# Ultra-Thin Free-Standing Membranes for Phononics

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Ultrathin free-standing membranes provide a good test bench to investigate the effects of phonon confinement and due surfaces on thermal properties. Information on phonon propagation may help, for example, in improving thermal control in nanoelectronic devices and developing better materials and structures for thermoelectrics. We have developed methods to fabricate ultra-thin free-standing membranes of several different materials. Sub-10 nm thick silicon membranes with area up to 1 mm2 and with controlled tensile strain from zero up to 300 MPa have been realised [1]. We have also realised free-standing membranes of TE materials, i.e., niobium doped strontium titanate and bismuth telluride. The fabrication of these is quite challenging due to very high tensile stress typical to titanates grown on silicon and the very soft nature of tellurides and selenides. In this presentation we will describe in more detail the fabrication of the membranes, including the challenges and solutions.

References:

[1] A. Shchepetov et al., Appl. Phys. Lett. 102 (2013) 192108.