Abstract Submitted
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In Situ Electronic Characterization of Graphene Nanoconstrictions Fabricated in a Transmission Electron Microscope[1] YE LU, CHRISTOPHER MERCHANT, MARIJA DRNDIC, A.T. CHARLIE JOHNSON, University of Pennsylvania, UNIVERSITY OF PENNSYLVANIA TEAM — We report electronic measurements on high quality graphene nanoconstrictions (GNCs) fabricated in a transmission electron microscope (TEM), and the first measurements on GNC conductance with an accurate measurement of constriction width down to 1 nm. To create the GNCs, freely suspended graphene ribbons were fabricated using few-layer graphene grown by chemical vapor deposition. The ribbons were loaded into the TEM, and a current-annealing procedure was used to clean the material and improve its electronic characteristics. The TEM beam was then used to sculpt GNCs to a series of desired widths in the range 1-700 nm; after each sculpting step, the sample was imaged by TEM and its electronic properties were measured in situ. GNC conductance was found to be remarkably high, comparable to that of exfoliated graphene samples of similar size. The GNC conductance varied with width approximately as $G(w) = (e^2/h)w^{0.75}$, where w is the constriction width in nanometers. GNCs support current densities greater than 120 $\mu A/nm^2$, 2 orders of magnitude higher than that which has been previously reported for graphene nanoribbons and 2000 times higher than that reported for copper.

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