Abstract Submitted
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Characterizing Atom-Thick Carbon via Electron Diffraction[1]
ERIC MANDELL, Bowling Green State University — Electron scattering models for various carbon nanostructures can be compared in order to gauge how diffraction effects due to crystal shape manifest in diffraction. Model diffraction profiles for specific molecules are calculated using the formula described by Debye, which averages the molecule over all orientations relative to an incident electron beam. This creates an azimuthally-averaged powder profile, as if from an infinite collection of identical crystals. Due to the atom-thick nature of graphene, interesting changes in diffraction peak shape arise from small changes in crystal shape. Particularly, differences are measured between Debye profiles for triangular and hexagonal graphene sheets. Also, it is shown here that diffraction peak shapes are altered due to curvature or faceting around pentagonal defects (i.e. nanocones), including the development of satellite peaks near the graphene periodicities. These satellite peaks manifest due to the coherence between lattice fringes resulting from in-plane defects that warp the 2D graphene crystal into a 3D structure. Improving the ability to characterize the structure of graphene and other molecular carbon forms will provide a better understanding of formation mechanisms, or the role of growth conditions present during the fabrication of carbonaceous materials.

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