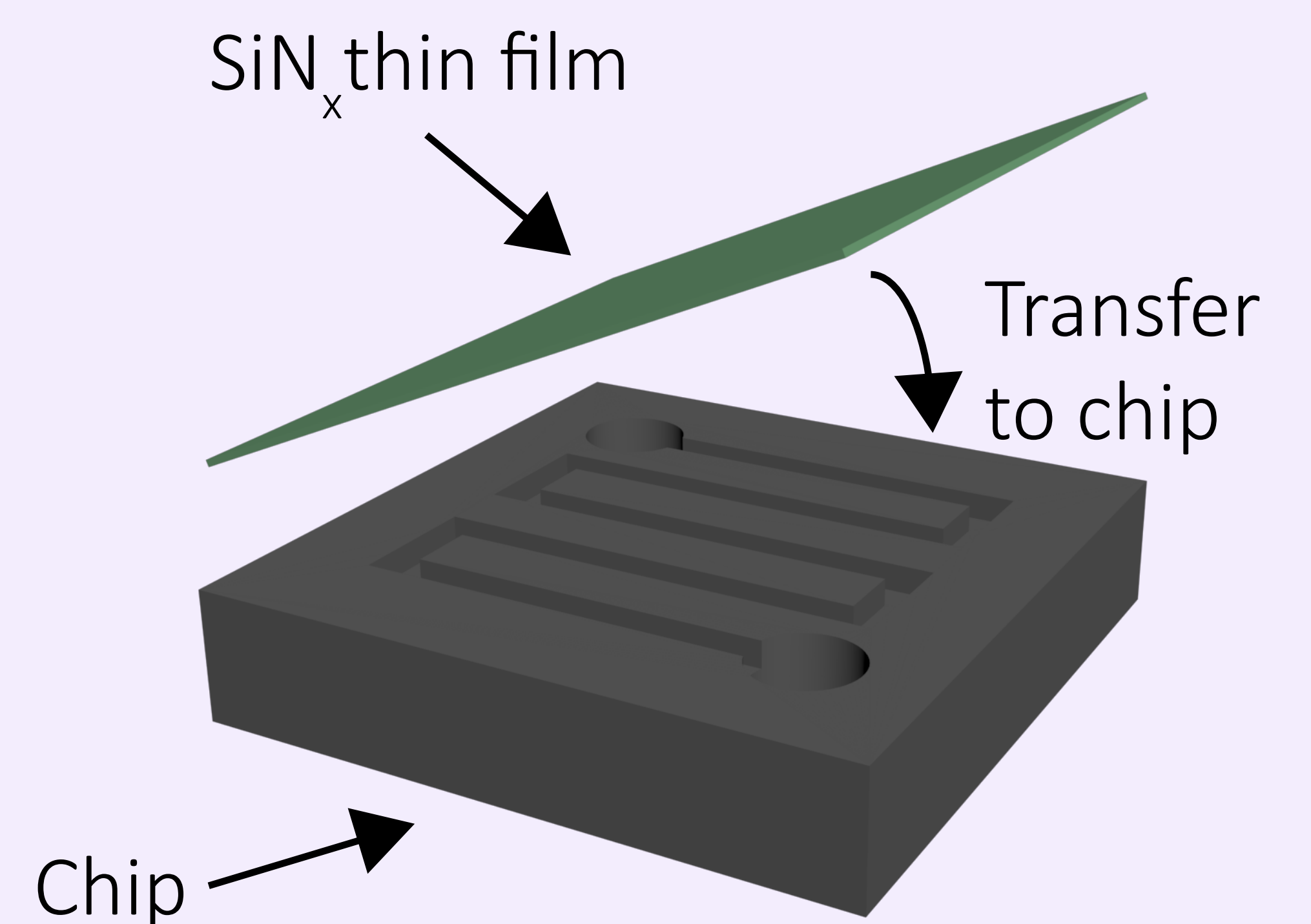


1. Abstract

Fabrication of silicon based micro-channels is typically a complex process involving multiple steps such as lithography, bonding, thin film deposition, etching, surface migration etc. [1-3].

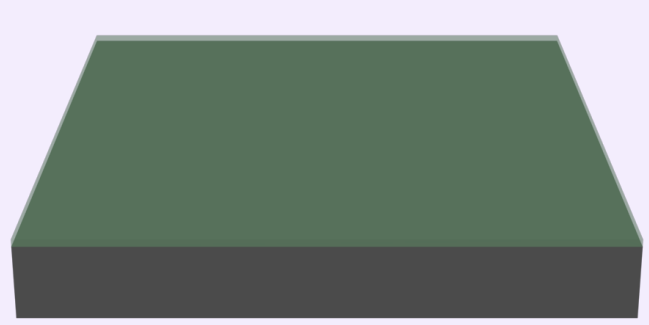
We present a method for the fabrication of microchannels. Inspired by 2D material transferring techniques [4], we transfer a 100 nm thick silicon nitride film on top of a silicon nitride coated chip with predefined trenches and holes to form silicon nitride microchannels and membranes.



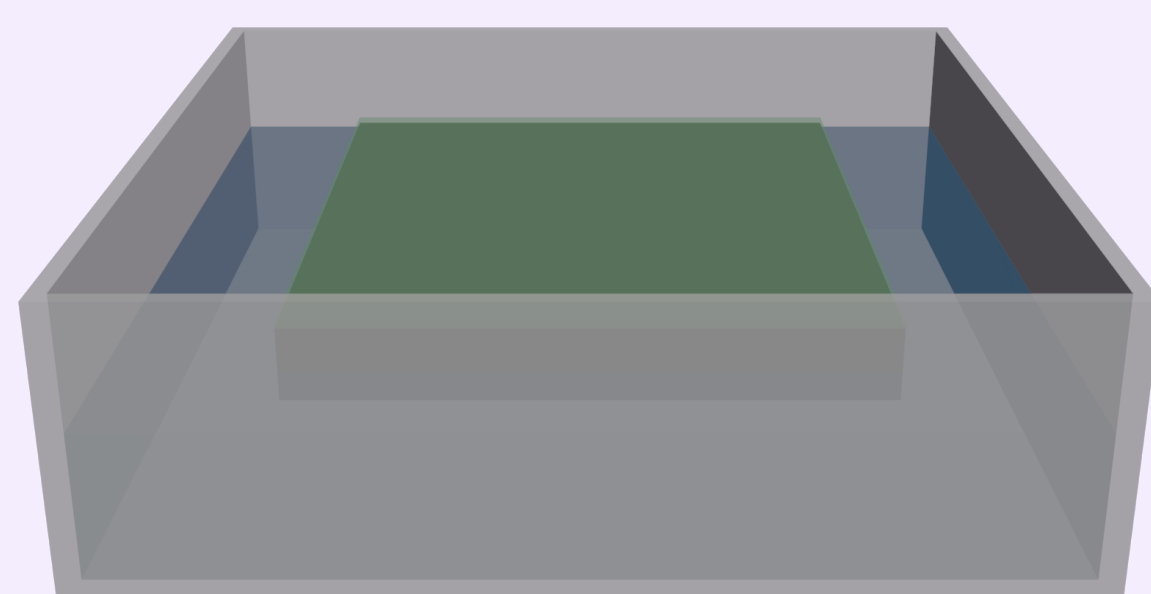
2. Fabrication

Transfer of a 100 nm thick silicon nitride film onto a chip with trenches and holes to form channels and membranes.

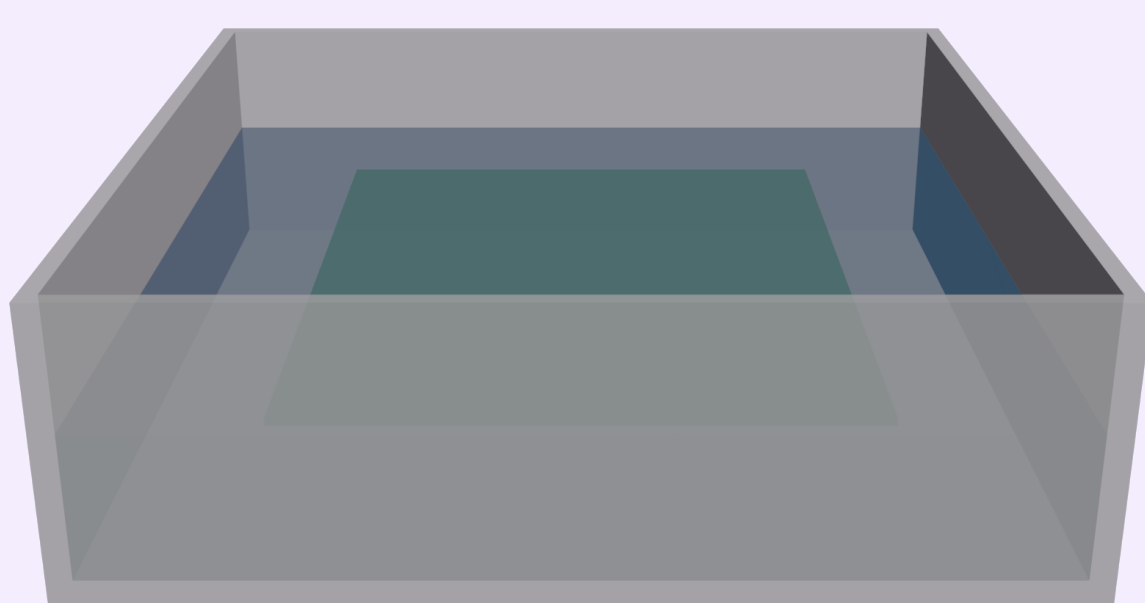
1. Chip with SiN_x



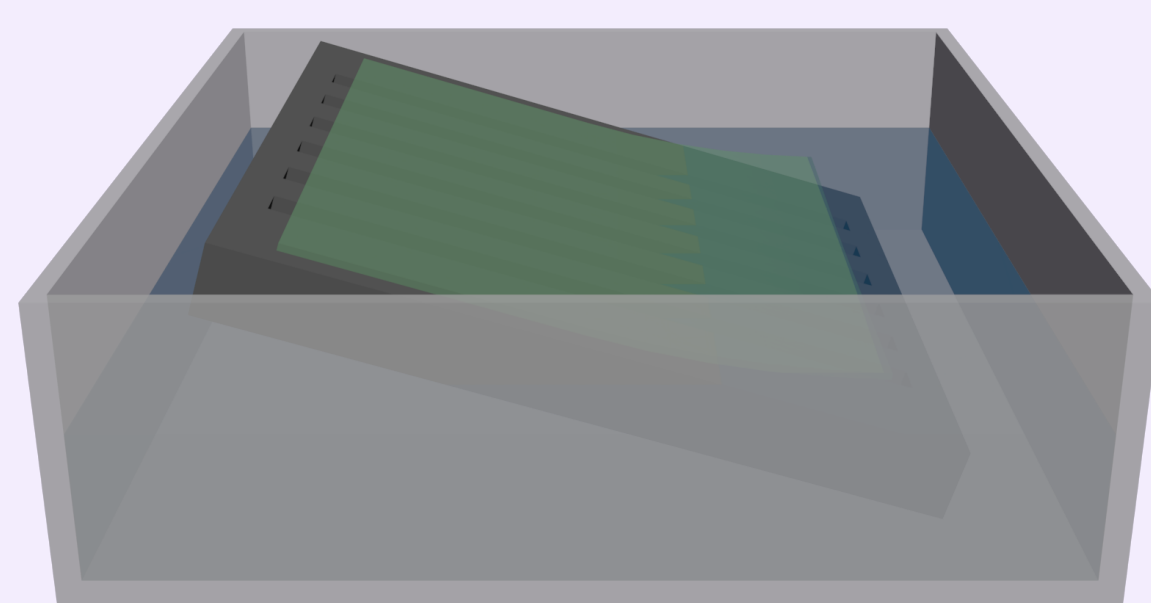
2. Etching of Si in KOH



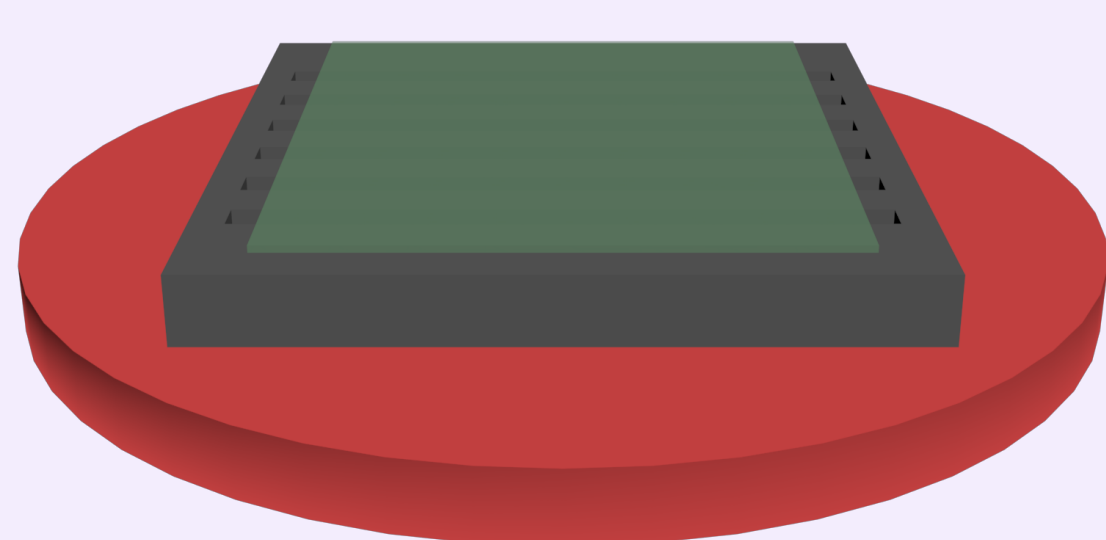
3. Rinsing in water



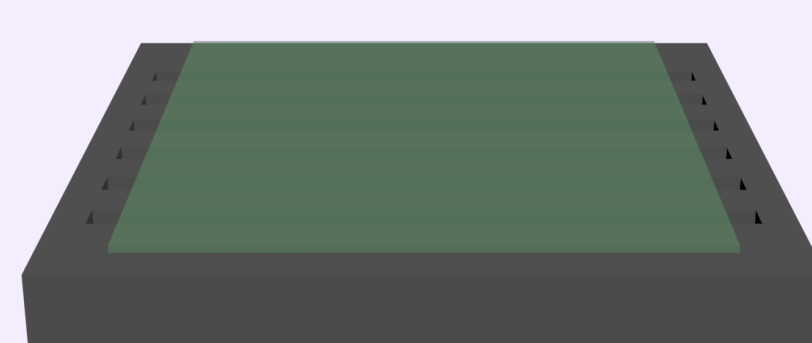
4. Transfer of film



5. Baking at 80 °C



6. Final chip



4. Conclusions

We successfully fabricated silicon nitride microchannels and membranes by transferring 100 nm thick films of silicon nitride onto chips with predefined trenches or holes.

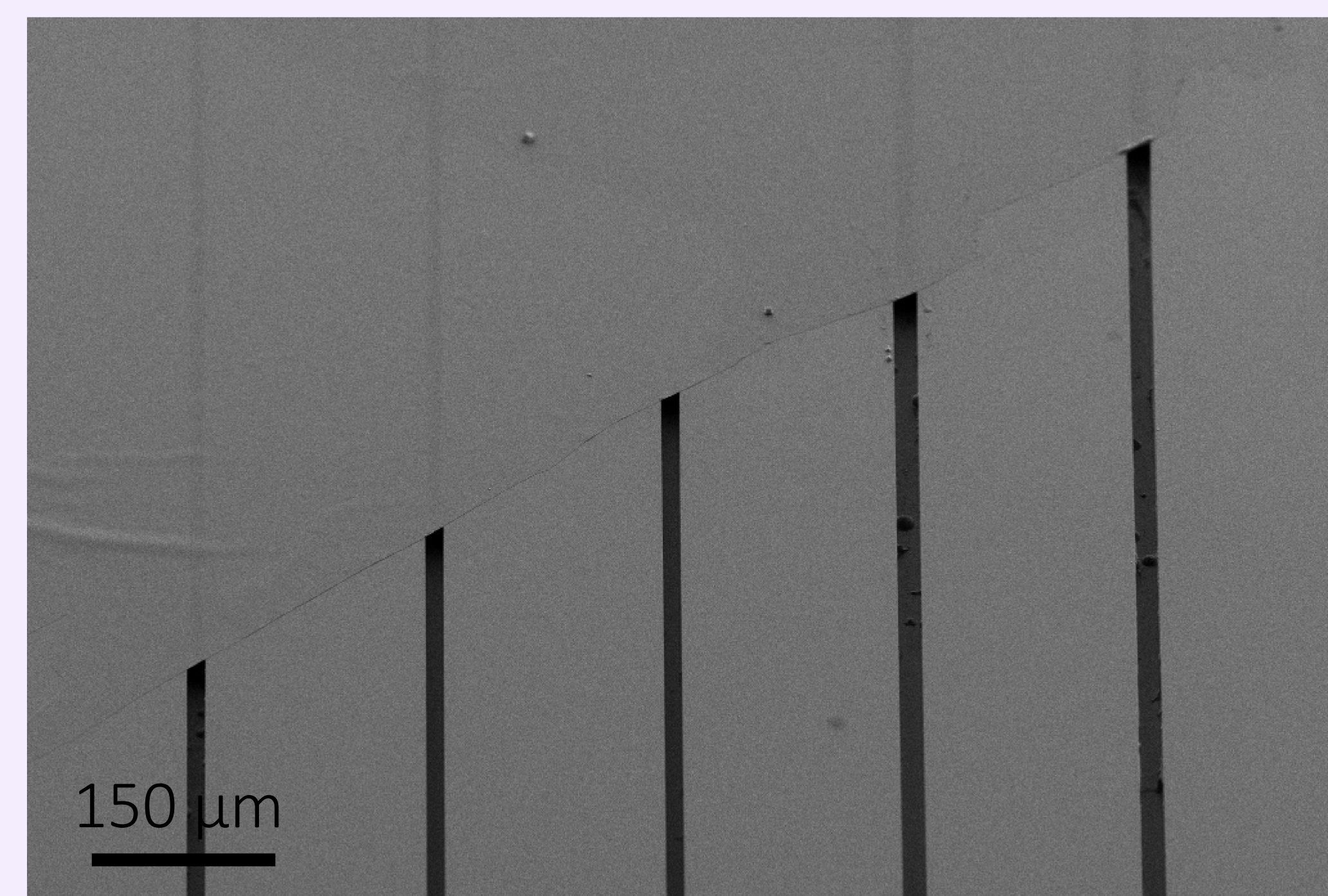
The presented fabrication method is not limited to silicon nitride films. Other KOH compatible films could be transferred using the same method.

Acknowledgement: The authors would like to thank Gebert RUF Stiftung and the European Commission through the Marie Curie program.

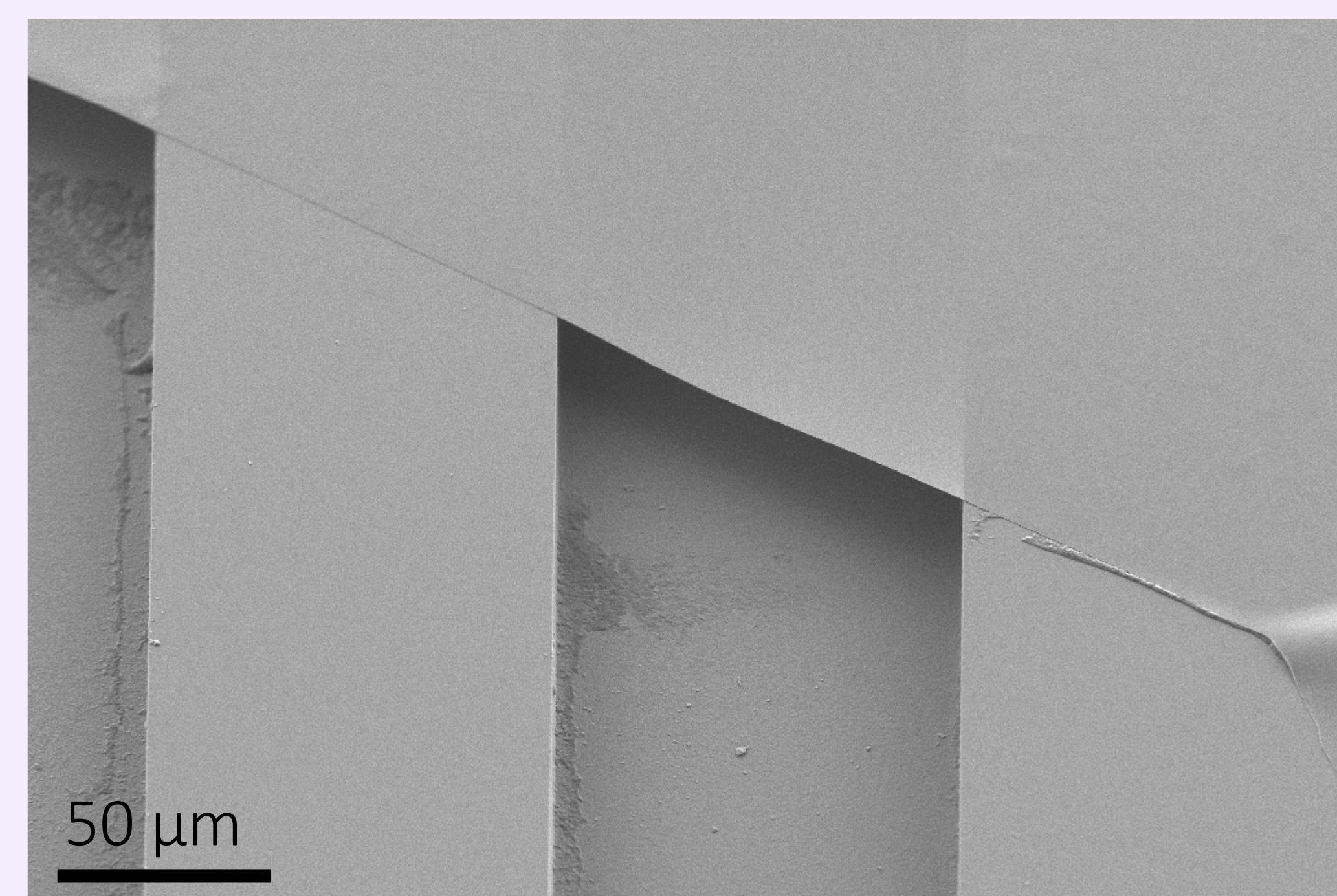
References: [1] Khan, M. F., et al., Microelectronic Engineering 88.8 (2011). [2] Burg, T. P., et al., Nature 446.7139 (2007). [3] Kim, J., et al., Nano letters 16.3 (2016). [4] Chen, Y., et al., Advanced Science 3.8 (2016).

3. Results

Fabricated microchannels

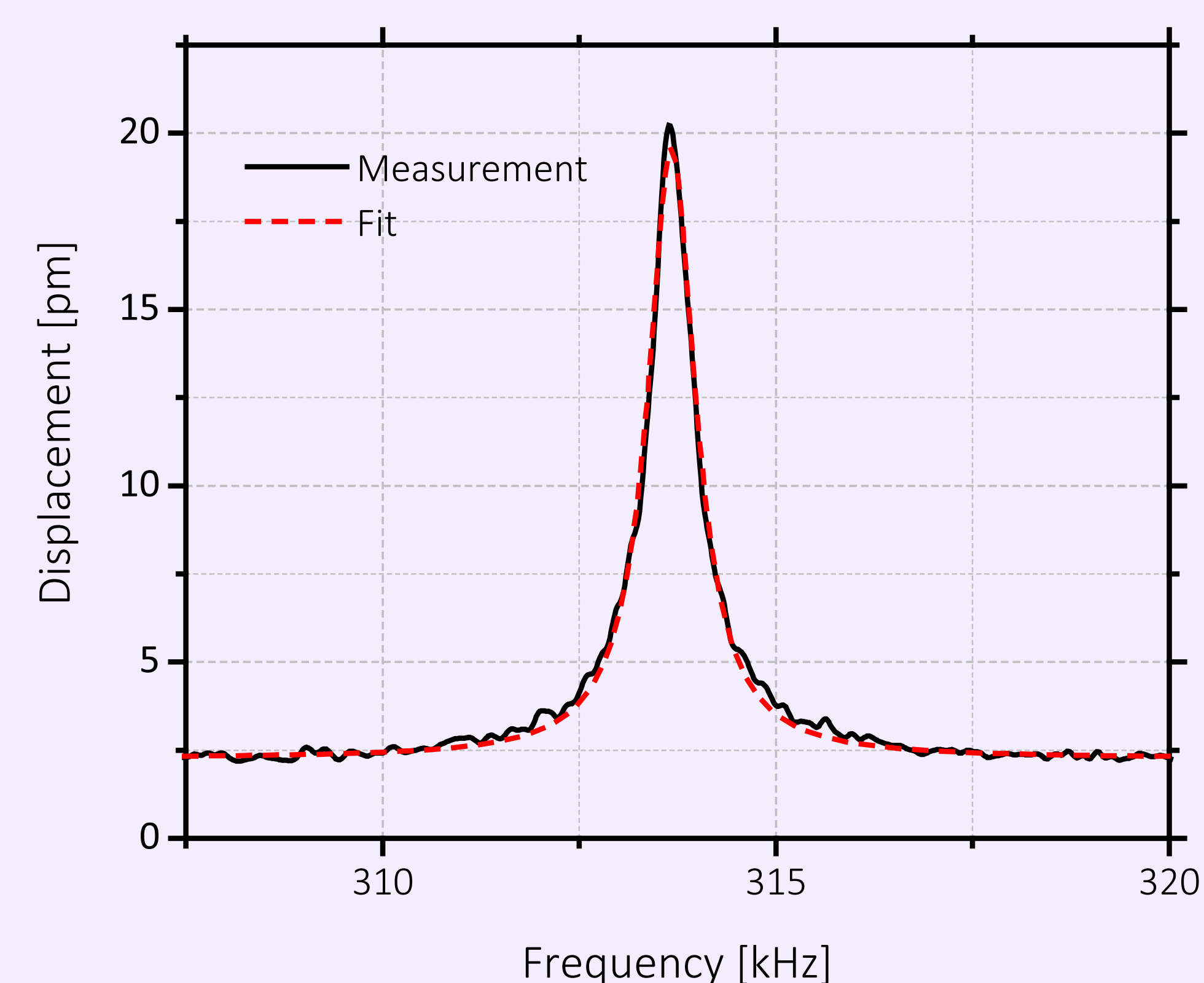


SEM picture of 10 μm or 15 μm wide trenches partly covered by the transferred silicon nitride film.



SEM picture of a 100 μm wide trench partly covered by the transferred silicon nitride film.

Resonance frequency of a SiN_x membrane



First mode mechanical resonance of a 100 μm diameter membrane.

The resonator has a quality factor of ~420. The build-in tensile stress is estimated to be 5 MPa.