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Fabrication of Single-layer Graphene Nanomechanical Oscillators by Deep-UV Lithography on Poly(methyl methacrylate) (PMMA) JEN-FENG HSU, SHONALI DHINGRA, BRIAN D'URSO, Department of Physics and Astronomy, University of Pittsburgh — Graphene is well-known for its conductivity and high mechanical strength. Its lightness and stiffness can be exploited for oscillation devices. It also makes promising candidates for quantum nano-mechanical device. And since it's a conductive material, the oscillator can be driven electrically. Here we present a simple and scalable graphene patterning technique for suspended nanomechanical oscillator (NMO) in various geometrical shapes, including doubly clamped beams, circular drums and rectangular drums, in sizes of $\approx$ 2 - 4 μm. The graphene in this work is synthesized by chemical-vapor deposition (CVD) on $\approx$ 2mm thick copper substrates which is later thinned down by single-point diamond turning for transfer. The patterning method employs deep-UV (240-310nm) lithography to expose the PMMA layer on top of the graphene layer. Oxygen plasma may be used to transfer patterns onto the graphene film. The PMMA layer further acts as clamping material for drum devices. This method avoids any metal or contamination and devices in different shapes have unique advantages such as torsional modes (beams) and higher quality factors (drums).

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