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Nanomechanical properties of few-layer graphene membranes MENNO POOT, HERRE VAN DER ZANT, Delft University of Technology — Graphene is a one-atom thick layer of graphite and has only recently been discovered. It combines unique electronic properties with an extremely high Young's modulus of 1 TPa. We have measured the mechanical properties of few-layer graphene and graphite flakes that are suspended over circular holes. The spatial profile of the flake's spring constant is measured with an atomic force microscope. Both the bending rigidity of and the tension in the membranes are extracted by fitting a continuum model to the data. Both parameters show a strong thickness-dependence. Surprisingly, flakes with down to only eight atoms thick can still be described by continuum mechanics. Measurements on single layer graphene could resolve the long standing question whether a one-atom thick membrane can have a finite bending rigidity. Finally we predict that these nanodrums have resonance frequencies in the GHz range. These high frequencies combined with their low mass make them ideal components for quantum electromechanical systems.

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