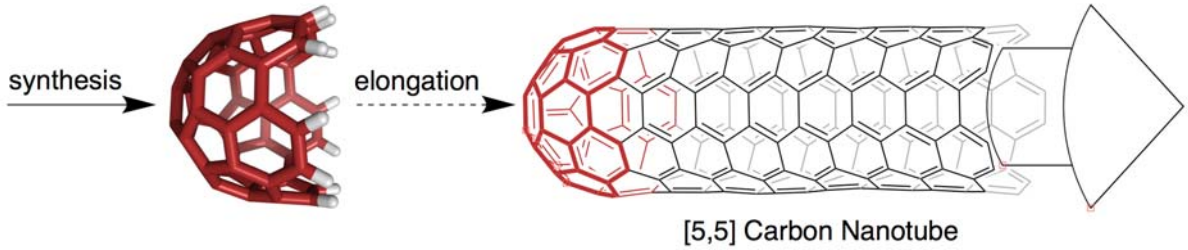
Can Organic Chemists Deliver Structurally Uniform Fullerenes and Carbon Nanotubes by Custom Synthesis?

Lawrence T. Scott

Merkert Chemistry Center, Boston College,
Chestnut Hill, Massachusetts 02467-3860 USA
lawrence.scott@bc.edu

In the ten years since the first directed chemical synthesis of C_{60},[1] no other fullerene has been prepared in isolable quantities by rational chemical methods. We organic chemists have an obligation to address this conspicuous shortcoming in our current synthesis capabilities. Very few fullerenes are available isomerically pure from soot by chromatography, and the vast majority of higher fullerenes lie beyond the reach of materials scientists, who could put them to good use. The situation is even worse for carbon nanotubes (CNTs). Separating useful amounts of metallic CNTs from those that are semiconducting is virtually impossible, and the quest for single-chirality, uniform diameter CNTs remains an even more formidable challenge.[2]

This lecture will present methods for synthesizing geodesic polyarenes[3] and describe how those methods can be applied to syntheses of fullerenes and end-caps for single-index [*n,m*]CNTs by design.[4] Strategies for elongating hemispherical polyarenes into full-length CNTs will also be outlined.[5]



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