Carbon nanocones: wall structure and morphology

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Abstract. Large-scale production of conical carbon nanostructures is possible through pyrolysis of hydrocarbons in a plasma torch process. The resulting carbon cones occur in five distinctly different forms, and disc-shaped particles are produced as well. The structure and properties of these carbon cones and discs have been relatively little explored until now. Here we characterize the structure of these particles using transmission electron microscopy, synchrotron x-ray and electron diffraction. The carbon nanocones are found to exhibit several interesting structural features; instead of having a uniform cross-section, the walls consist of a relatively thin inner graphite-like layer with a non-crystalline envelope, where the amount of the latter can be modified significantly by annealing. The cones appear with a well-defined faceting along the cone edge, demonstrating strict long-range atomic ordering; they also present occasional examples of symmetry breaking, such as two apexes appearing in the same carbon nanocone.

Keywords: nanocarbon, electron microscopy, electron diffraction

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