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Graphene as an etch mask for silicon ANIRUDDH RANGARAJAN, JOSHUA WOOD, JUSTIN KOEPKE, JOSEPH LYDING, University of Illinois at Urbana-Champaign — We are using graphene as a hard etch mask for silicon. The error introduced by its edges is hypothesized to be far less compared to innate issues of photolithography (e.g. undercut, sidewall hardening). This presents the possibility of making a highly precise etch mask. We lithographically pattern a graphene layer transferred to a Si(100) surface and fluorinate the sample to demonstrate the selective etching on exposed regions. The graphene layer becomes fluorinated, but shields the silicon underneath. The Si(100) with selective graphene coating was subjected to isotropic etching by xenon difluoride (at 1.0 Torr, and N_2 at 35.0 Torr) for 180 s to remove approximately 190 nm of silicon. Raman spectroscopy confirms the onset of sp^3 hybridization of carbon atoms in the hexagonal lattice, brought on by covalent C–F bonding. Along with the possibility of producing highly precise silicon structures, the monolayer mask has added advantages, such as not requiring as many processing steps as the conventional method involving photoresist.

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