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Growing and Characterizing 2D Silica Bilayers on Graphene Epitaxially Grown on Ruthenium(0001)/Sapphire JEFF GUEVARA, KENNETH GANEZER, California State University, Dominguez Hills, ERIC ALTMAN[1], Yale University — Two-dimensional (2D) silica (SiO_2) glass bilayers are a new form of SiO_2 that is exactly 2 atoms thick with no dangling bonds. Since 2D silica bilayers have no dangling bonds, it is expected to be a van der Waals material with no detectable covalent bonding. Two-dimensional silica can have many applications in layered graphene electronics and dielectric layers in atomically thin transistors, along with applications as membranes that allow only molecules smaller than a specific size to fit through and where the atomic thickness promises unprecedented throughput. The goal of this research is to determine the optimal conditions for growing a 2D silica bilayer on a uniform graphene monolayer and to also study its characteristics and intrinsic properties when removed from all substrates. The first step is to determine the optimal growth conditions for growing a uniform graphene monolayer on epitaxial ruthenium (0001) on c-plane sapphire. The next step is to determine the optimal growth conditions of 2D silica bilayers on graphene. The 2D silica will then be isolated from the substrate so that its characteristics and intrinsic properties can be studied using Raman spectroscopy, transmission electron microscopy, scanning transmission electron microscopy, and electron energy loss and X-ray emission spectroscopy.

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