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"Free-standing nanomechanical and nanophotonic structures in single-crystal diamond"

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Date and Time: **Monday, April 11, 2016, 14:00 ct**

Location: **TU Wien, Inst. of Solid State Electronics**
Floragasse 7, 1040 Vienna,
Seminar room, ground level.

Host: G. Strasser

Abstract

Single-crystal diamond, with its unique optical, mechanical and thermal properties, has emerged as a promising engineering material with applications in both nanoscale mechanical and photonic systems. Diamond is also rich in optically active defects, such as the nitrogen vacancy (NV) center, which provide a robust architecture to study quantum optics in the solid state, with direct access to highly coherent electron and nuclear spins. However, the lack of heteroepitaxial growth and scalable fabrication techniques remain major limiting factors preventing more wide-spread development and application of diamond nanomechanics and nanophotonics. In our work, we overcome this difficulty by developing angled-etching: an unconventional, yet scalable, nanofabrication technique. With angled-etching, we realize state-of-the art nanomechanical and nanophotonic resonators in single-crystal diamond substrates, including the demonstration of diamond optomechanical crystals (OMCs), where the co-localization of ~200 THz photons and ~6 GHz phonons in a quasi-periodic diamond nanostructure leads to coupling of an optical cavity field to a mechanical mode via the radiation pressure of light. These newly developed diamond nanomechanical and nanophotonic structures open the door for a wealth of applications, ranging from nonlinear optics to quantum information processing.

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