

Dataset for ‘Printed ecoresorbable temperature sensors for environmental monitoring’

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This data set contains the data collected during the FNS project Green Piezo (Grant no. 179064) in association with the publication titled ‘Printed ecoresorbable temperature sensors for environmental monitoring’.

The data set consists of the following folders:

- 1: Temperature behavior characterization
- 2: Humidity dependance characterization
- 3: Individual measurements
- 4: Physical characterization

Below is a detailed description of the file naming conventions and folder contents.

File naming conventions

The data in this dataset stems from three main recording setups: (i) Hot plate, cool pack or fridge, without humidity control, (ii) Climatic chamber with full control of temperature and relative humidity. Files recorded in the first modality have the following convensions: [Substrate]_[Sintering voltage]Vx[Pulse count]_[Experiment number]_[Target temperature]°C_[Encapsulation]. The voltage corresponds linearly with the pulse energy, and more information can be found on the manufacturer’s website or in previous publications. ‘0V’ refers to samples that didn’t undergo photonic sintering. The second modality results in files with the following naming convention: [Substrate]_[Sintering voltage]Vx[Pulse count]_[Experiment number]_[Temperature protocol]°C_[Humidity protocol]rH_[Encapsualtion]. Temperature and humidity protocols respectively refer to the values reached by the temperature and relative humidity during recording, separated by dashes.

File types

The following data types are present in the dataset. All data types can be accessed and analyzed with open-source software.

.csv: The data is comma delimited and can be opened with any text editor. *.csv* data files in this dataset contain headers where relevant information to the file are given (e.g. data columns, UNIX timestamp marking the beginning of

data acquisition, sampling frequency). The data is organised in columns where the first line represents the label for the columns. The rows in the data represent different samples or different timepoints, as indicated in the header.

.edf: This data is recorded by the Sensirion SHT4x humidity and temperature sensors and is organised in a similar fashion to the *.csv* data described above. It can also be opened with any text editor.

.png: High-resolution image data acquired with a scanning electron microscope, which can be opened with any image viewer/editor.

01 Temperature behavior characterization

This folder contains the experiments related to the influence of the pulse energy and pulse number on the temperature behavior. For each experiment, consisting in a temperature step to a set temperature and return to ambient temperature, two files are generated: a *.csv* file for the resistance of the zinc resistor (in Ohm) and a *.edf* file for the temperature and humidity values (°C and %rH).

02 Humidity dependance characterization

This folder contains the data for experiments related to the testing of the temperature sensors under different temperature and humidity values, and the assessment of a beeswax encapsulation as coating. As above, each sensor corresponds to a resistance file in *.csv* format and the temperature and humidity recorded inside the chamber with the commercial sensor in a *.edf* file.

03 Individual measurements

This folder contains the data pertaining to measurements of temperature sensors with optimized sintering parameters for different measurement protocols and target temperatures. The files follow a convention very similar to the first one (i) described above: [Substrate]_[Sintering voltage]Vx[Pulse count]_[Experiment number]_[Target temperature]°C_[Encapsulation]_[Experiment protocol]. The added experiment protocol entry describes the experiment type (e.g. cycling) and if not specified, describes a step to the target temperature and return to room temperature.

04 Physical characterization

This folder contains SEM images of the microstructure of the printed zinc after variations of the photonic treatment. The files are named as follows: [Substrate]_[Sintering voltage]Vx[Pulse count]_[Magnification]_[Acceleration voltage].