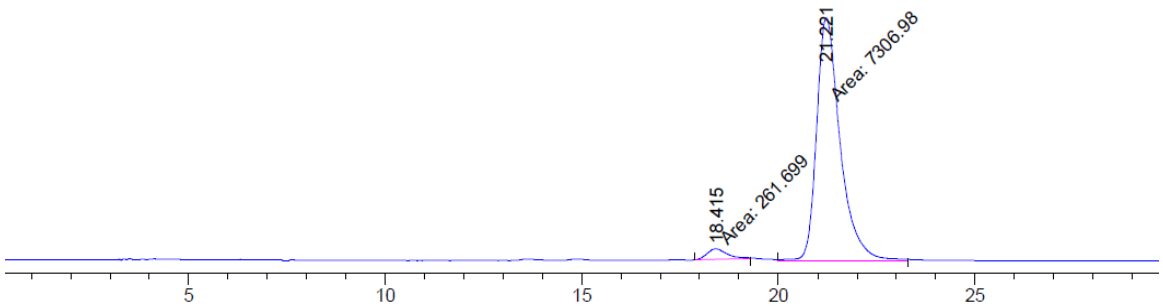
^{13}C-NMR (100 MHz, $CDCl_3$) of compound **14p**



HPLC of compound **14p**

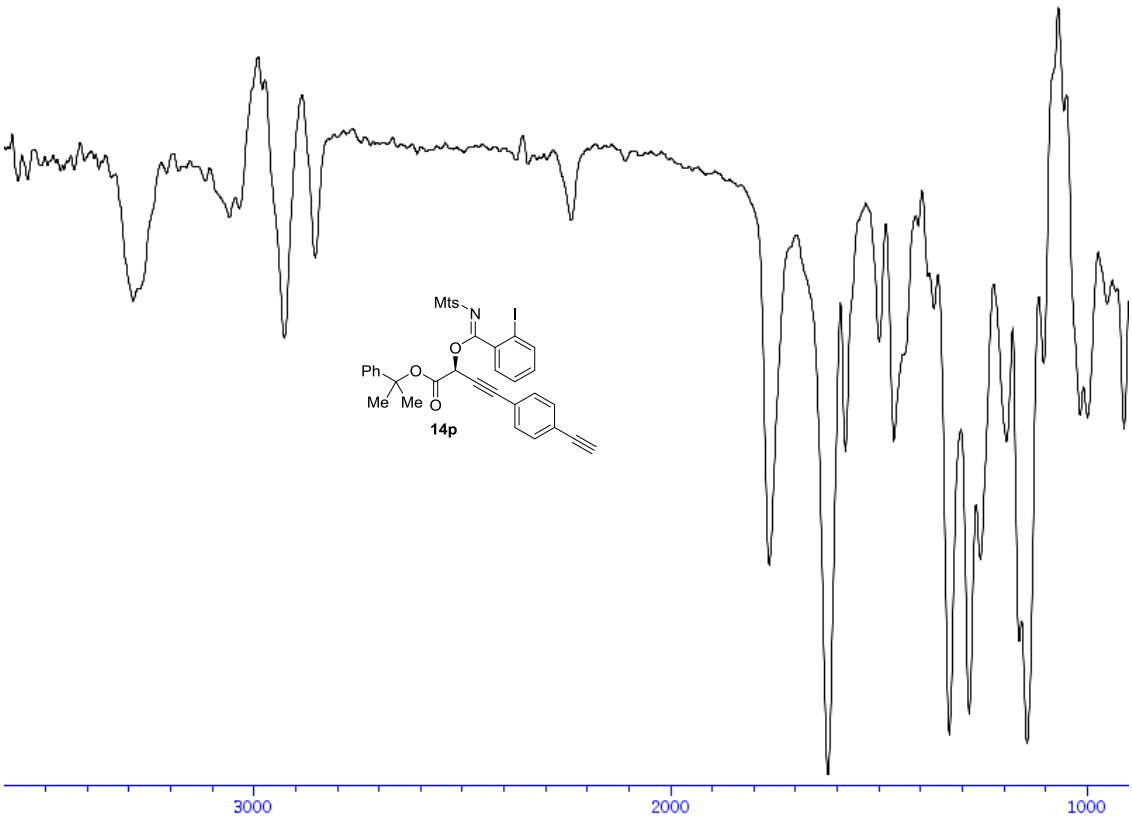


Peak #	RetTime [min]	Type	Width [min]	Area [mAU*s]	Height [mAU]	Area %
1	17.841	MM	0.5671	1871.95227	55.01223	50.4282
2	20.613	MM	0.6431	1840.15845	47.68807	49.5718

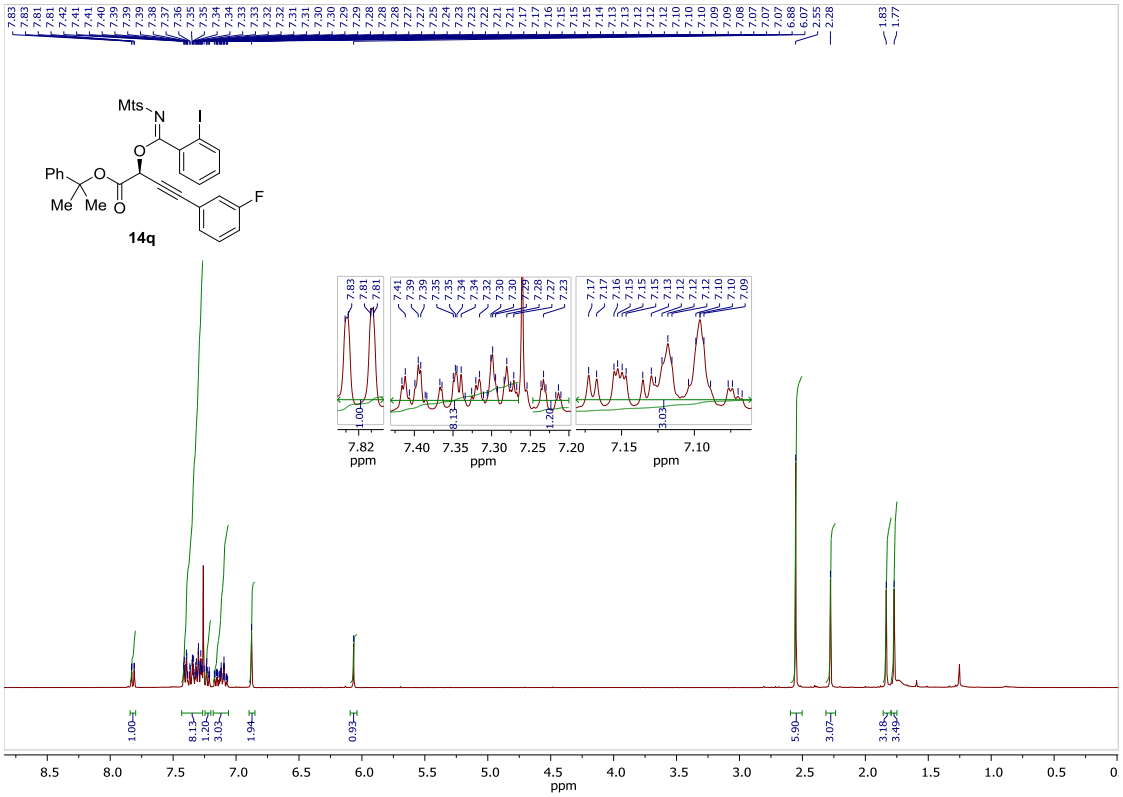


Peak #	RetTime [min]	Type	Width [min]	Area [mAU*s]	Height [mAU]	Area %
1	18.415	MM	0.5903	261.69855	7.38915	3.4577
2	21.221	MM	0.6919	7306.97656	176.01575	96.5423

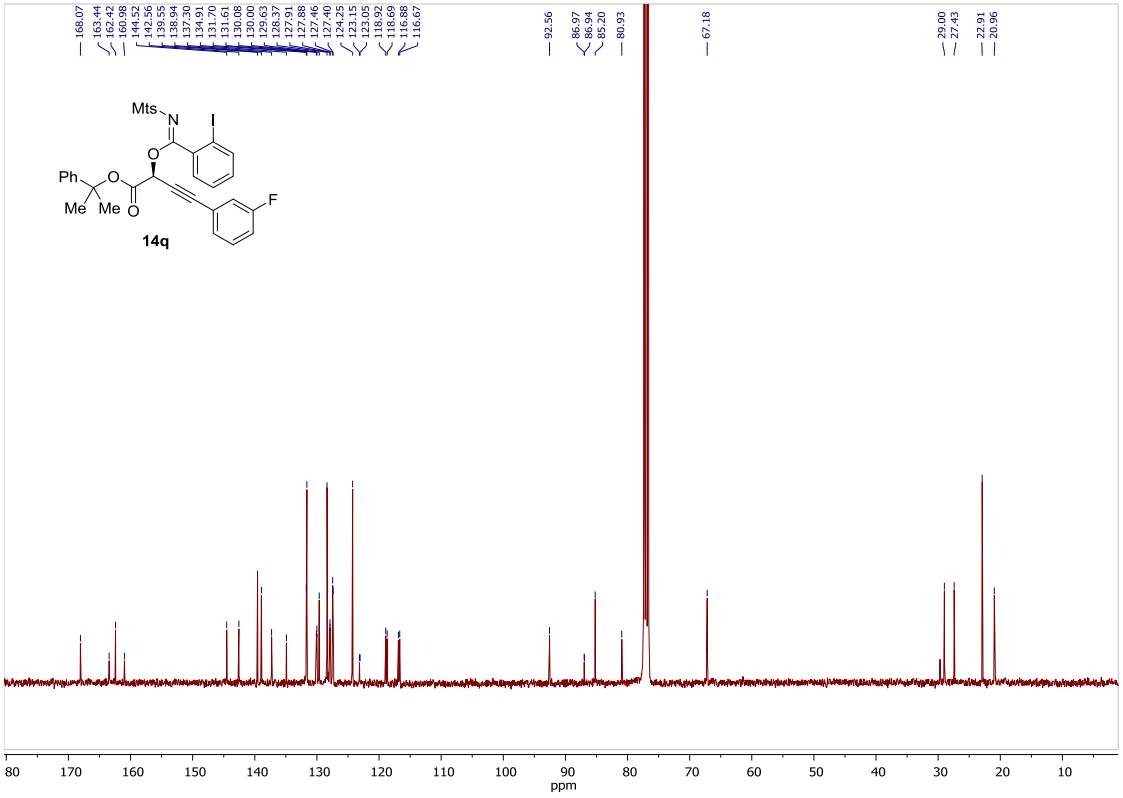
IR of compound **14p**



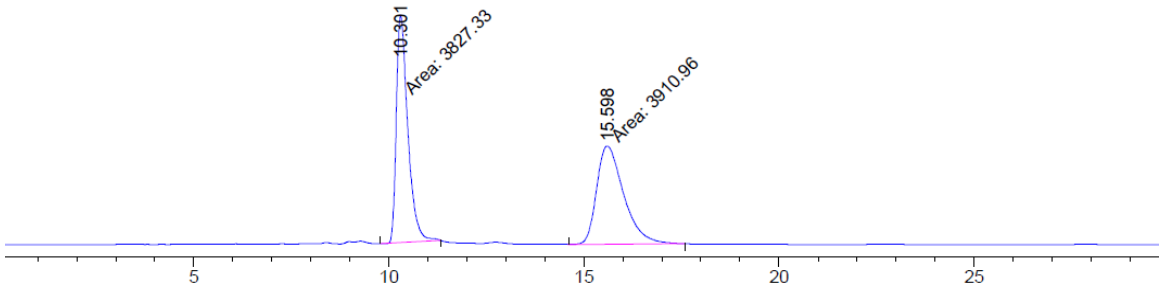
^{1}H-NMR (400 MHz, $CDCl_3$) of compound **14q**



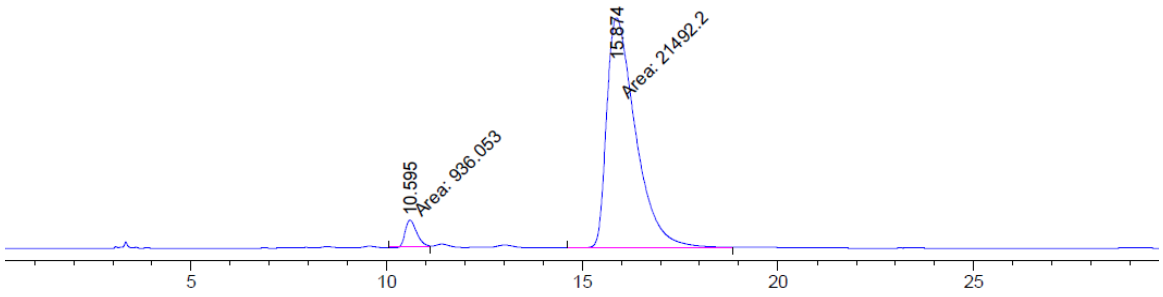
^{13}C-NMR (100 MHz, $CDCl_3$) of compound **14q**



HPLC of compound **14q**

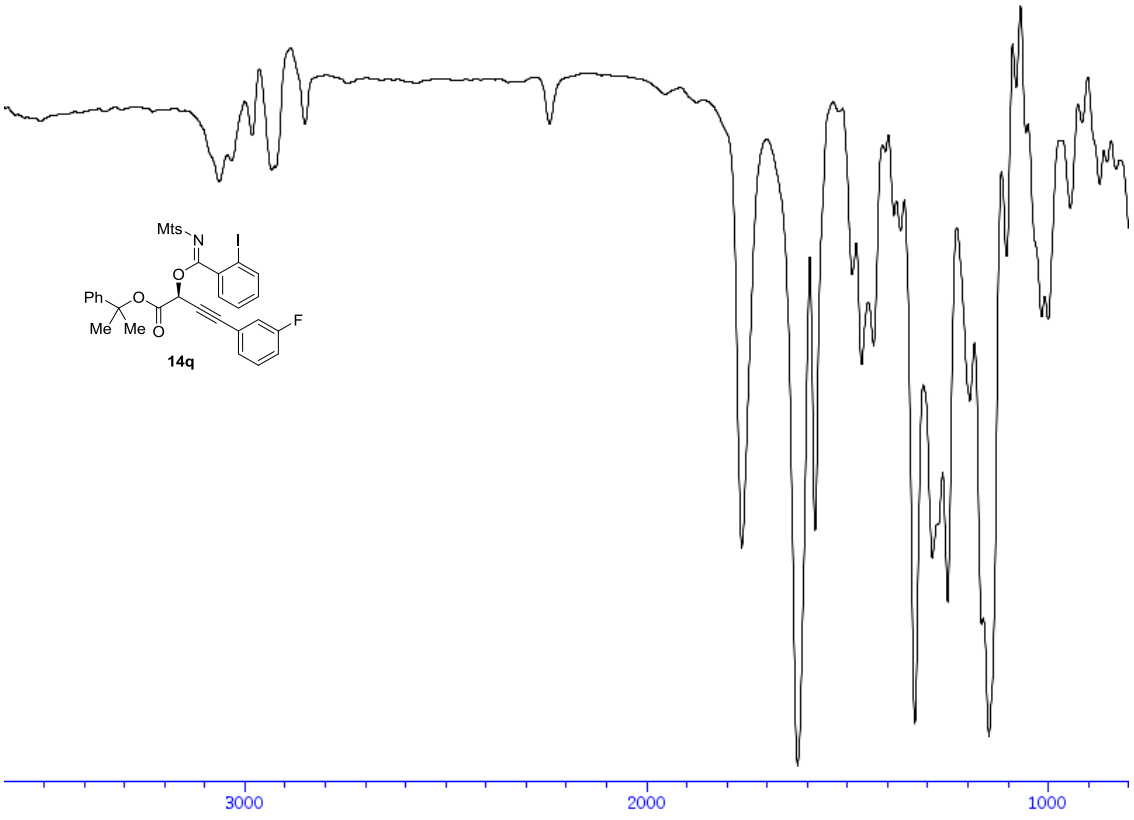


Peak #	RetTime [min]	Type	Width [min]	Area [mAU*s]	Height [mAU]	Area %
1	10.301	MM	0.3411	3827.33472	187.01433	49.4597
2	15.598	MM	0.8060	3910.95850	80.87256	50.5403

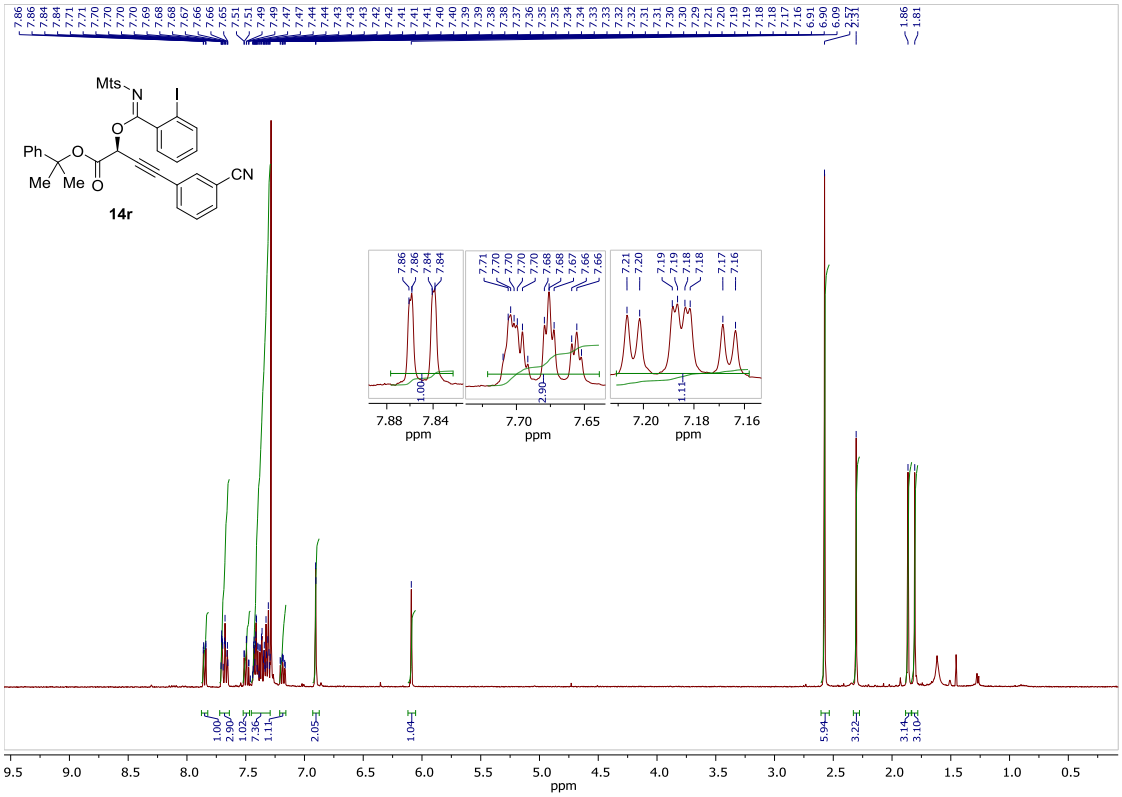


Peak #	RetTime [min]	Type	Width [min]	Area [mAU*s]	Height [mAU]	Area %
1	10.595	MM	0.3264	936.05255	47.79220	4.1735
2	15.874	MM	0.8506	2.14922e4	421.11047	95.8265

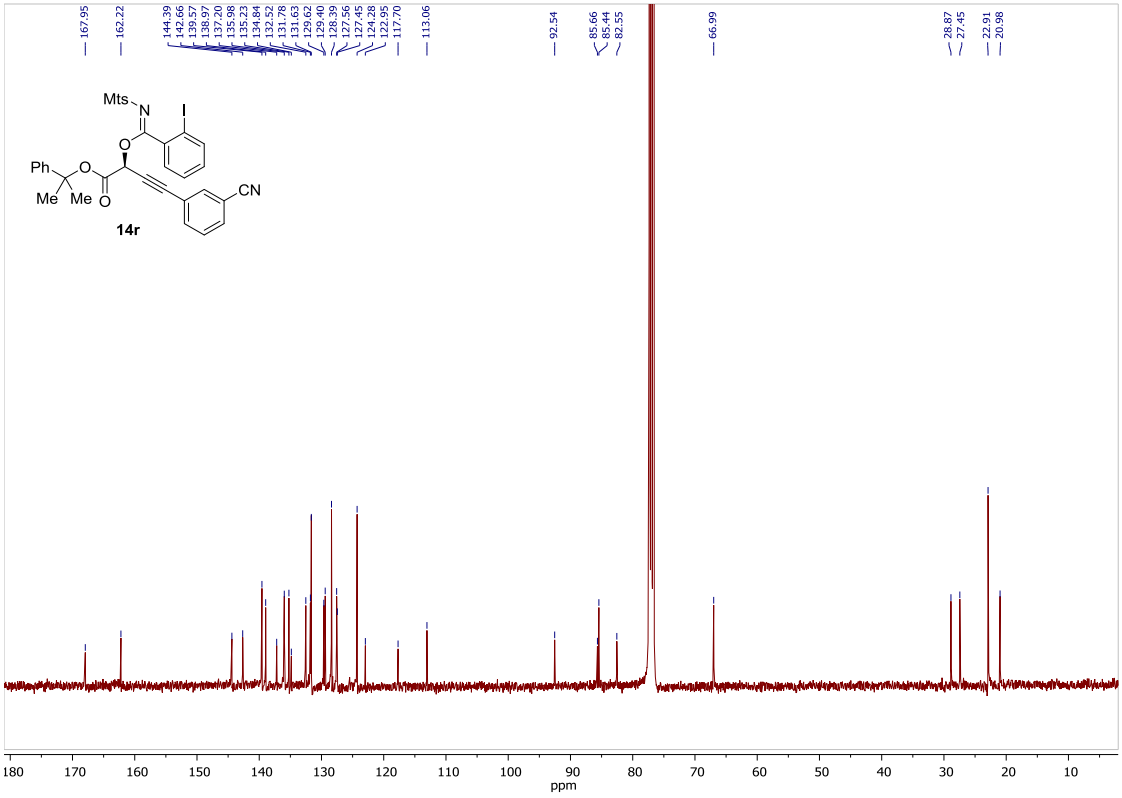
IR of compound **14q**



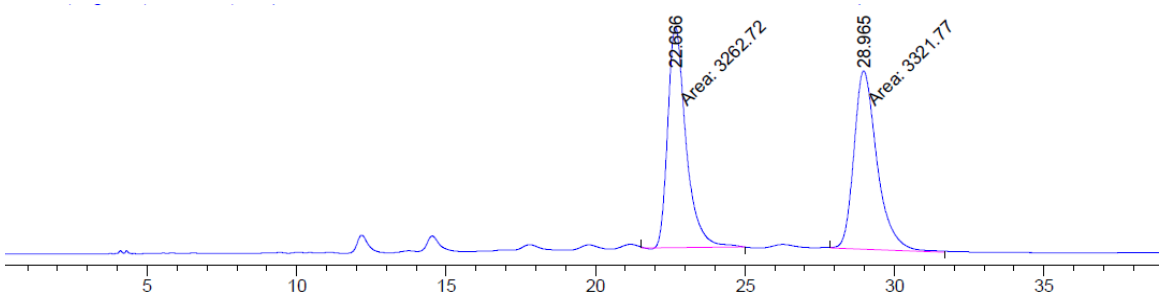
^{1}H-NMR (400 MHz, $CDCl_3$) of compound **14r**



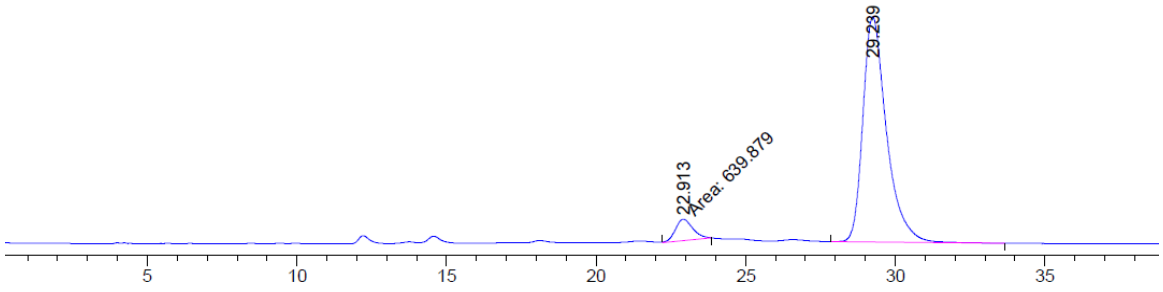
^{13}C-NMR (100 MHz, $CDCl_3$) of compound **14r**



HPLC of compound **14r**

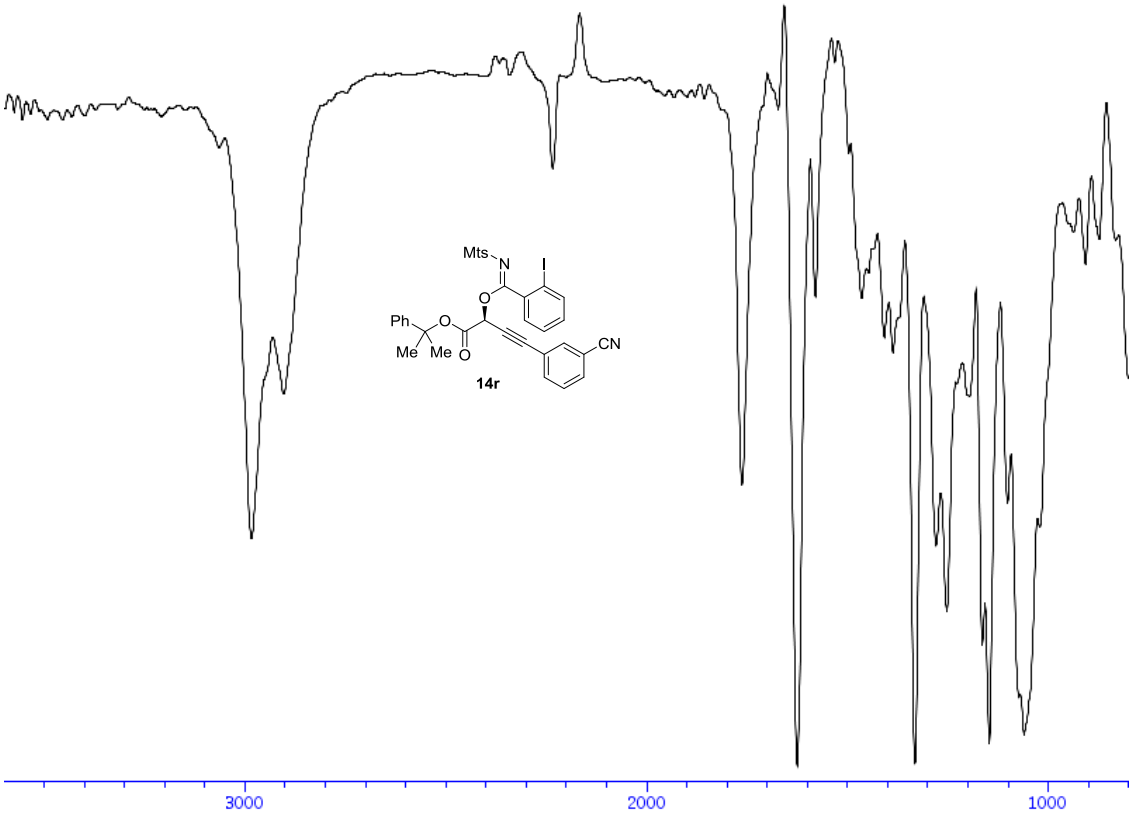


Peak #	RetTime [min]	Type	Width [min]	Area [mAU*s]	Height [mAU]	Area %
1	22.666	MM	0.7097	3262.72363	76.61926	49.5516
2	28.965	MM	0.8953	3321.76831	61.83421	50.4484

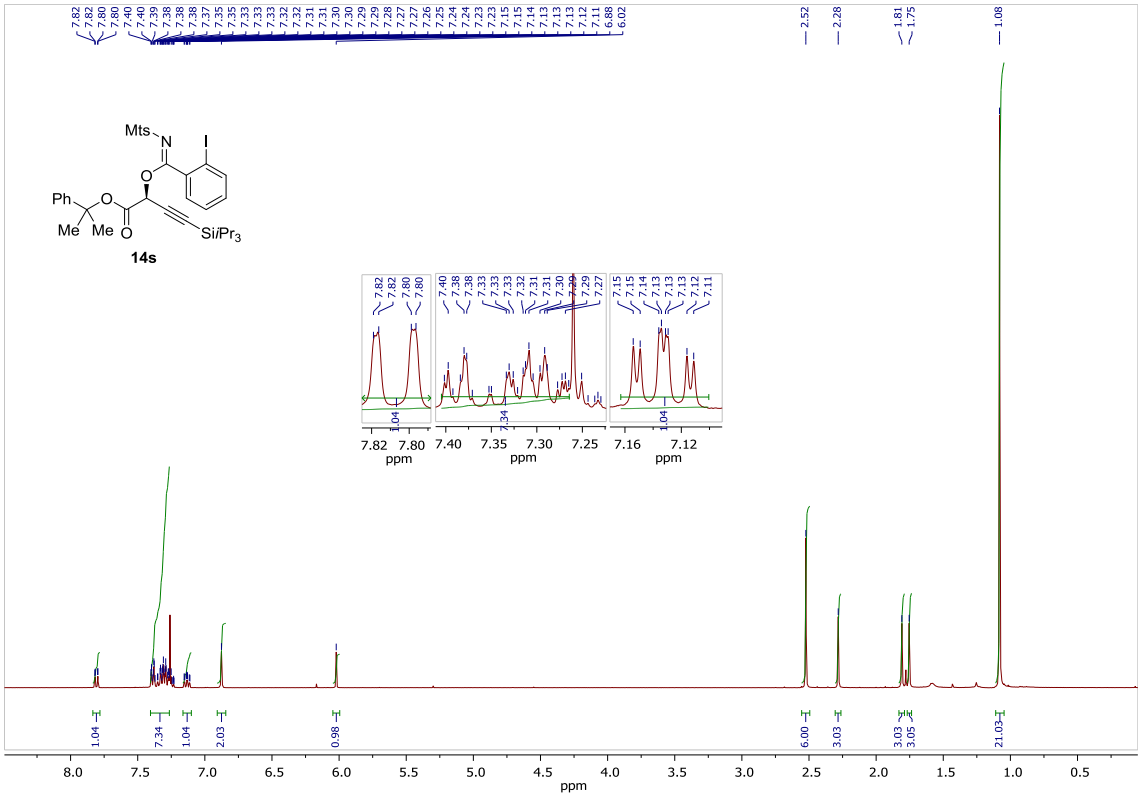


Peak #	RetTime [min]	Type	Width [min]	Area [mAU*s]	Height [mAU]	Area %
1	22.913	MM	0.6632	639.87933	16.08115	6.4491
2	29.239	BB	0.8275	9282.15332	169.34767	93.5509

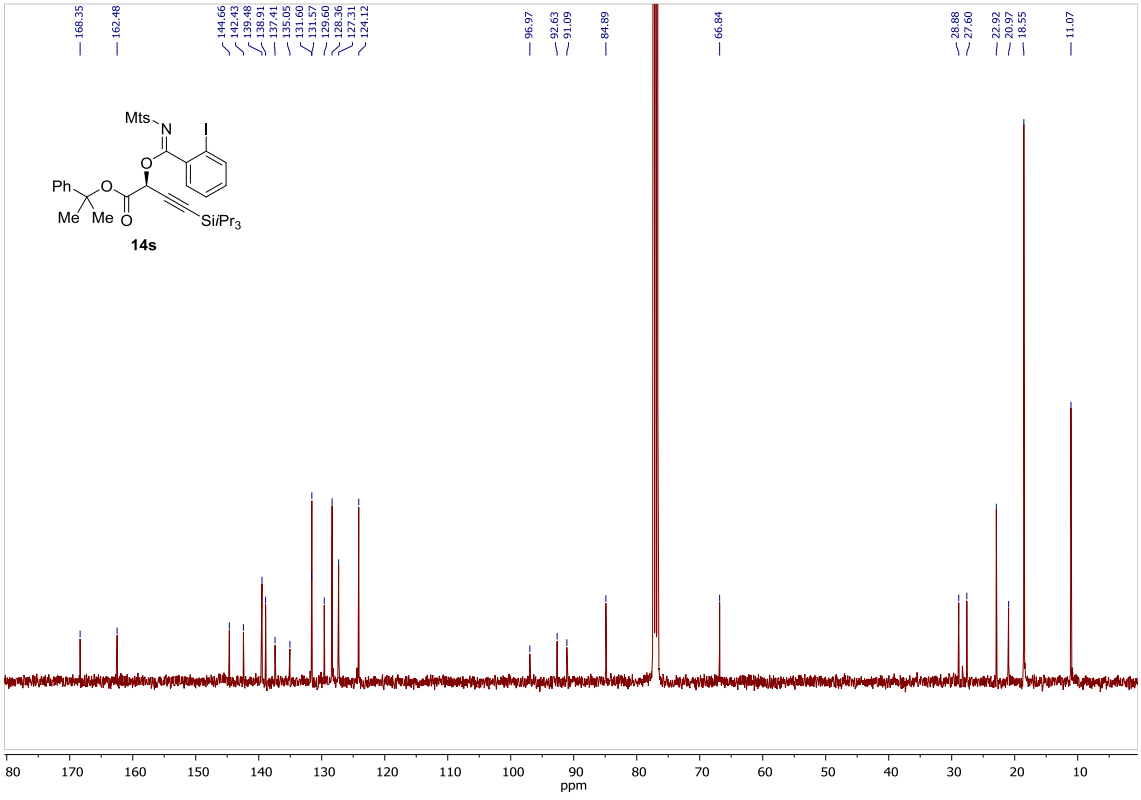
IR of compound **14r**



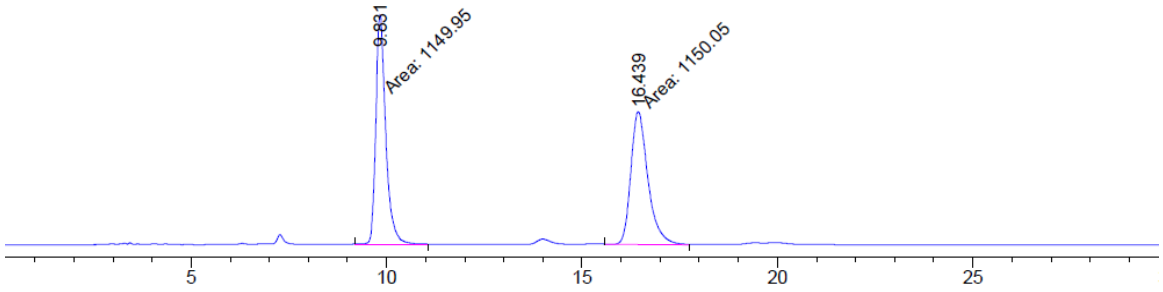
^{1}H-NMR (400 MHz, $CDCl_3$) of compound **14s**



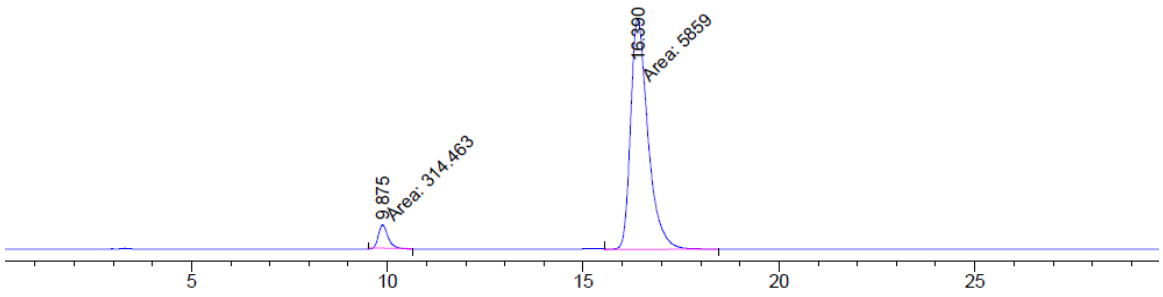
^{13}C-NMR (100 MHz, $CDCl_3$) of compound **14s**



HPLC of compound **14s**

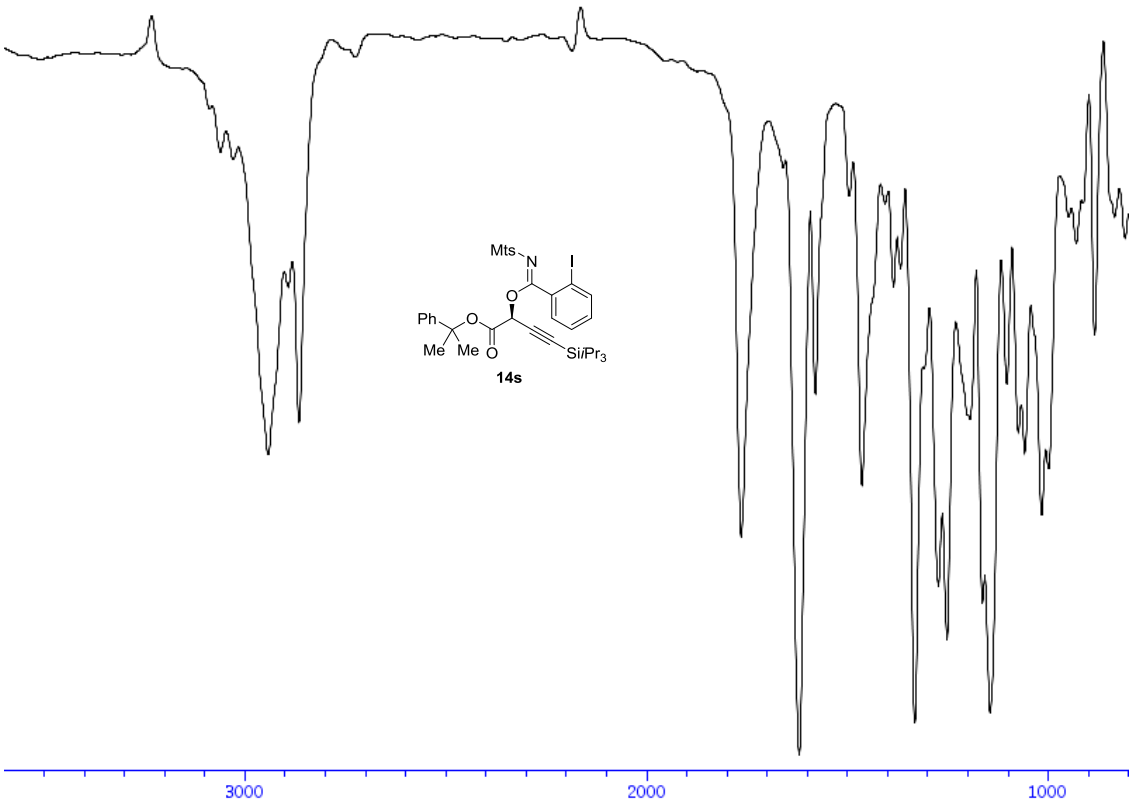


Peak #	RetTime [min]	Type	Width [min]	Area [mAU*s]	Height [mAU]	Area %
1	9.831	MM	0.2956	1149.95093	64.82918	49.9979
2	16.439	MM	0.5114	1150.04749	37.48198	50.0021

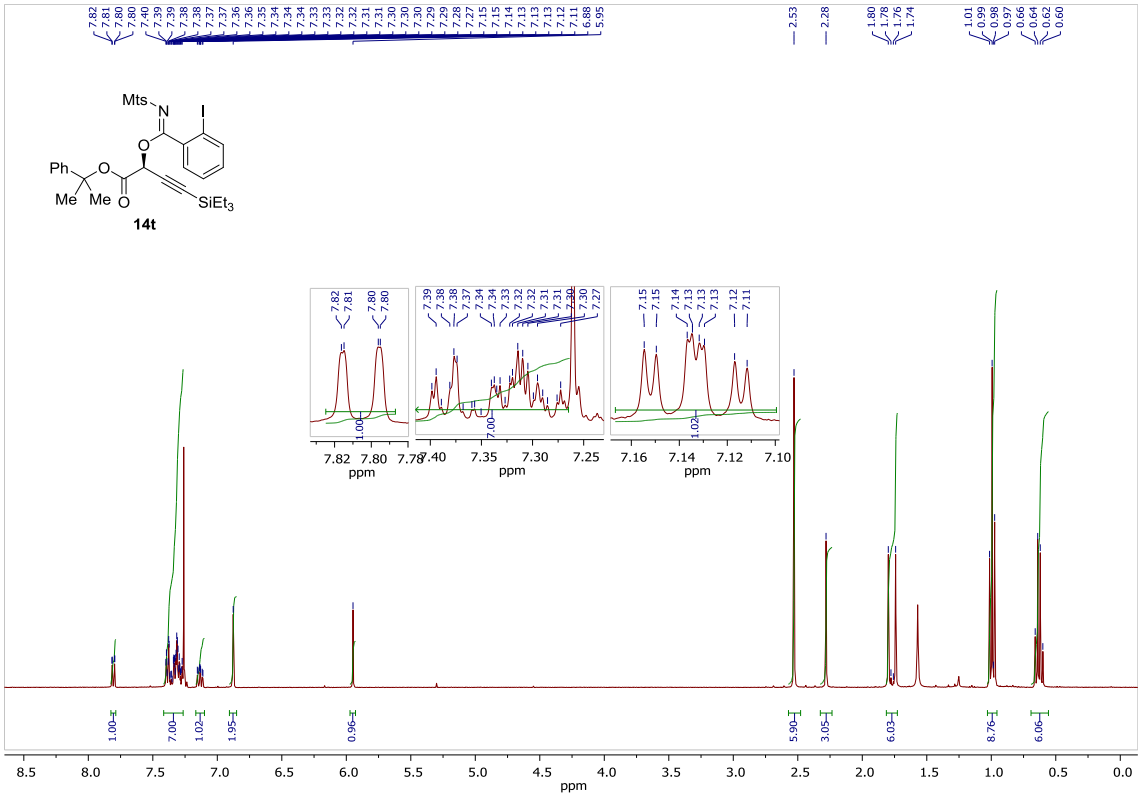


Peak #	RetTime [min]	Type	Width [min]	Area [mAU*s]	Height [mAU]	Area %
1	9.875	MM	0.2759	314.46310	18.99383	5.0938
2	16.390	MM	0.5181	5858.99707	188.49220	94.9062

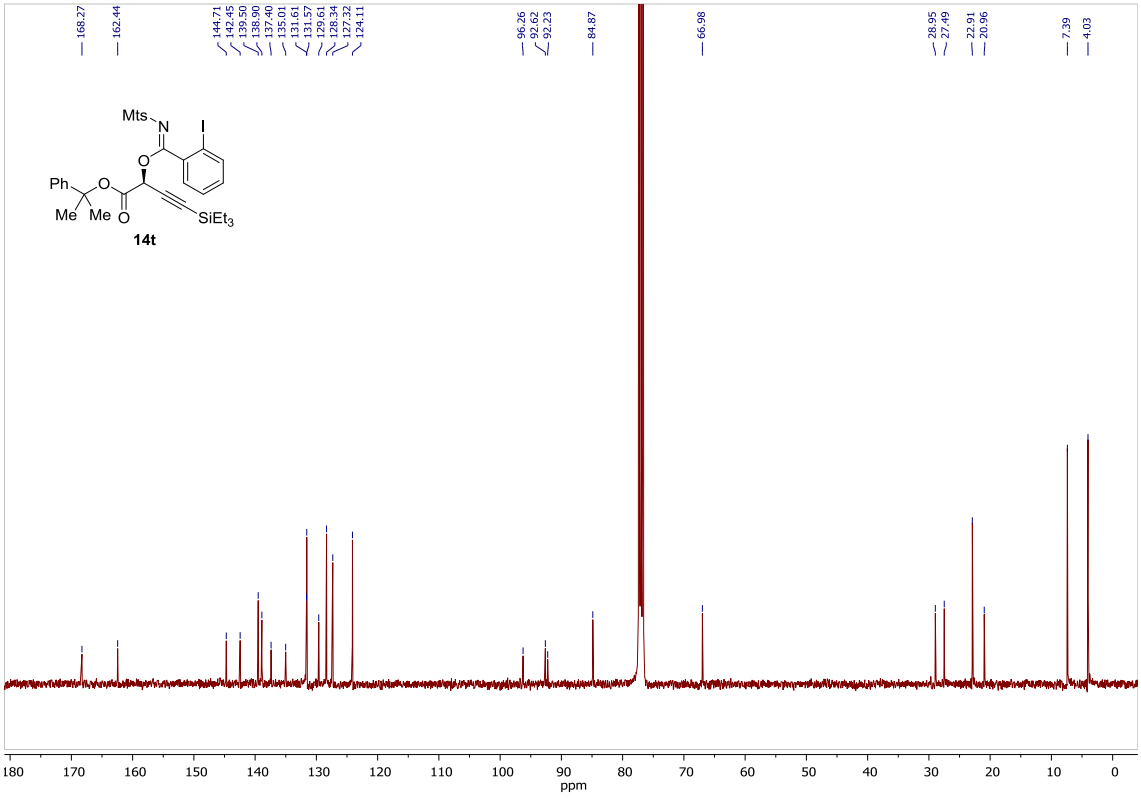
IR of compound **14s**



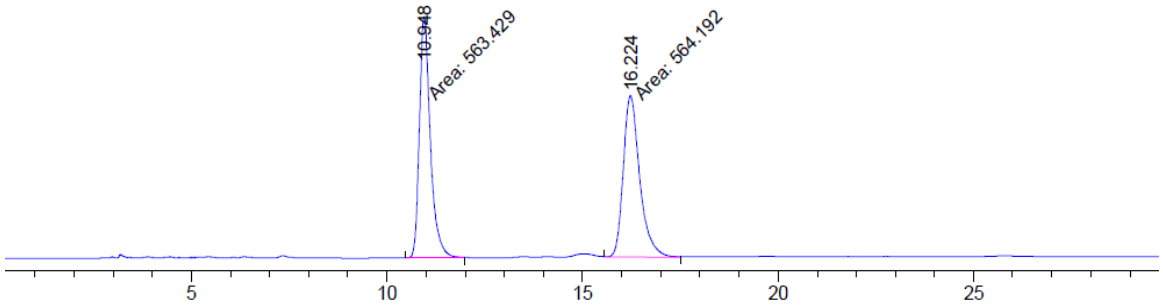
^{1}H-NMR (400 MHz, $CDCl_3$) of compound **14t**



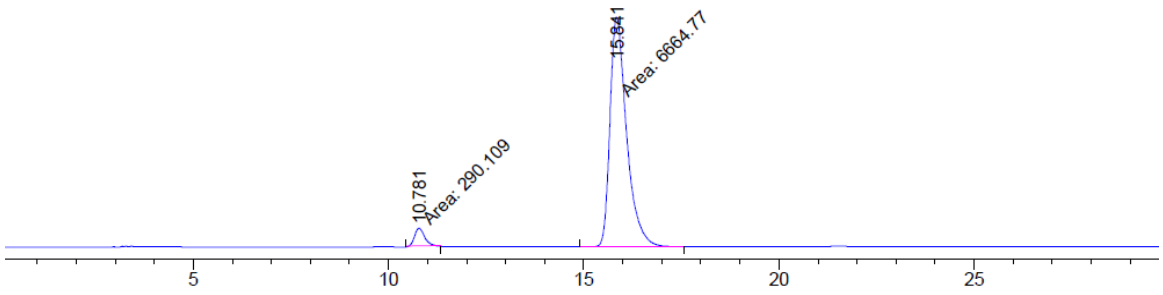
^{13}C-NMR (100 MHz, $CDCl_3$) of compound **14t**



HPLC of compound **14t**

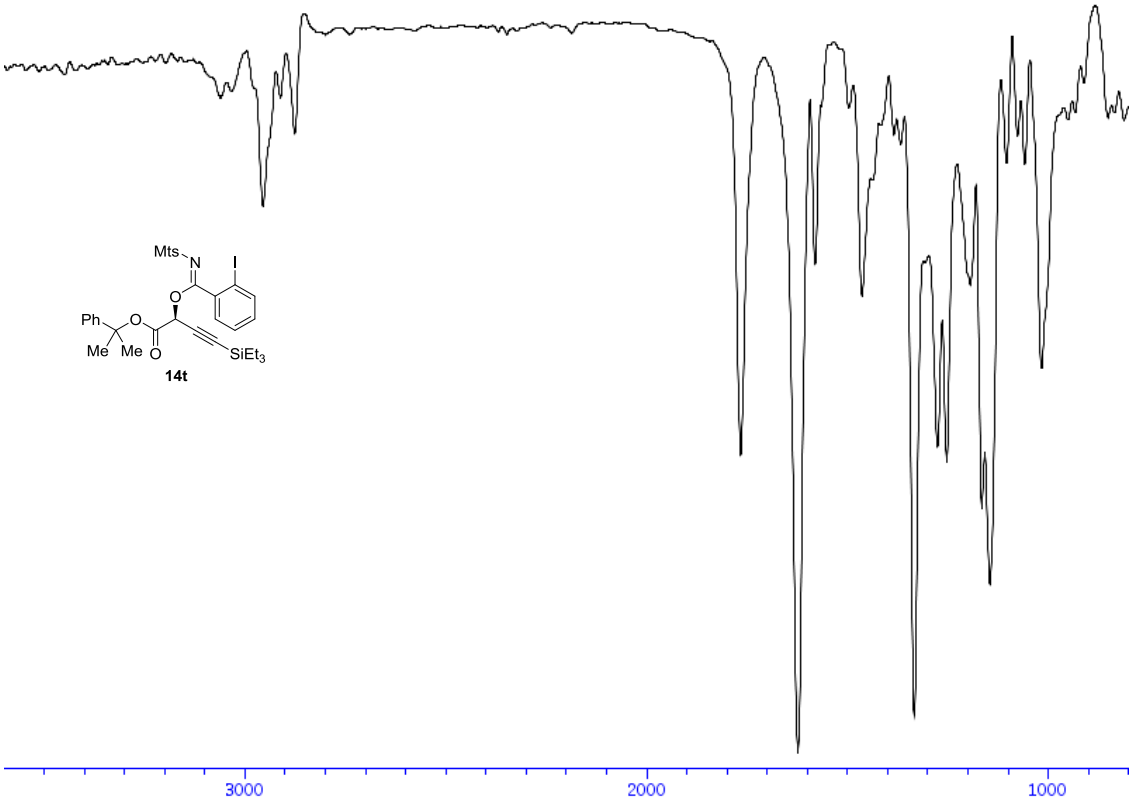


Peak #	RetTime [min]	Type	Width [min]	Area [mAU*s]	Height [mAU]	Area %
1	10.948	MM	0.3254	563.42926	28.85790	49.9662
2	16.224	MM	0.4871	564.19244	19.30488	50.0338

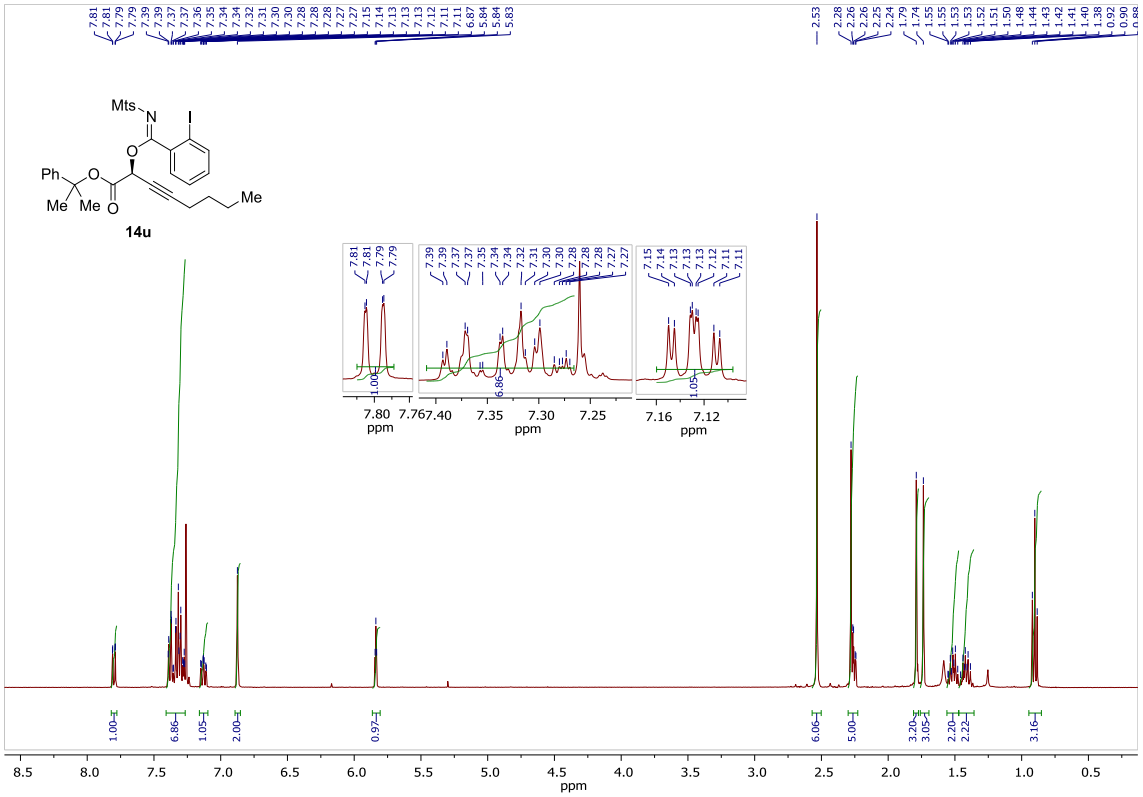


Peak #	RetTime [min]	Type	Width [min]	Area [mAU*s]	Height [mAU]	Area %
1	10.781	MM	0.2844	290.10907	17.00128	4.1713
2	15.841	MM	0.4981	6664.76611	223.00455	95.8287

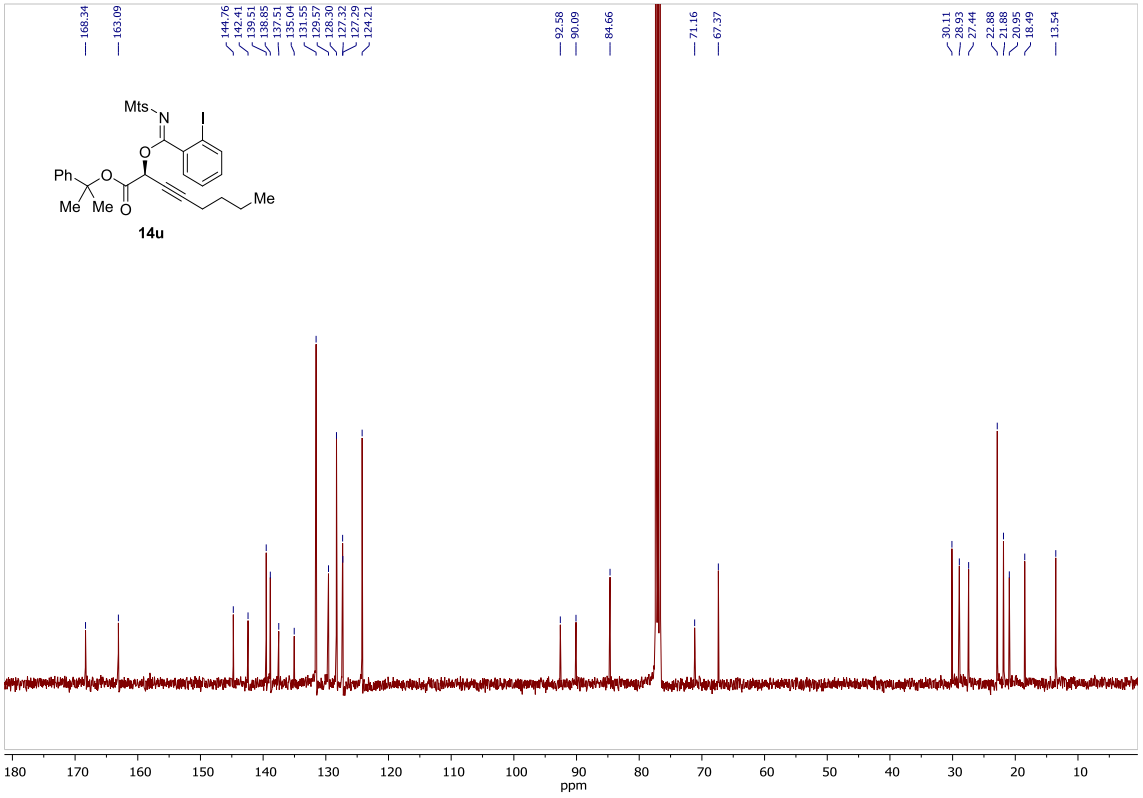
IR of compound **14t**



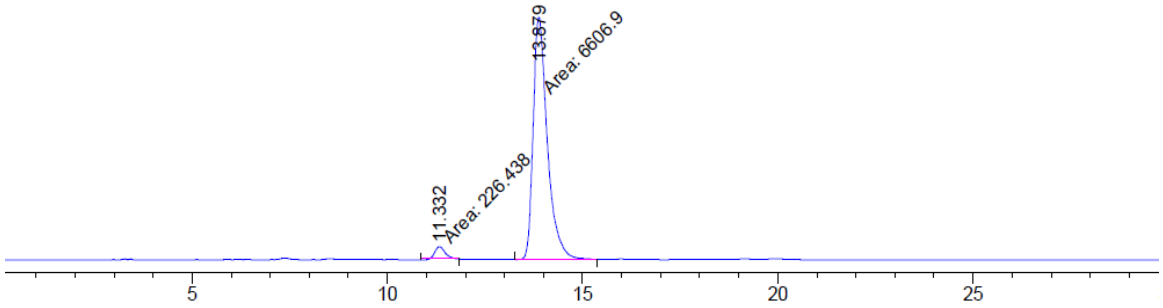
^{1}H-NMR (400 MHz, $CDCl_3$) of compound **14u**



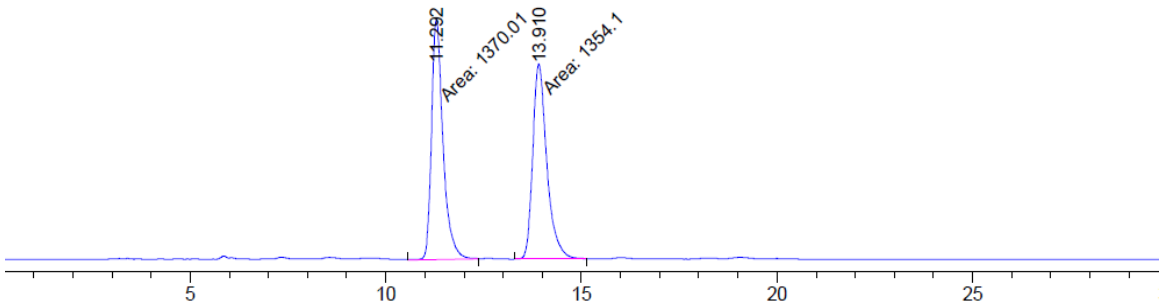
^{13}C-NMR (100 MHz, $CDCl_3$) of compound **14u**



HPLC of compound **14u**

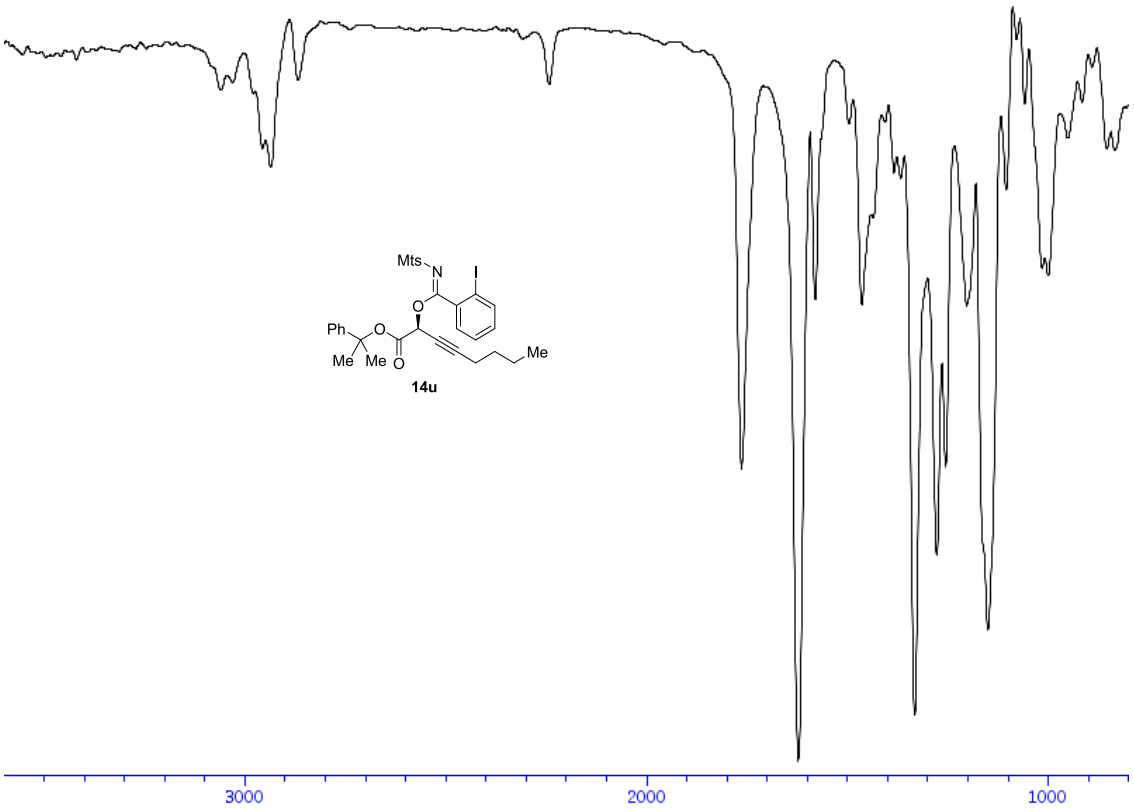


Peak #	RetTime [min]	Type	Width [min]	Area [mAU*s]	Height [mAU]	Area %
1	11.332	MM	0.2947	226.43759	12.80400	3.3137
2	13.879	MM	0.4245	6606.90088	259.41061	96.6863

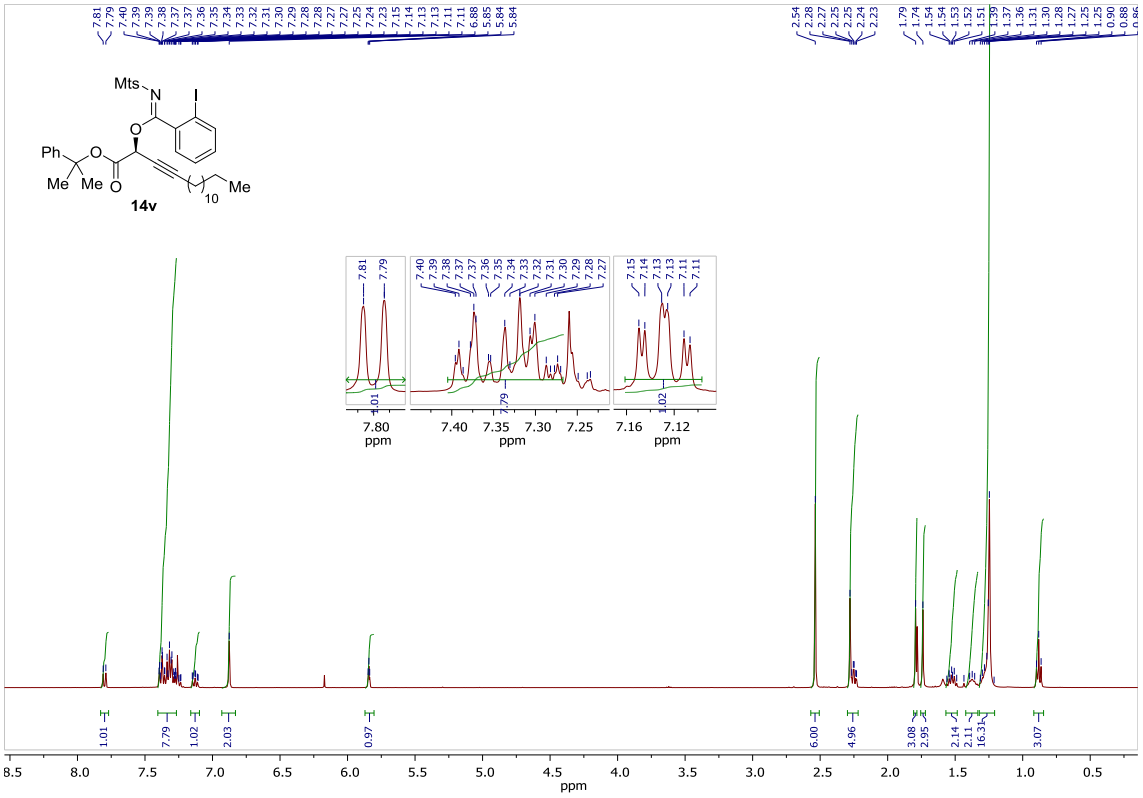


Peak #	RetTime [min]	Type	Width [min]	Area [mAU*s]	Height [mAU]	Area %
1	11.292	MM	0.3424	1370.01038	66.68088	50.2920
2	13.910	MM	0.4179	1354.10254	54.00178	49.7080

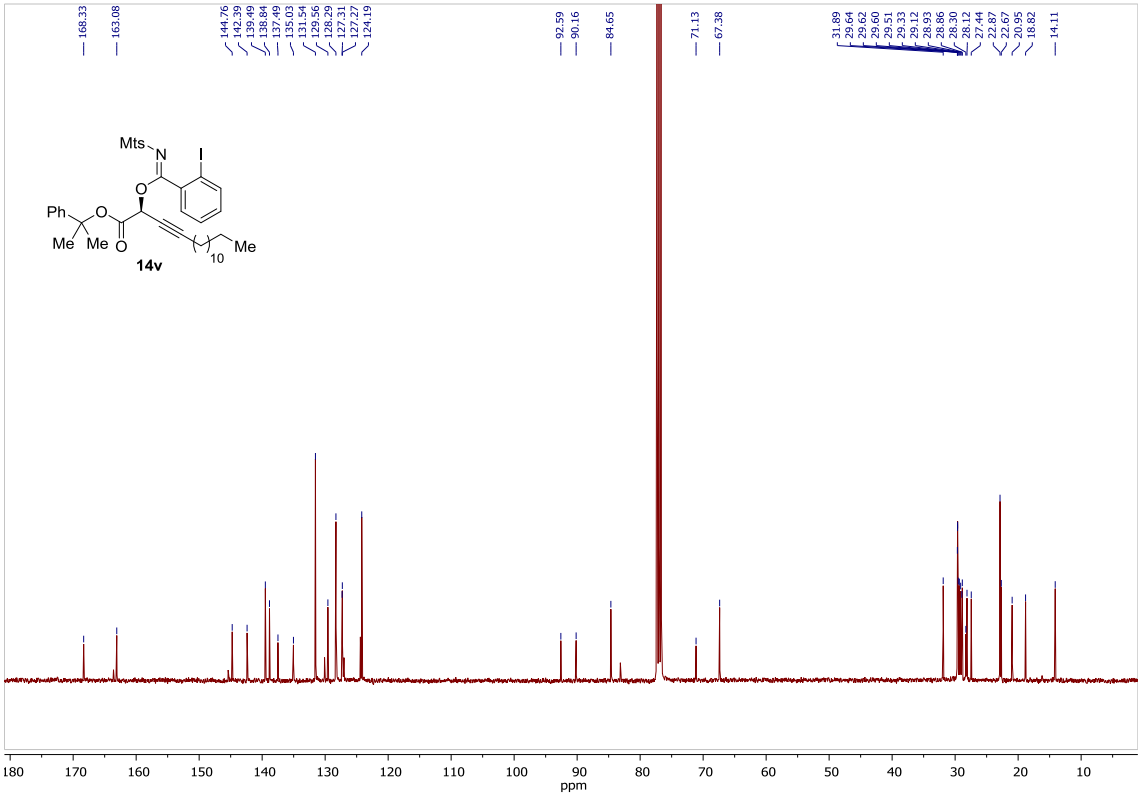
IR of compound **14u**



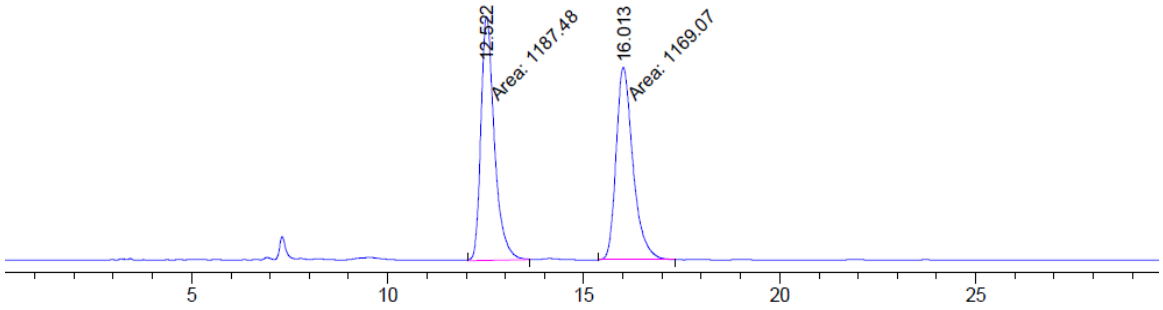
^{1}H-NMR (400 MHz, $CDCl_3$) of compound **14v**



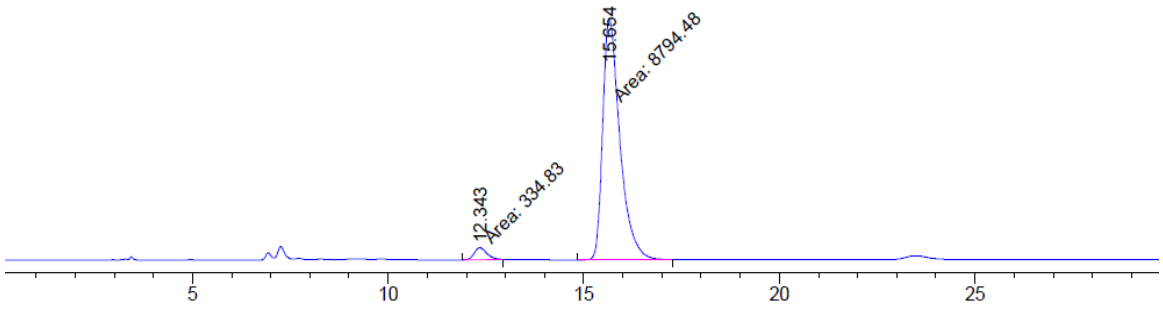
^{13}C-NMR (100 MHz, $CDCl_3$) of compound **14v**



HPLC of compound **14v**

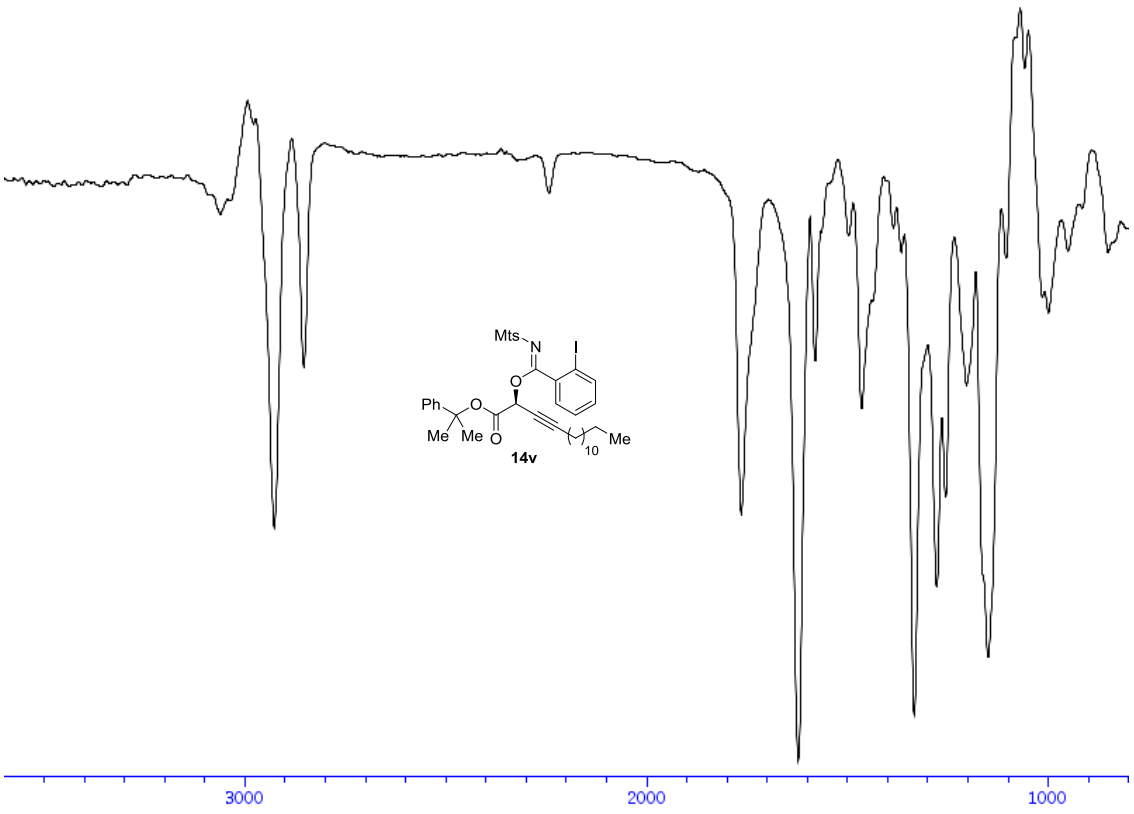


Peak #	RetTime [min]	Type	Width [min]	Area [mAU*s]	Height [mAU]	Area %
1	12.522	MM	0.3995	1187.48083	49.53580	50.3906
2	16.013	MM	0.4990	1169.06982	39.04598	49.6094

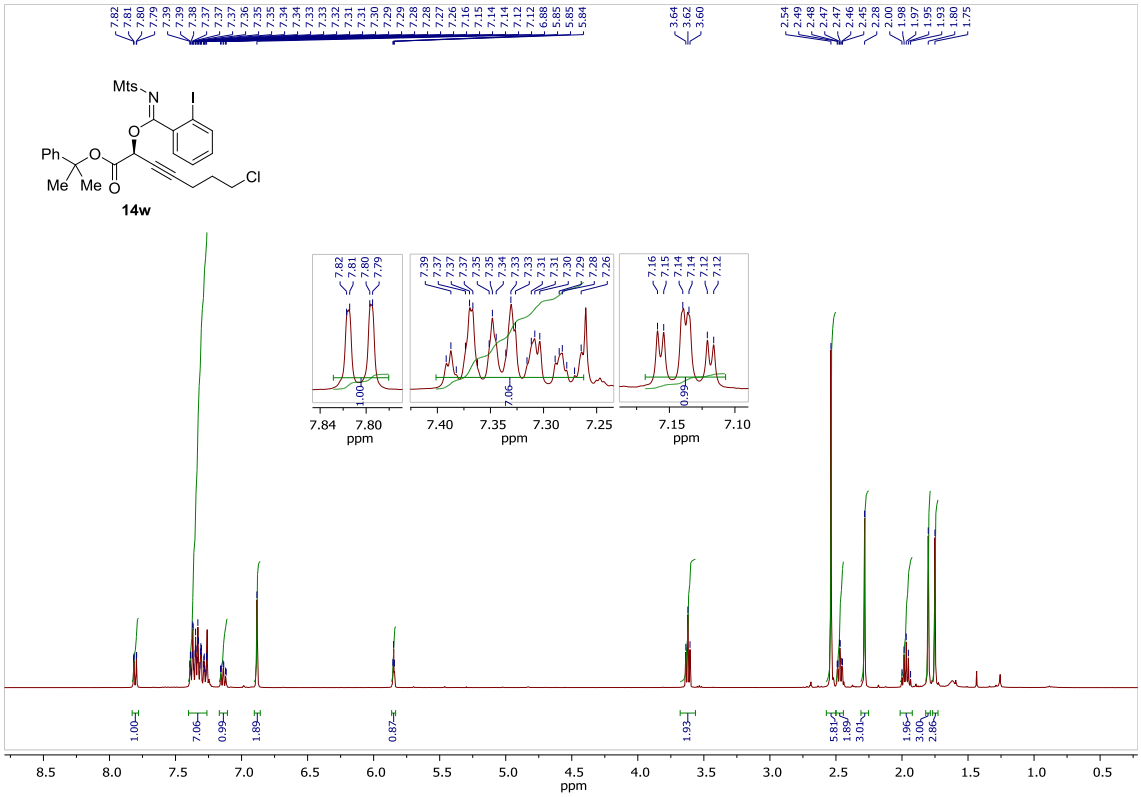


Peak #	RetTime [min]	Type	Width [min]	Area [mAU*s]	Height [mAU]	Area %
1	12.343	MM	0.3826	334.82959	14.58541	3.6676
2	15.654	MM	0.5123	8794.47949	286.09067	96.3324

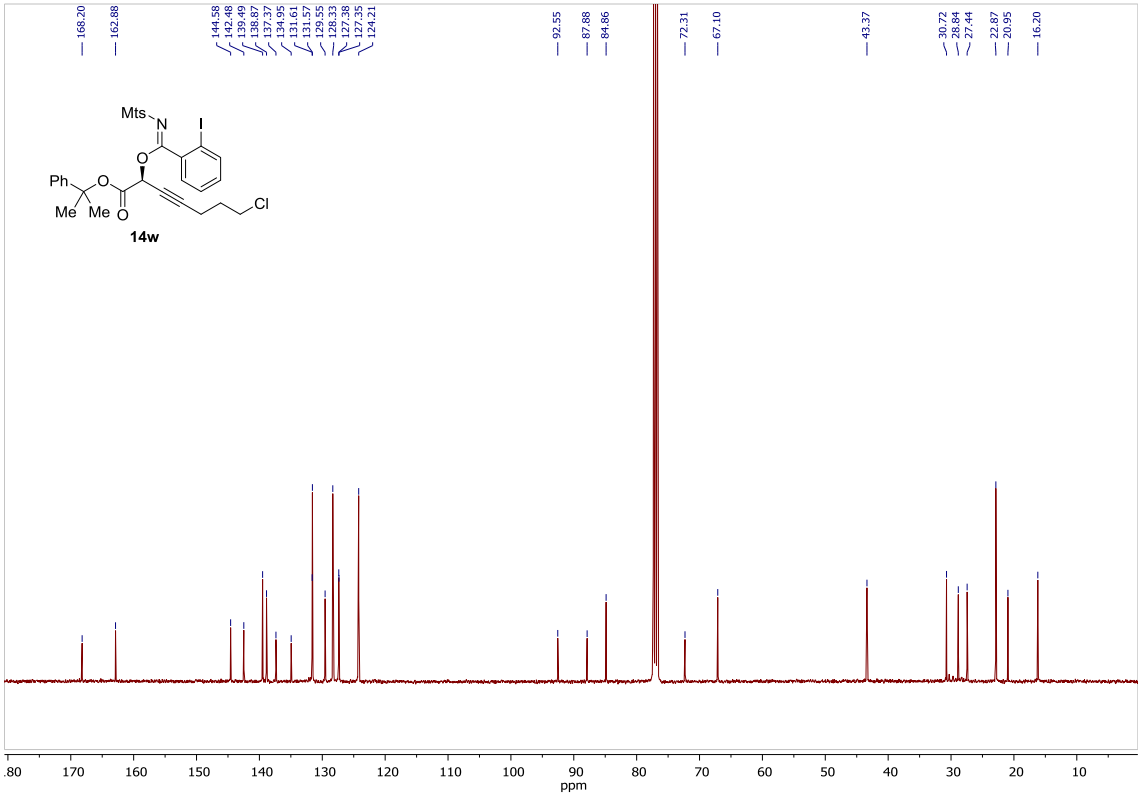
IR of compound **14v**



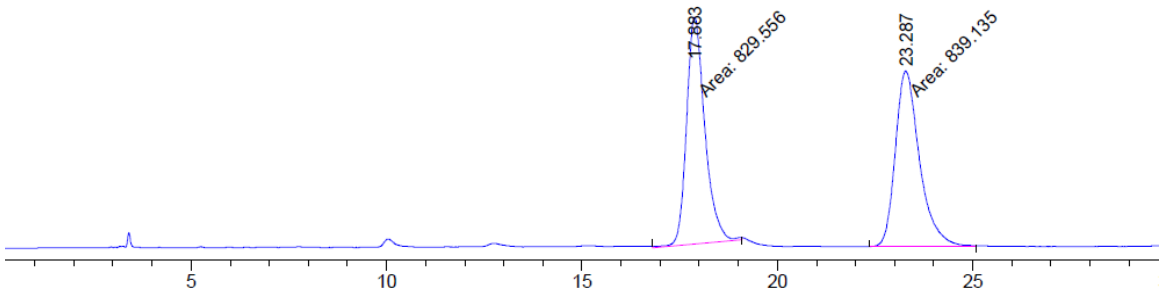
^{1}H-NMR (400 MHz, $CDCl_3$) of compound **14w**



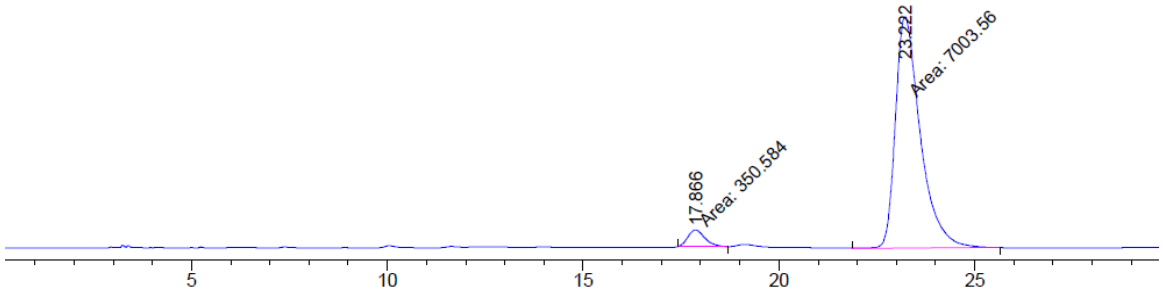
^{13}C-NMR (100 MHz, $CDCl_3$) of compound **14w**



HPLC of compound **14w**

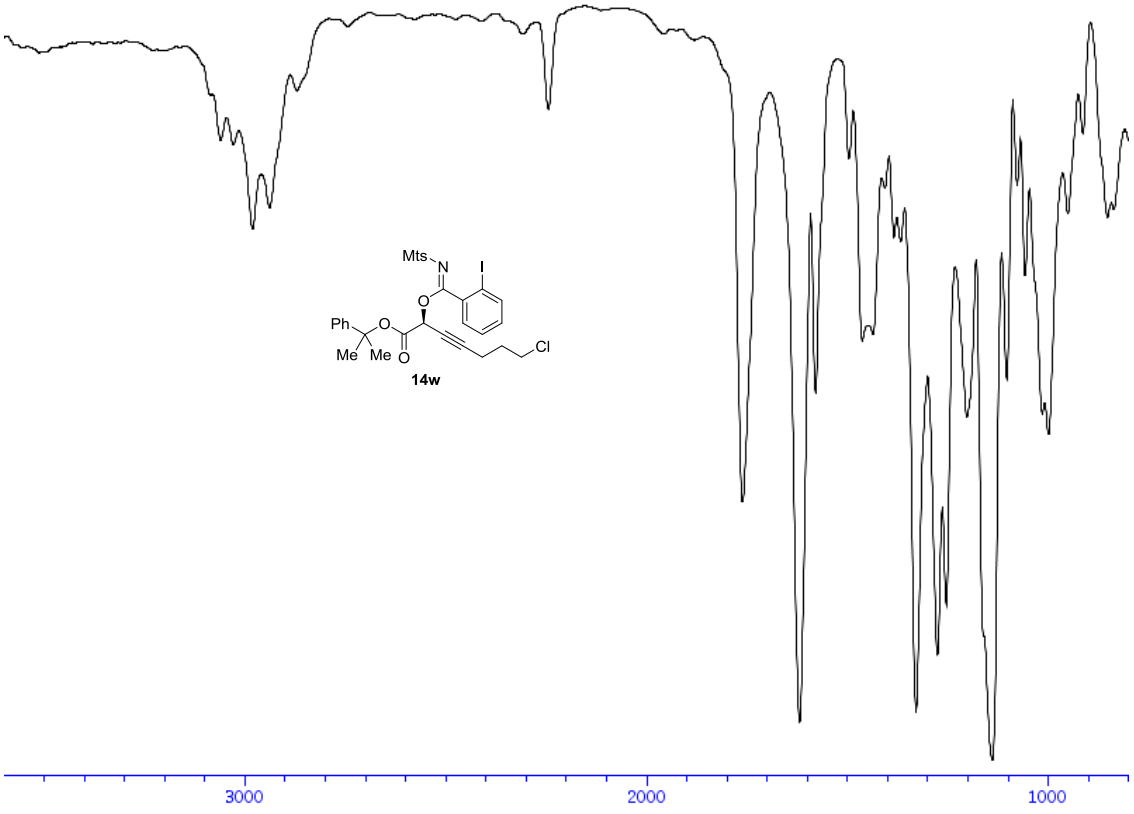


Peak #	RetTime [min]	Type	Width [min]	Area [mAU*s]	Height [mAU]	Area %
1	17.883	MM	0.5439	829.55560	25.41787	49.7130
2	23.287	MM	0.7131	839.13501	19.61322	50.2870

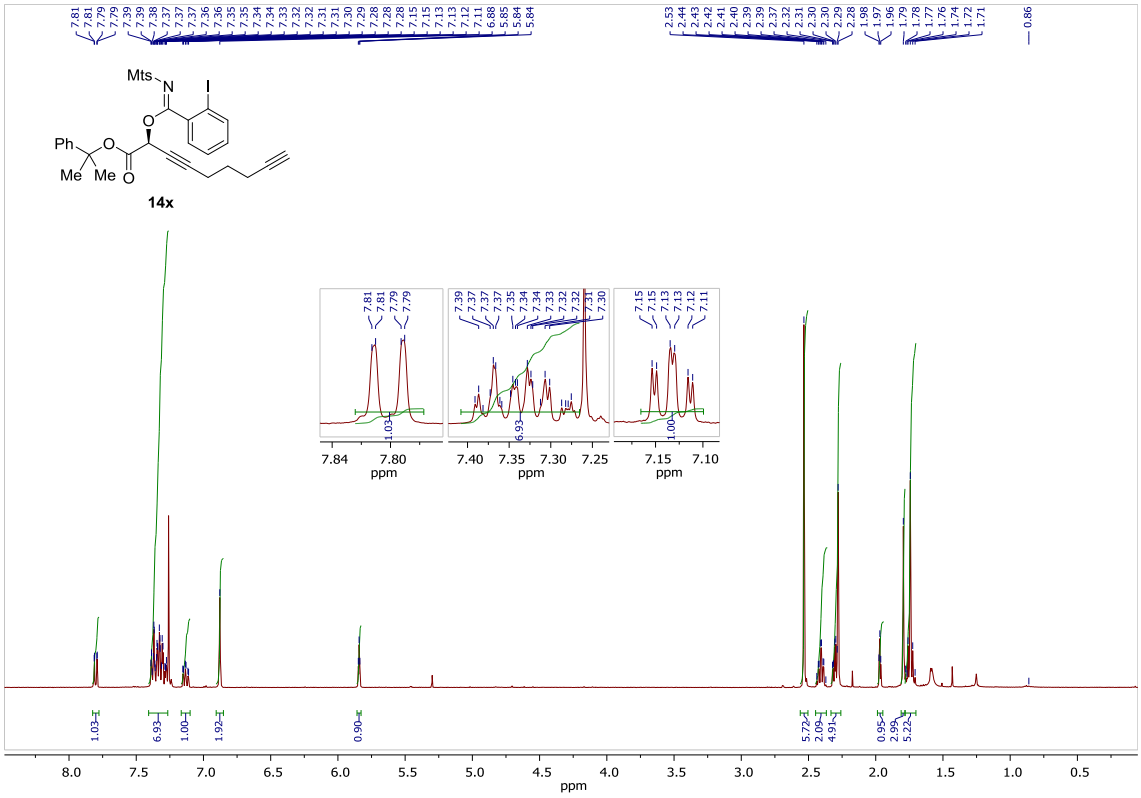


Peak #	RetTime [min]	Type	Width [min]	Area [mAU*s]	Height [mAU]	Area %
1	17.866	MM	0.5084	350.58383	11.49350	4.7672
2	23.222	MM	0.7396	7003.56445	157.82423	95.2328

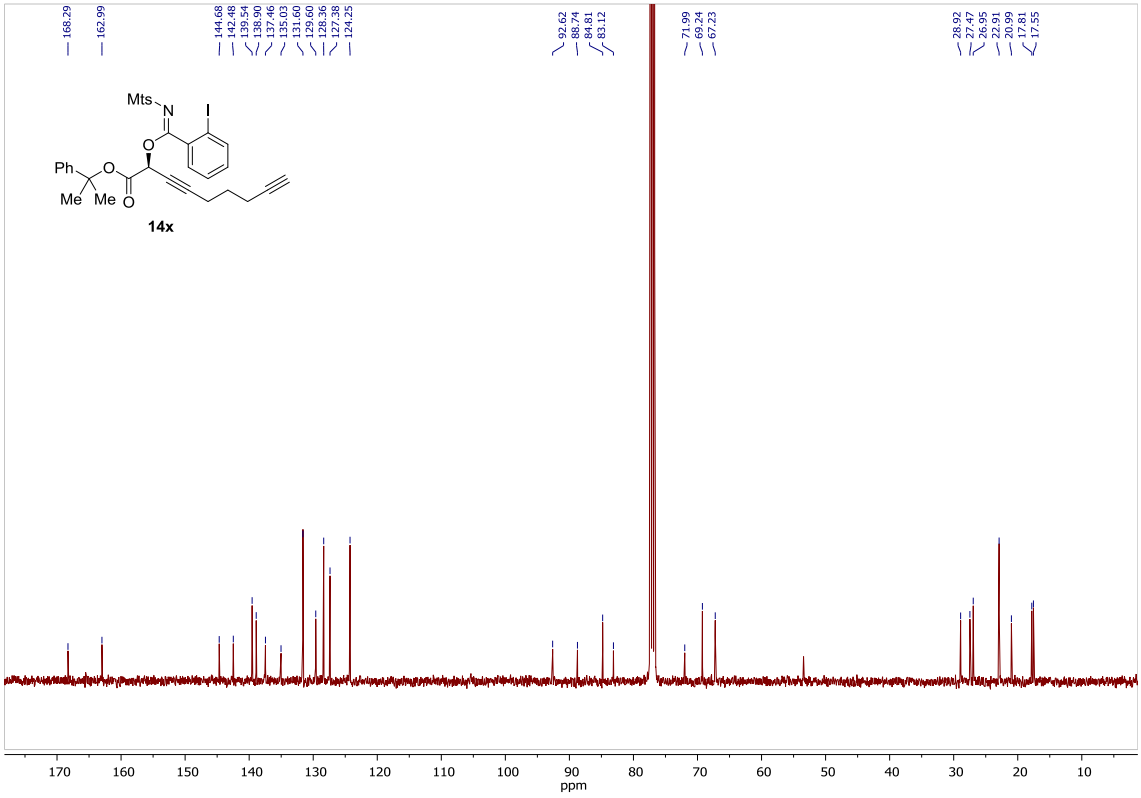
IR of compound **14w**



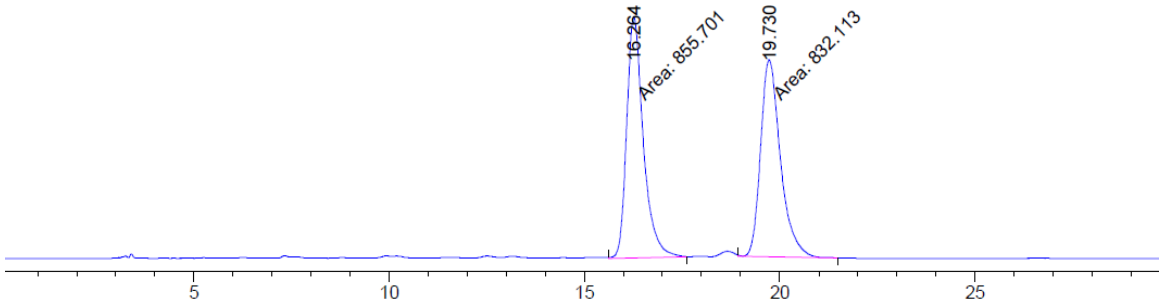
^{1}H-NMR (400 MHz, $CDCl_3$) of compound **14x**



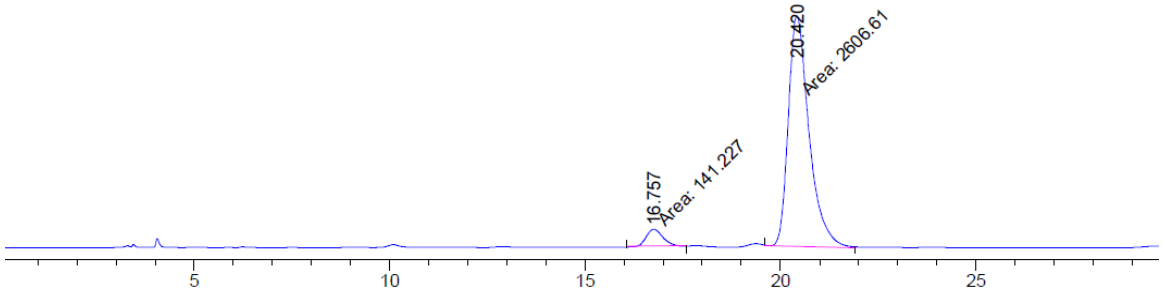
^{13}C-NMR (100 MHz, $CDCl_3$) of compound **14x**



HPLC of compound **14x**

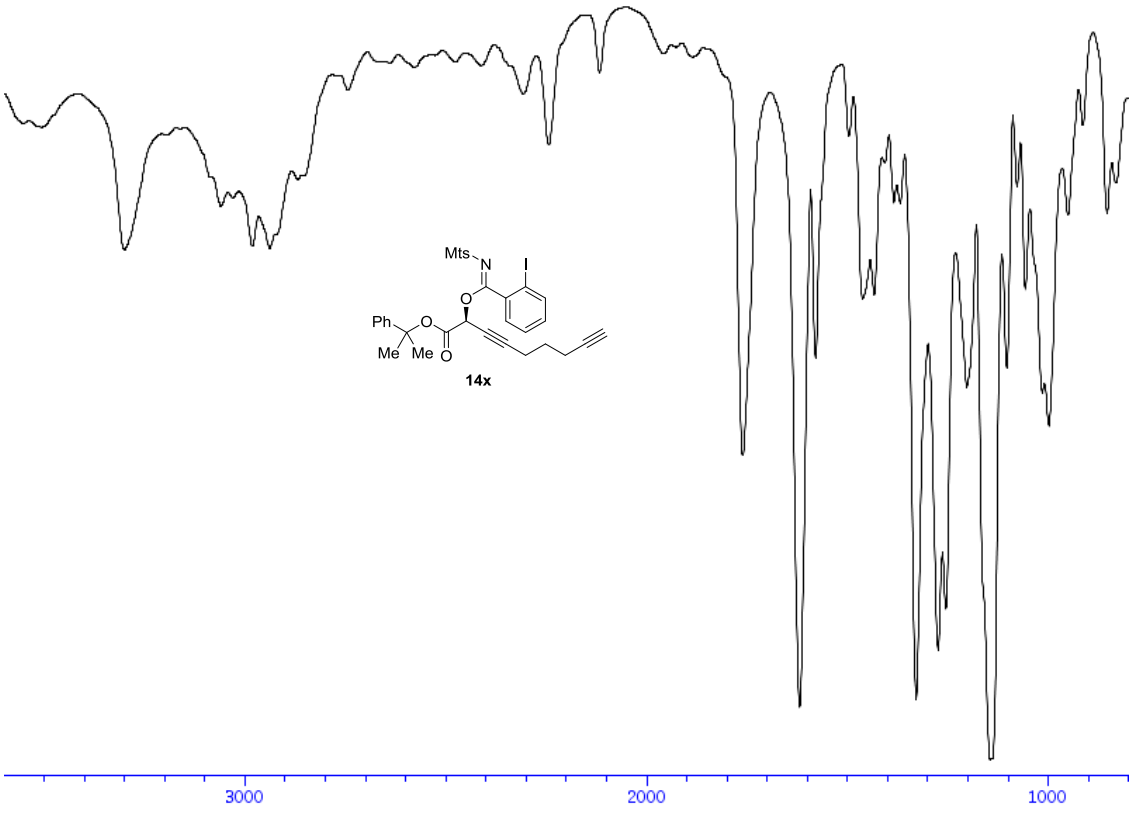


Peak #	RetTime [min]	Type	Width [min]	Area [mAU*s]	Height [mAU]	Area %
1	16.264	MM	0.4934	855.70081	28.90598	50.6988
2	19.730	MM	0.5889	832.11328	23.54800	49.3012

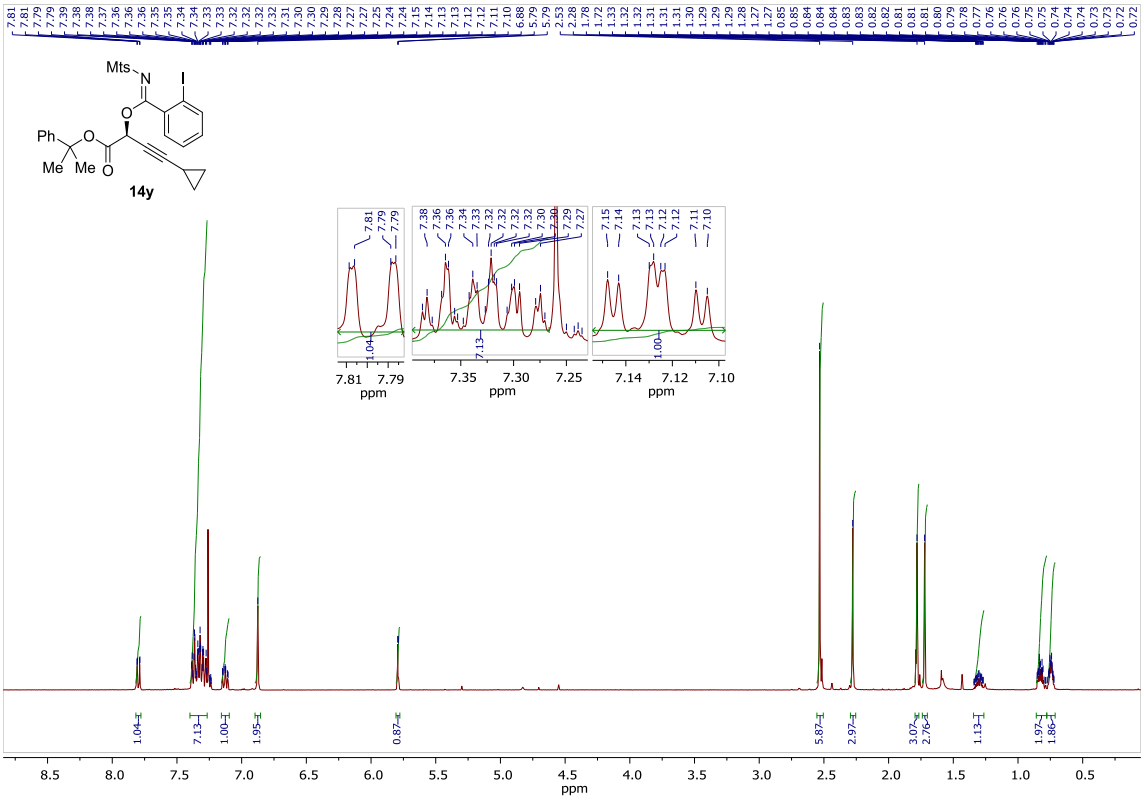


Peak #	RetTime [min]	Type	Width [min]	Area [mAU*s]	Height [mAU]	Area %
1	16.757	MM	0.4662	141.22705	5.04856	5.1396
2	20.420	MM	0.6148	2606.61377	70.65749	94.8604

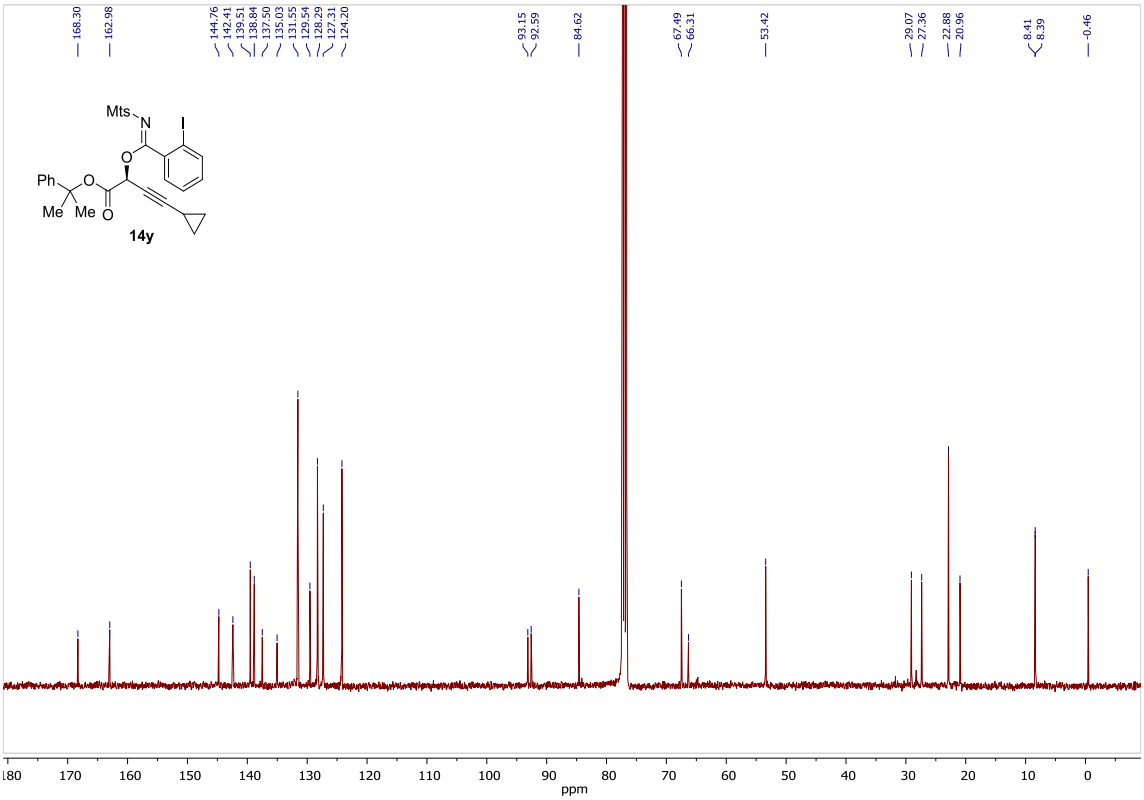
IR of compound **14x**



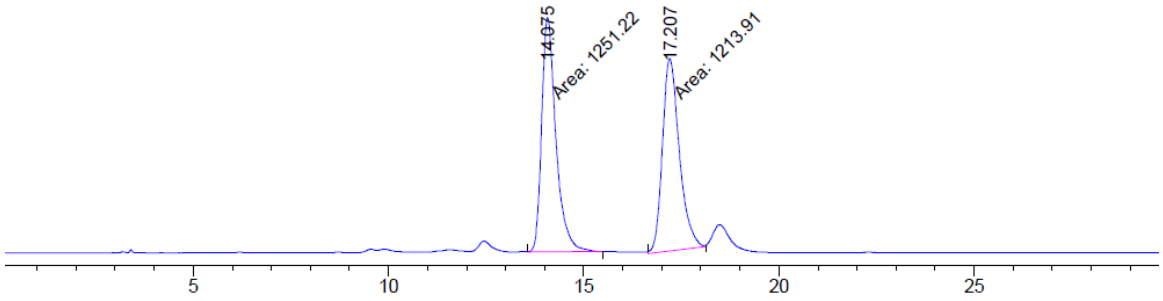
^{1}H-NMR (400 MHz, $CDCl_3$) of compound **14y**



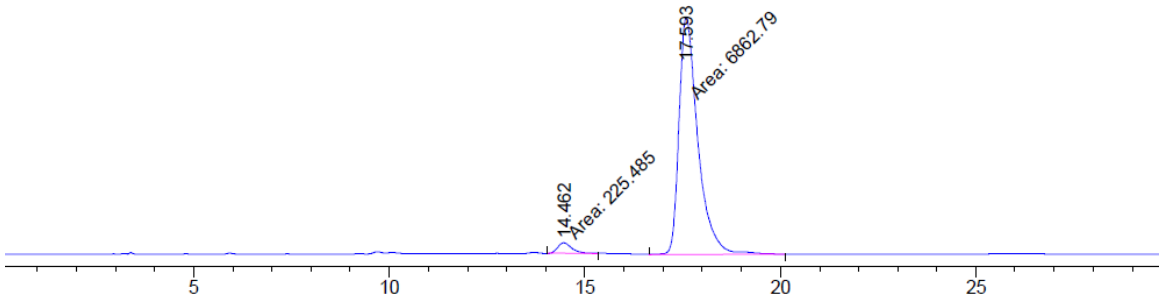
^{13}C-NMR (100 MHz, $CDCl_3$) of compound **14y**



HPLC of compound **14y**

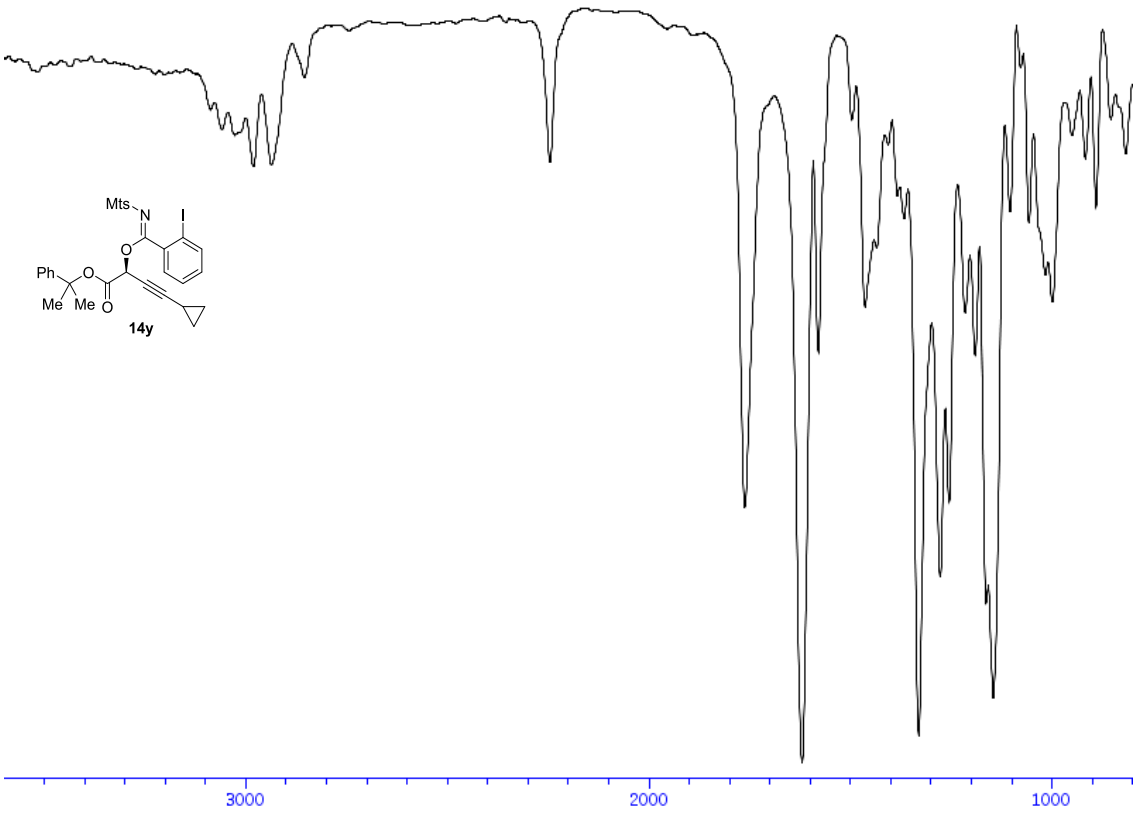


Peak #	RetTime [min]	Type	Width [min]	Area [mAU*s]	Height [mAU]	Area %
1	14.075	MM	0.4233	1251.21790	49.26518	50.7567
2	17.207	MM	0.4999	1213.90906	40.46896	49.2433

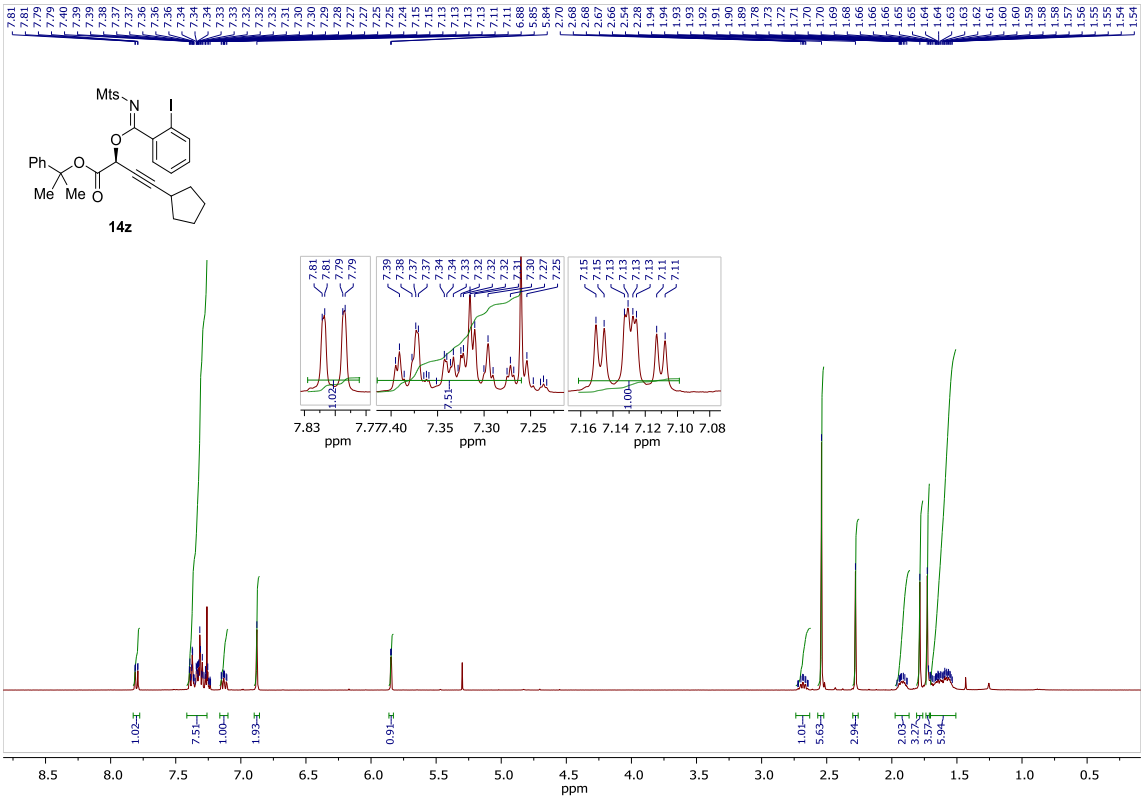


Peak #	RetTime [min]	Type	Width [min]	Area [mAU*s]	Height [mAU]	Area %
1	14.462	MM	0.4199	225.48512	8.95010	3.1811
2	17.593	MM	0.5630	6862.79102	203.16142	96.8189

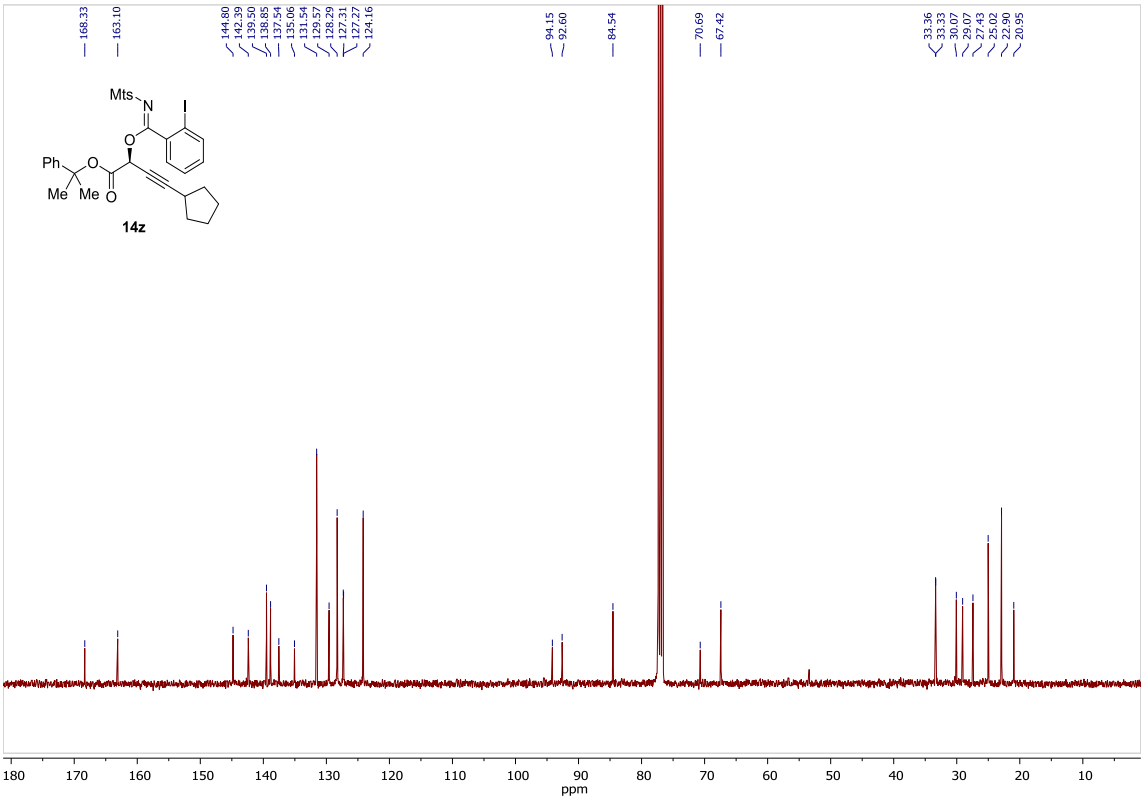
IR of compound **14y**



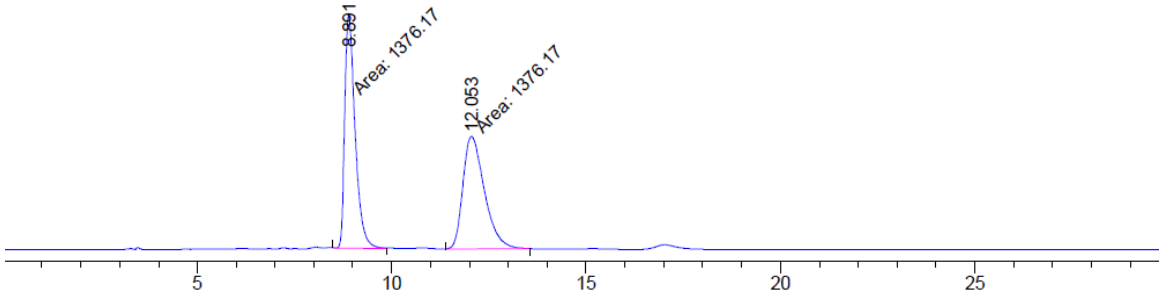
^{1}H-NMR (400 MHz, $CDCl_3$) of compound **14z**



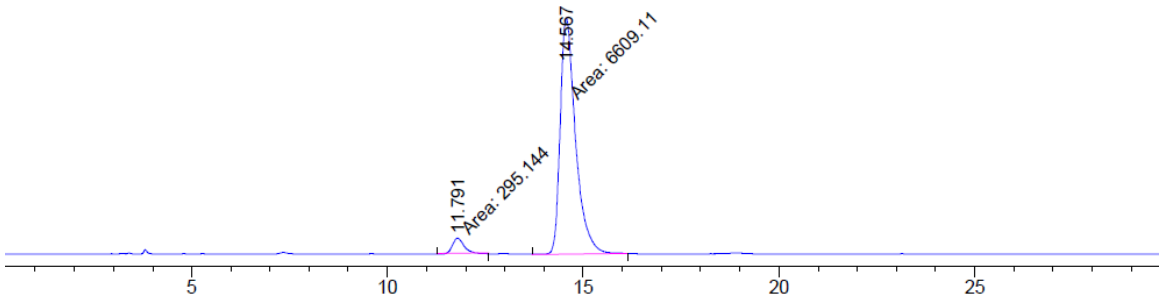
^{13}C-NMR (100 MHz, $CDCl_3$) of compound **14z**



HPLC of compound **14z**

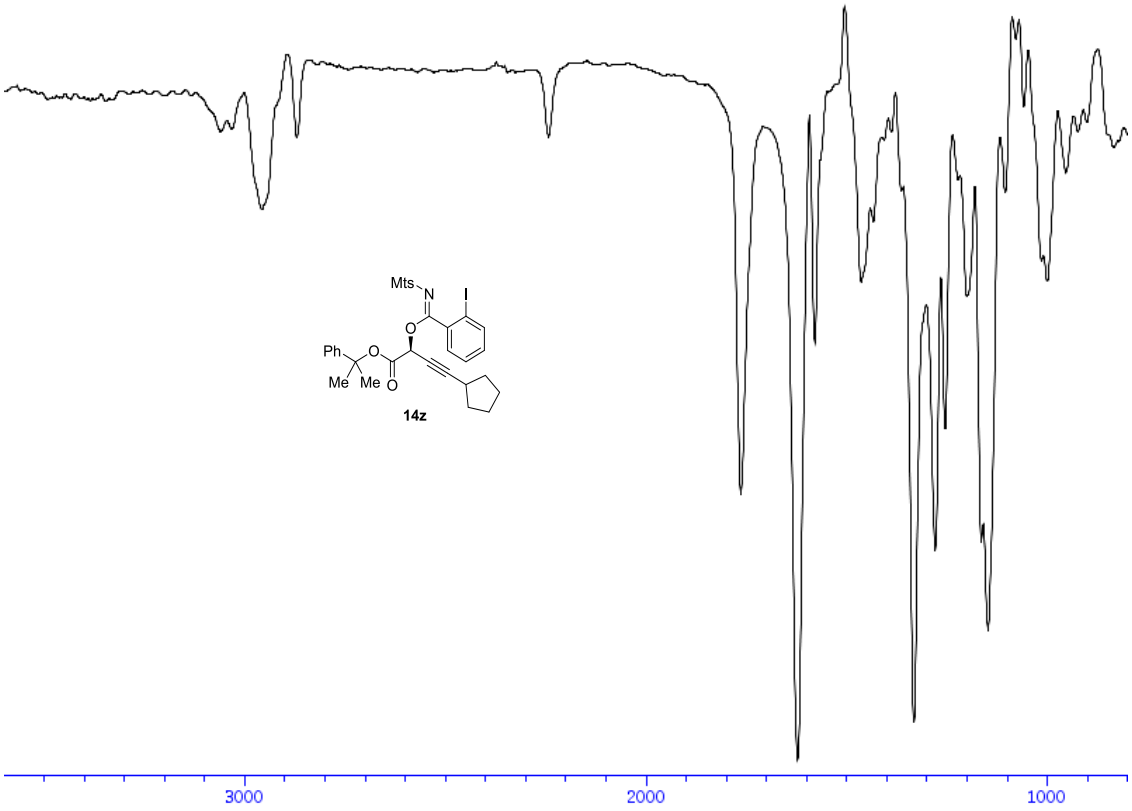


Peak #	RetTime [min]	Type	Width [min]	Area [mAU*s]	Height [mAU]	Area %
1	8.891	MM	0.3081	1376.16699	74.44983	50.0000
2	12.053	MM	0.6410	1376.16748	35.78159	50.0000

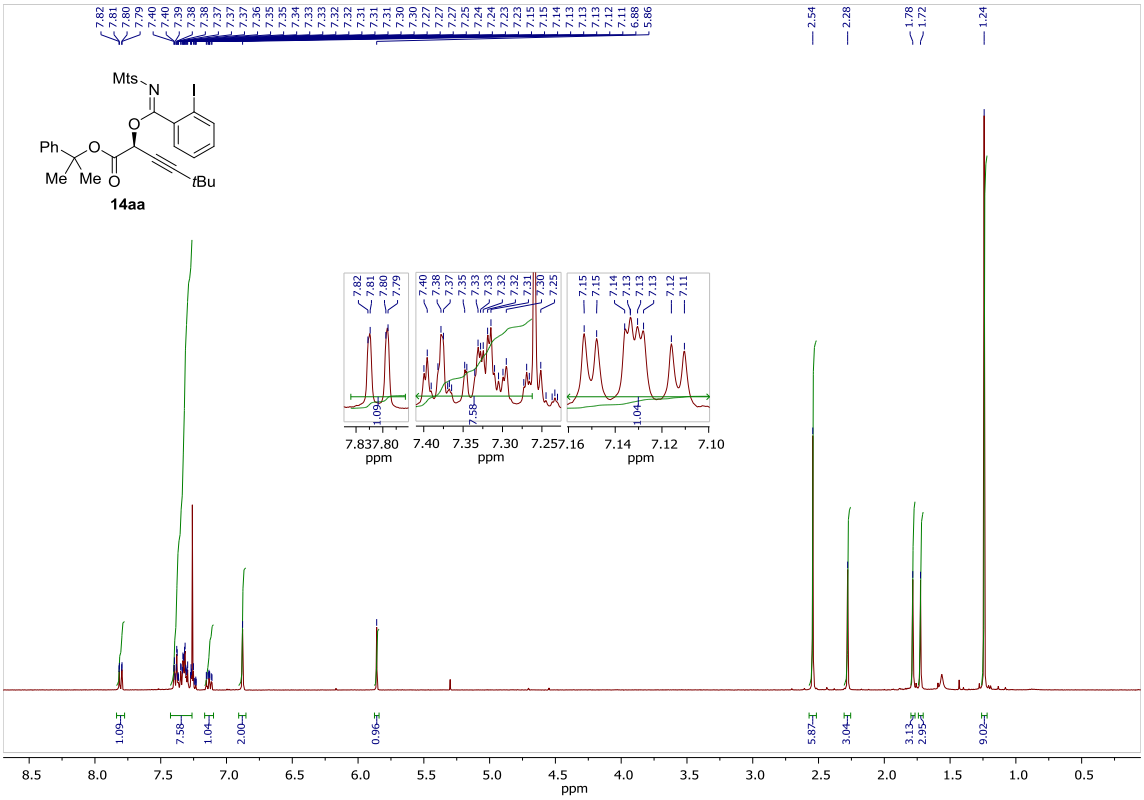


Peak #	RetTime [min]	Type	Width [min]	Area [mAU*s]	Height [mAU]	Area %
1	11.791	MM	0.3212	295.14435	15.31630	4.2748
2	14.567	MM	0.4552	6609.11328	241.99719	95.7252

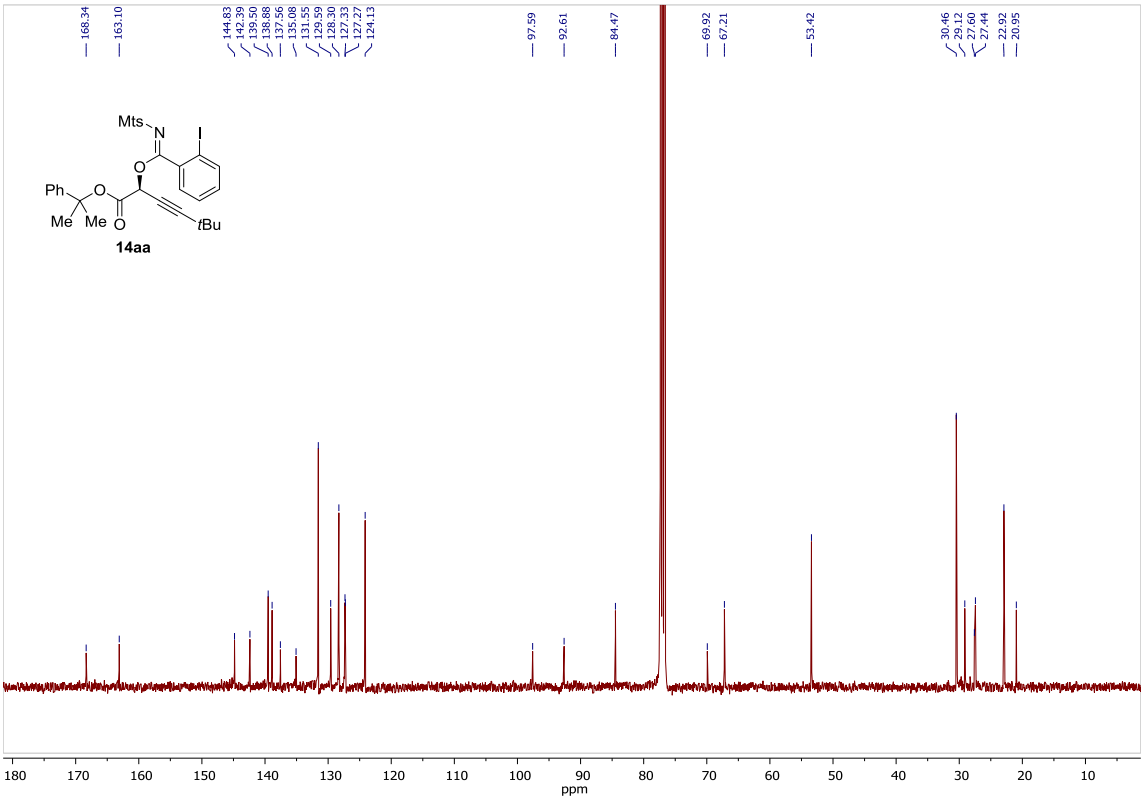
IR of compound **14z**



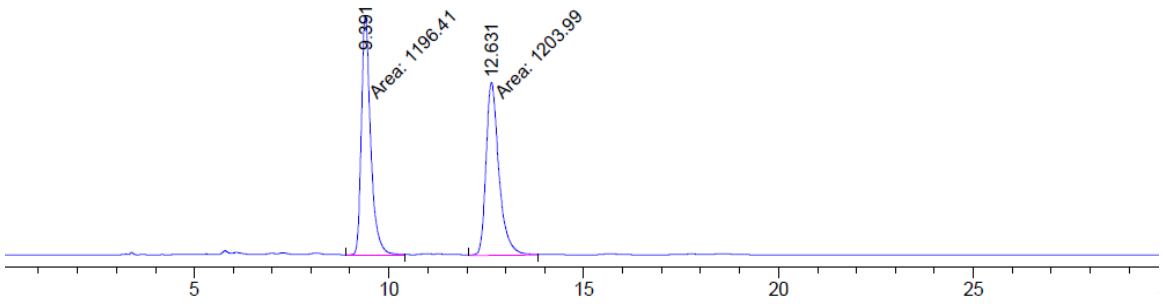
^{1}H-NMR (400 MHz, $CDCl_3$) of compound **14aa**



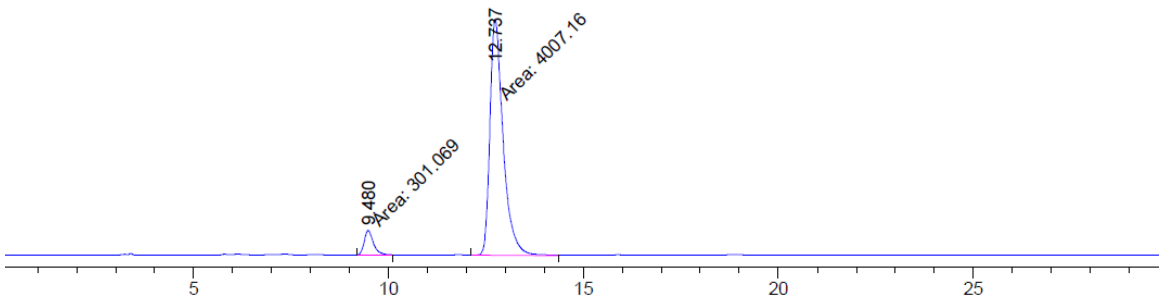
^{13}C-NMR (100 MHz, $CDCl_3$) of compound **14aa**



HPLC of compound **14aa**

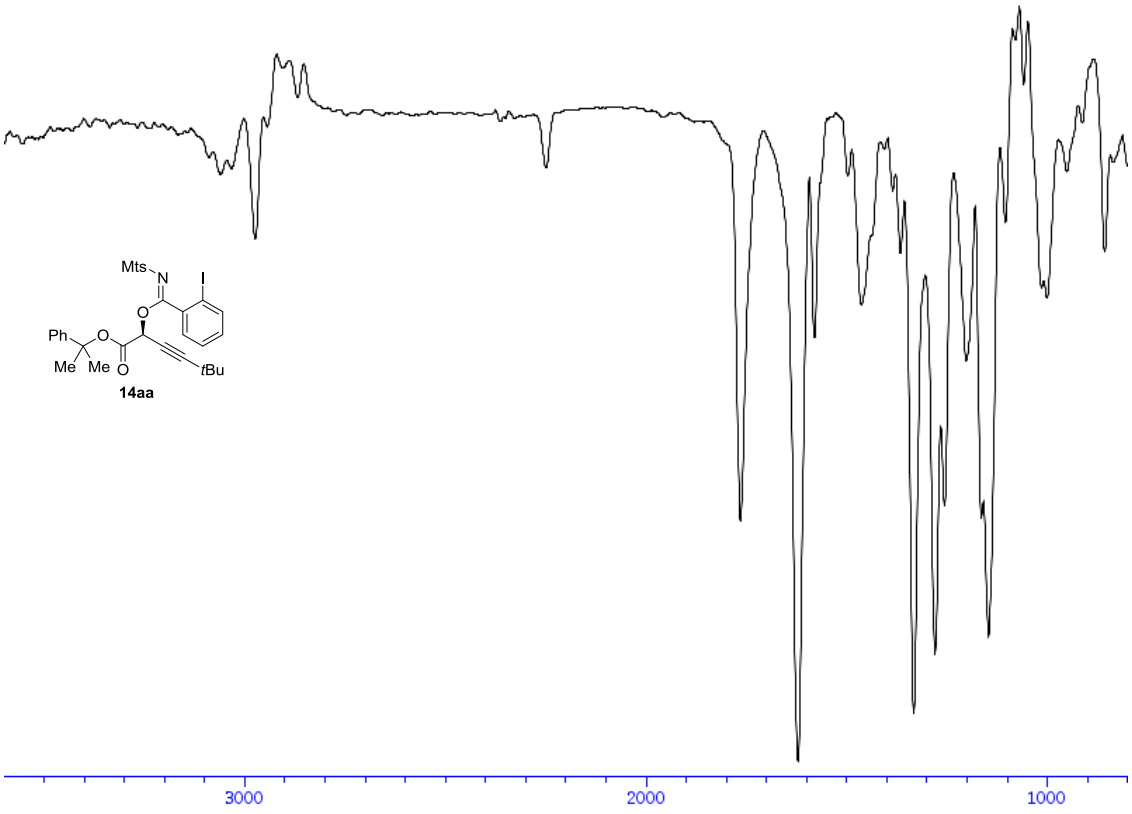


Peak #	RetTime [min]	Type	Width [min]	Area [mAU*s]	Height [mAU]	Area %
1	9.391	MM	0.2783	1196.40881	71.66096	49.8421
2	12.631	MM	0.3858	1203.99158	52.00711	50.1579

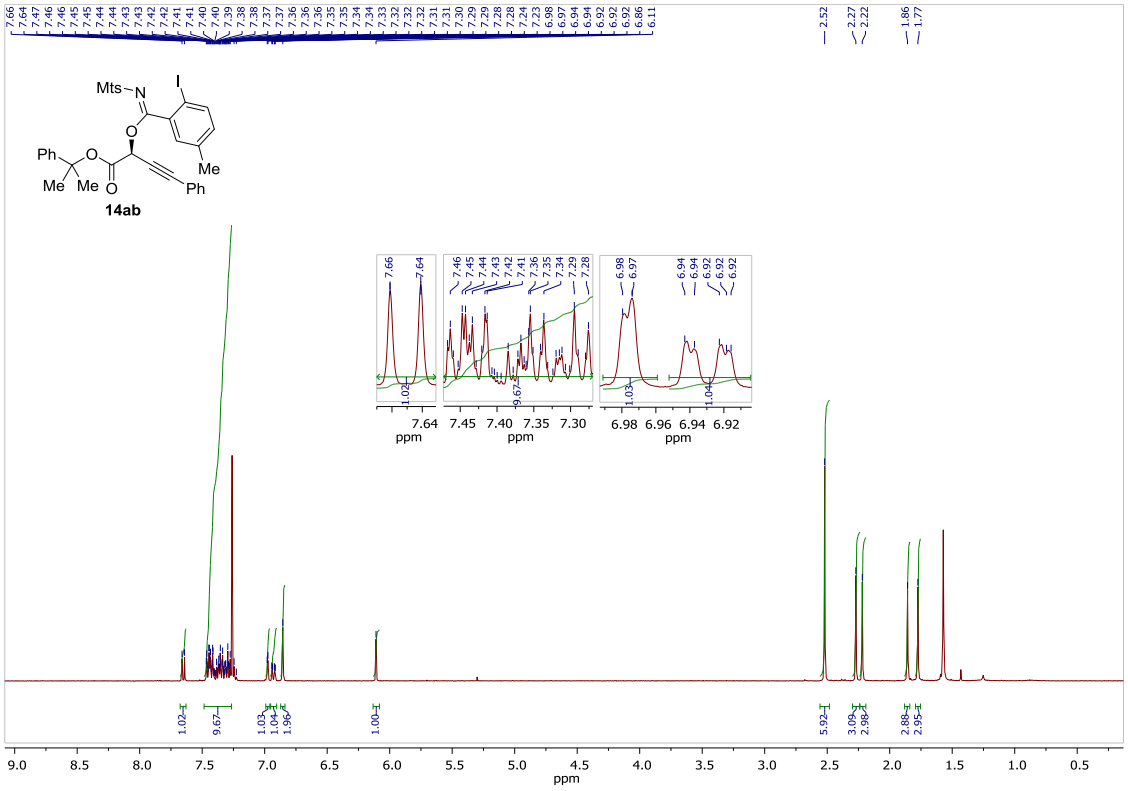


Peak #	RetTime [min]	Type	Width [min]	Area [mAU*s]	Height [mAU]	Area %
1	9.480	MM	0.2839	301.06897	17.67515	6.9882
2	12.737	MM	0.3962	4007.16333	168.56831	93.0118

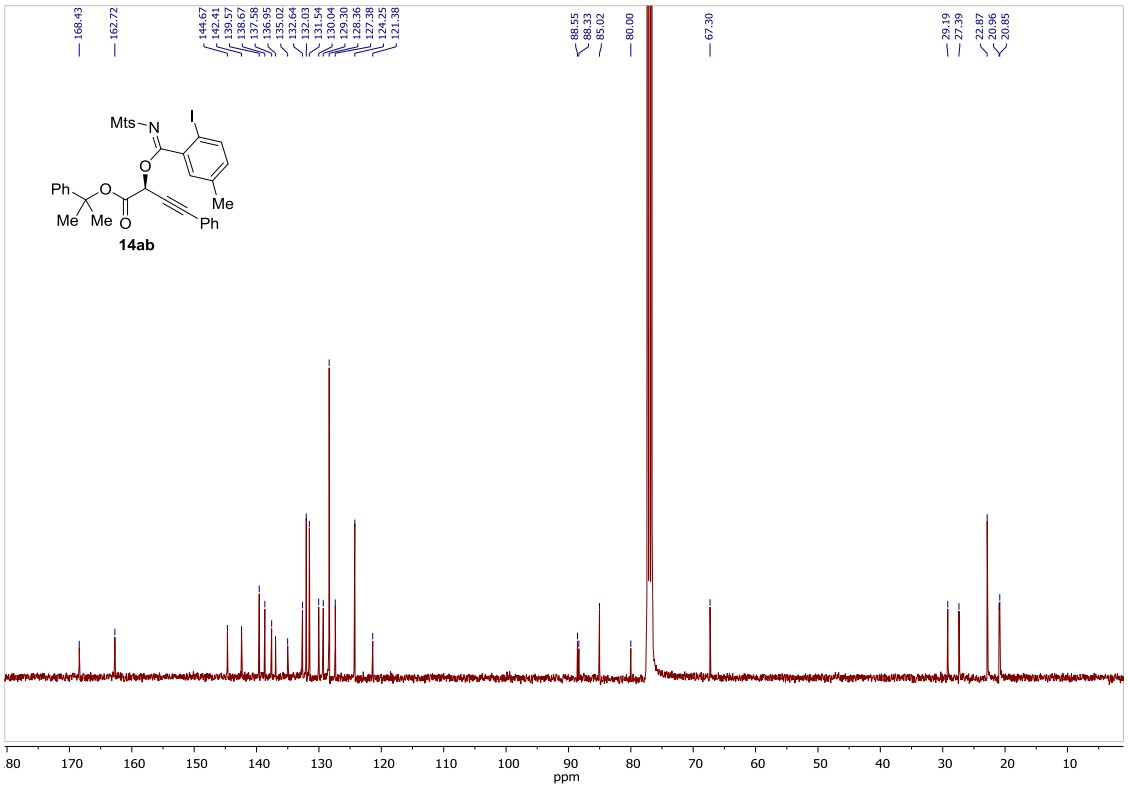
IR of compound **14aa**



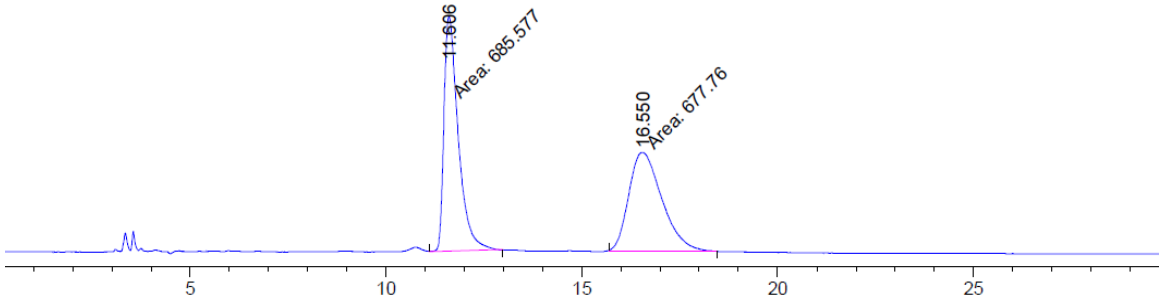
^{1}H-NMR (400 MHz, $CDCl_3$) of compound **14ab**



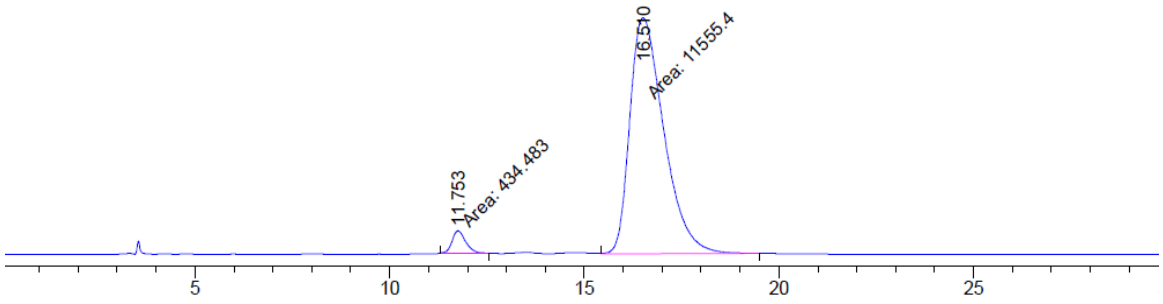
^{13}C-NMR (100 MHz, $CDCl_3$) of compound **14ab**



HPLC of compound **14ab**

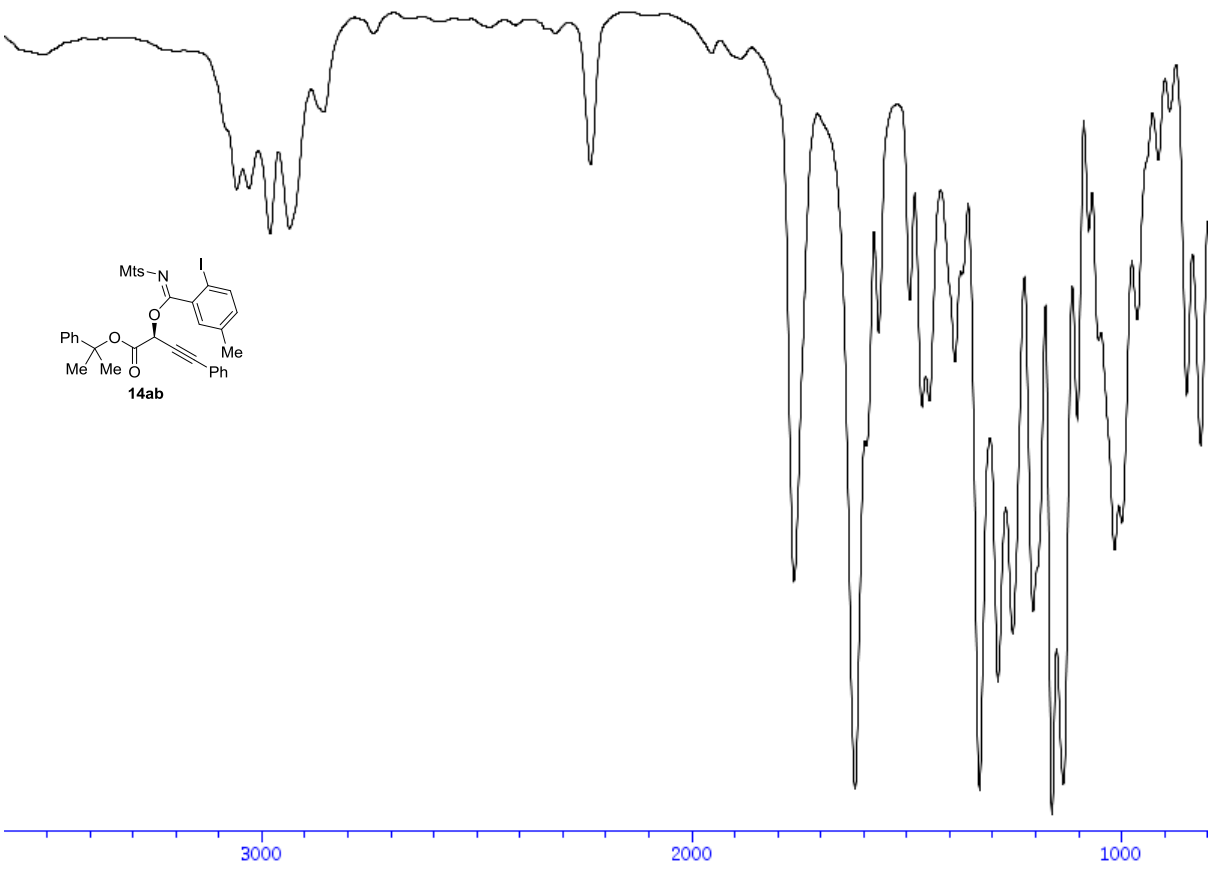


Peak #	RetTime [min]	Type	Width [min]	Area [mAU*s]	Height [mAU]	Area %
1	11.606	MM	0.4214	685.57721	27.11613	50.2867
2	16.550	MM	0.9858	677.75977	11.45867	49.7133

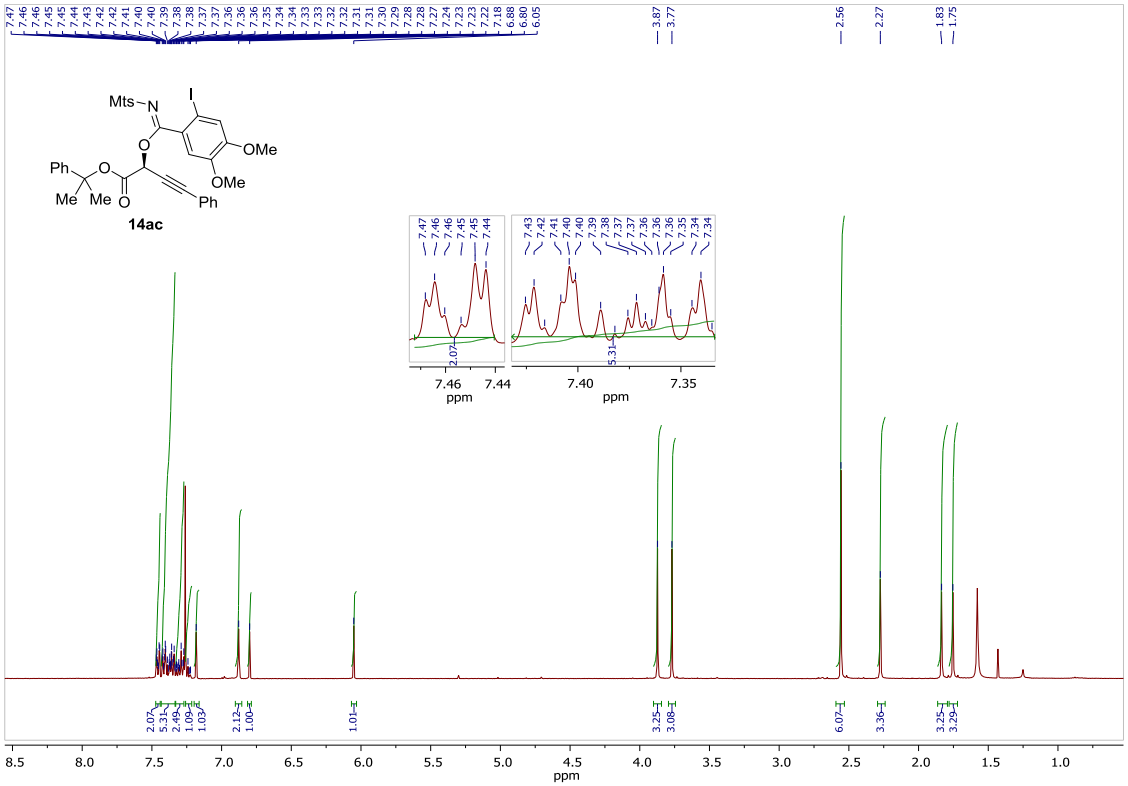


Peak #	RetTime [min]	Type	Width [min]	Area [mAU*s]	Height [mAU]	Area %
1	11.753	MM	0.4029	434.48349	17.97125	3.6237
2	16.510	MM	1.0126	1.15554e4	190.18657	96.3763

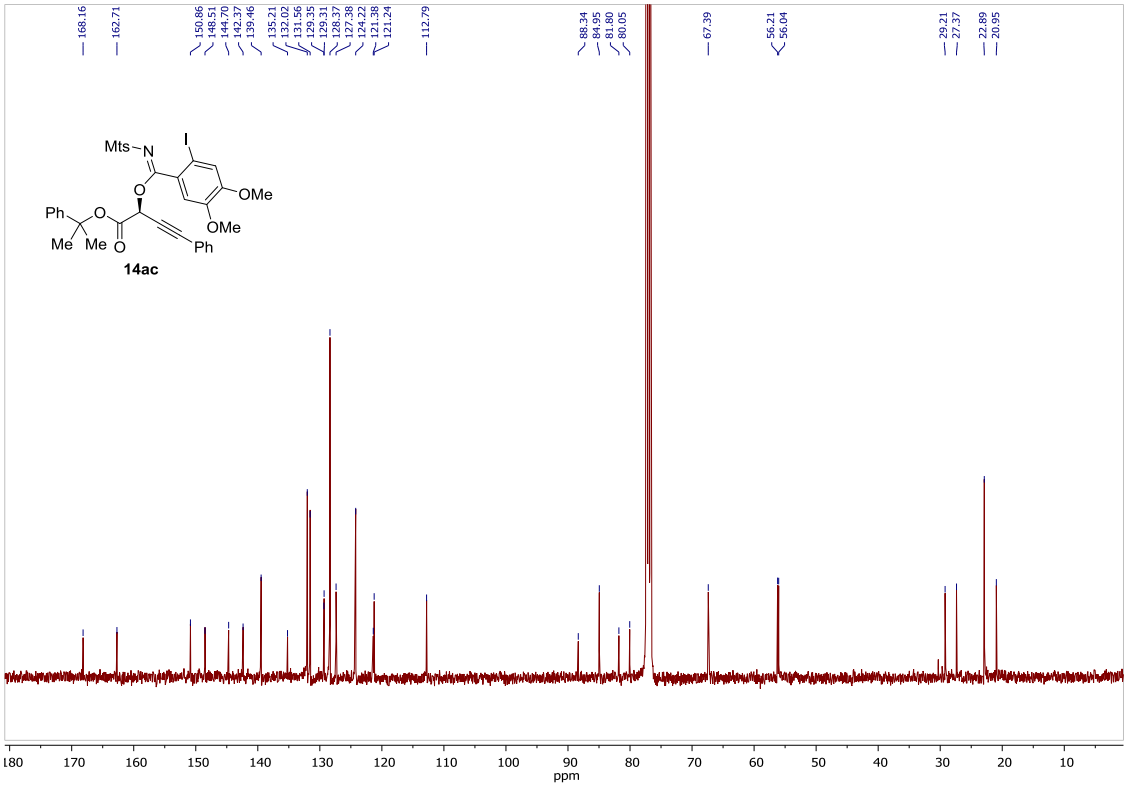
IR of compound **14ab**



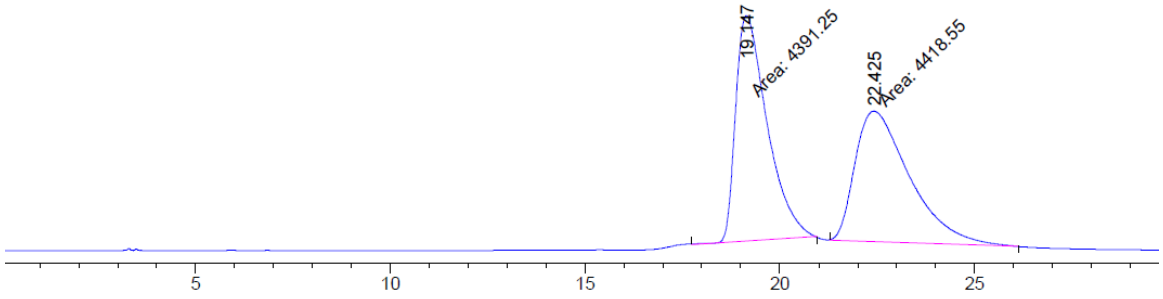
^{1}H-NMR (400 MHz, $CDCl_3$) of compound **14ac**



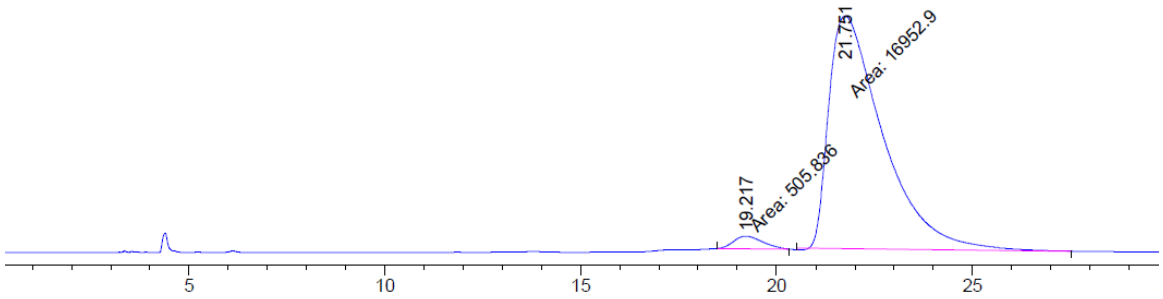
^{13}C-NMR (100 MHz, $CDCl_3$) of compound **14ac**



HPLC of compound **14ac**



Peak #	RetTime [min]	Type	Width [min]	Area [mAU*s]	Height [mAU]	Area %
1	19.147	MM	0.9367	4391.25244	78.13583	49.8450
2	22.425	MM	1.6254	4418.55420	45.30606	50.1550



Peak #	RetTime [min]	Type	Width [min]	Area [mAU*s]	Height [mAU]	Area %
1	19.217	MM	0.8671	505.83563	9.72240	2.8973
2	21.751	MM	1.6050	1.69529e4	176.03938	97.1027

IR of compound **14ac**