The Chemist´s Carbon Nanostructures as Functional Multitalents

Klaus Müllen

Max Planck Institute for Polymer Research, Mainz, 55128, Germany

muellen@mpip-mainz.mpg.de

We introduce carbon nanostructures of different size, dimensionality and structural complexity. Dendrimers made from twisted and interlocked benzene rings constitute shape-persistent nanoparticles allowing perfect site definition of functional groups. This affords light harvesting complexes, receptors for guest up-take and sensing, drug delivery vehicles as well as single-molecule rotors. On the other hand, these dendrimers serve as 3D-precursors for the bottom-up synthesis of nanographenes and graphene nanoribbons (GNRs). Graphene is praised as a multifunctional "wonder" material and rich playground for physics. Above all, however, it is a 2D-polymer and thus a task for materials synthesis. Thereby "conventional" GNR-synthesis can be related to a surface-bound synthesis under in-situ control by scanning tunneling spectroscopy. We then compare our "bottom-up" precision synthesis starting from dendrimers with "top-down" protocols starting from graphite. The available toolbox of fabrication methods provides access to an enormous breadth of materials for batteries, supercapacitors, oxygen reduction catalysts and semiconductors.

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