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Title:

Symmetric carbon nanostructures: synthesis, growth mechanism and physical properties

Abstract:

Understanding and control of microscopic shape formation are elemental in modern material sciences. We explore novel synthesis routes to various carbon nanostructures, aiming to understand how symmetric shapes of nano carbon emerge from metal clusters. We use organometallic compounds as a single precursor to perform synthesis being confined in various dimensions ranging from nanometres to centimetres across. Inside a single-wall carbon nanotube (SWCNT), organometallic compounds react with each other to form small diameter SWCNTs [1,2]. Multi-frequency Raman spectroscopy allows the growth properties to be determined for (n, m) tubes with Fe, Co and Ni catalysts. Using various spectroscopic techniques we study electronic and magnetic properties of metal clusters inside SWCNTs [3,4]. In a macroscale reactor, the growth symmetry is determined for a given reaction temperature and density of organometallic compounds, allowing various carbon structures (spheres, tubes, bi-spirals) to be produced [5]. I will highlight our recent microscopic study and discuss the formation mechanism [6].

References

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