CHALMERS UNIVERSITY OF TECHNOLOGY | Department of MICROTECHNOLOGY AND NANOSCIENCE

Quantum Technology Laboratory
Wieczorek group
https://wieczorek-lab.com/

Two-dimensional photonic crystals for quantum cavity optomechanics

Background Cavity optomechanics studies the interaction between an optical mode and a mechanical resonator mode. In the past decade optomechanical experiments with tensile-stressed SiN mechanical resonators demonstrated interferometric displacement measurements below the standard quantum limit (SQL) and reached the quantum optomechanical regime at room temperature [1,2,3].
To form a high-finesse cavity with the mechanical resonator, we have to increase the reflectivity. This can be achieved with a photonic crystal (PhC), which is a structure with a periodic refractive index change, see Fig. 1 (a). A properly engineered PhC combines properties such as a large reflectivity for both oblique and direct incident light [4,5].

Project The project consists of the following parts:
- Fabrication of photonic crystal membranes in Silicon Nitride
- Characterization of reflectivity and transmission
- Optimization of the reflectivity through simulations
- Forming a high-finesse cavity between a photonic crystal and a fiber mirror

What will you learn/get?
- Fabrication techniques and gain experience in the cleanroom.
- Physics of photonic crystals.
- Team work in a stimulating research environment.

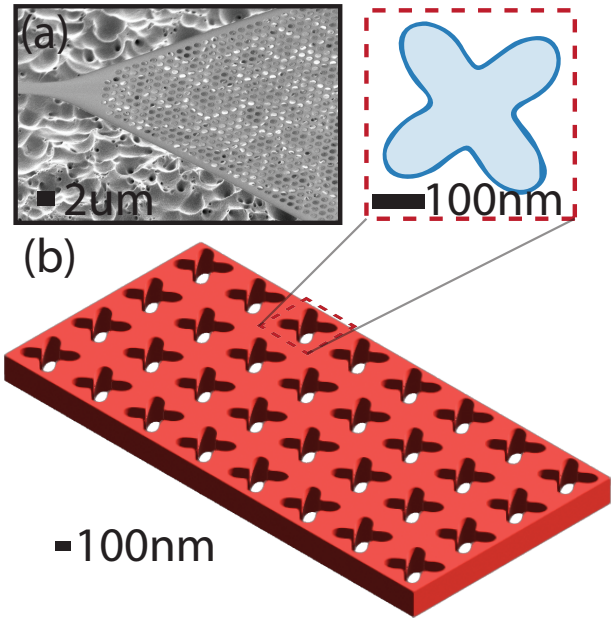

Figure 1: (a) SEM image of the PhC for one of our mechanical resonators [6]. (b) Scheme of a PhC with a non-circular unit cell used for the PhC.

References
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Contacts:
Alexander Jung, PhD student: alexander.jung@chalmers.se
Anastasiia Ciers, Researcher: anastasiia.ciers@chalmers.se
Witlef Wieczorek, Professor: witlef.wieczorek@chalmers.se

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