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Van der Waals screening by single-layer graphene and molybdenum disulfide STANISLAV TSOI, US Naval Research Laboratory, PRATIBHA DEV, National Research Council, ADAM FRIEDMAN, JEREMY ROBINSON, US Naval Research Laboratory, RORY STINE, Nova Research, THOMAS REINECKE, PAUL SHEEHAN, US Naval Research Laboratory — We used a sharp tip of an atomic force microscope to experimentally measure van der Waals forces of a silicon oxide substrate with adhered graphene, prepared by micromechanical cleavage. Data obtained in the range of separations from 3 to 20 nm indicated that single-, double-, and triple-layer graphenes screened the van der Waals forces of the substrate. The van der Waals force from graphene determined per layer was found to decrease with the number of layers. In addition, increased hole doping of graphene enhanced the force. The screening was lifted in the single-layer graphene upon its fluorination, which rendered it electrically insulating. Finally, we also demonstrated strong screening of the van der Waals forces of the silicon oxide substrate by single- and double-layer molybdenum disulfide. Analysis of the experimental results was aided by density functional theory calculations.

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