Direct synthesis of carbon nanostructures

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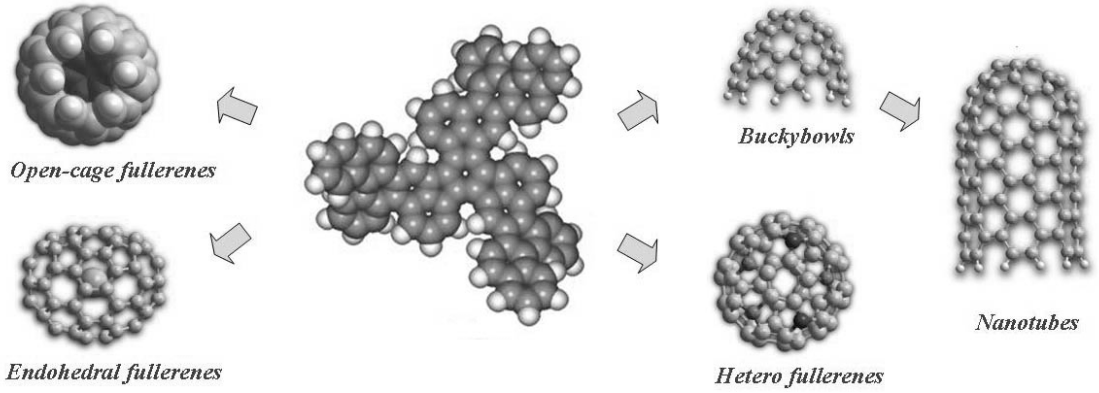
The main task of direct synthesis is the controlled generation of the desired nanostructures by rational chemical methods. This approach is of practical interest for the production of individual higher fullerenes and nanotubes with specific chiralities. Our methodology is based on the synthesis of polycyclic aromatic hydrocarbons which already contain all nessasary carbon atoms in appropriate positions. The following intramolecular condensation leads to the desired nanostructures, the carbon connectivity of which is fully predefined by the precursor molecule. The higher fullerenes can be synthesized by regioselective "rolling-up" of the precursor molecules either by flash vacuum pyrolysis (FVP)[1,2] or by catalytical cyclodehydrogenation (CCDH) on a Pt surface.[3] The CCDH approach seems to be an appropriate technique for direct synthesis of carbon nanotubes since the nucleation step leading to the formation of an end-cap with accidental geometry can be replaced by introducing a predefined end-cap molecule. Subsequent growth will lead to the desired SWCNT species as determined by the end-cap geometry. [7]



The direct synthesis approach is not limited to fullerenes and carbon nanotubes but can be applied as well to the formation of other carbon based nanostructures including, but not limited to endohedral and open cage fullerenes, nanoribbons and hetero graphenes.

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[3] K.Yu. Amsharov, N. Abdurakhmanova, S. Stepanow, S. Rauschenbach, M. Jansen, K. Kern, *Angewandte Chemie* **49**, 9392. (2010).
[4] A. Mueller, K. Yu. Amsharov, M. Jansen, *Tetrahedron Lett.* **51**, 3221, (2010).