Abstract Submitted
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Optical Measurements of Ice-Induced Strain Effects on Single Layer Graphene[1] WILLIAM SCOUGALE, SUBASH KATTEL, JOSEPH MURPHY, SAMUEL PASCO, Dept. of Physics and Astronomy, University of Wyoming , JOHN ACKERMAN, VLADIMIR ALVARADO, Dept. of Chemical Engineering, University of Wyoming, WILLIAM RICE, Dept. of Physics and Astronomy, University of Wyoming, 1000 E University Ave. Laramie, WY USA 82071 — A deep understanding of material interfaces remains challenging due to the difficulty in probing their limited spatial extents and complex properties. In particular, the material interface with ice is scientifically intriguing and economically valuable, but poorly understood. Measuring the properties of ice adhesion, crystallography, and strain are important for icing physics, as well as understanding real-world behaviors and designing icephobic coatings. In this work, we use Raman spectroscopy to measure the strain created by ice on quartz-mounted single-layer graphene (SLG). We observe a shift of -2 cm^{-1} in the 2D peak of SLG upon ice formation from 0 to -20°C, which we attribute to the mismatch between SLG and ice. Additionally, spatial mapping of the SLG surface reveals a distinct 2 cm^{-1} downward shift in the SLG 2D peak in regions where ice has formed. This ice-created change in the SLG Raman spectrum is indefinitely maintained after ice removal and is only restored when the SLG is heated above room temperature. Finally, we study different purities of distilled water to isolate strain and water-SLG charge transfer effects. These results help demonstrate the applicability of 2D materials as interfacial strain probes of ice and other critical materials.

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