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Determining Graphene Sheet Shape in Presolar Graphite Spherules ERIC MANDELL, Bowling Green State University — Presolar graphite spherules are a subset of graphitic stardust exhibiting an intriguing micron-sized nanocrystalline core that is surrounded by concentric graphitic layers, similar to those of a carbon onion. These grains are presolar as indicated by isotopic measurements being significantly different from solar values (i.e. $C^{12}/C^{13} <$ solar $= 89$). The r and s type nuclear processes required to explain these isotopic ratios suggest grain-forming regions of red giant (AGB) atmospheres as a likely point of origin for these particles. Electron diffraction data has indicated the cores are comprised primarily of unlayered graphene sheets, approximately 2-4[nm] in breadth. Previous diffraction analyses on these grains have focused on examining the differences between the experimental data and a flat, hexagonal graphene diffraction model. Here, improvements in fitting experimental diffraction profiles are realized when altering the shape of the graphene sheet. In addition, curvature of atom-thick sheets or regular relationships between neighboring sheets can introduce coherence effects which manifest in diffraction. Analysis of both diffraction and HRTEM images, and comparisons to simulations, indicates these structural relationships may be present in the core material.

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