Synthesis and Applications of Curved Polycyclic Aromatics

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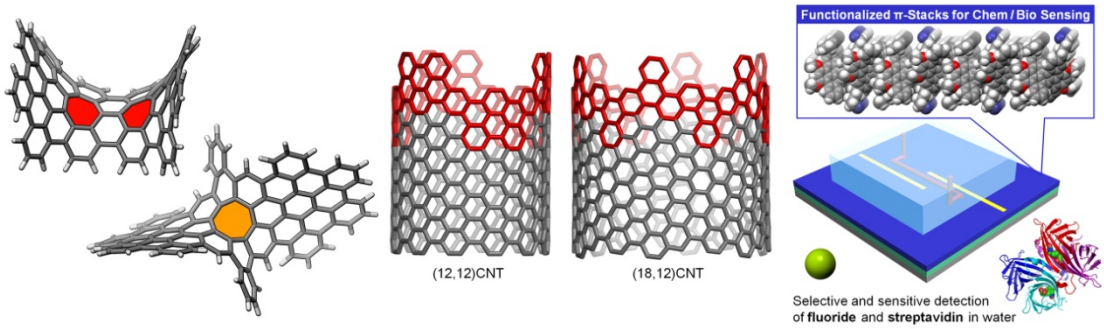
Curved polycyclic arenes are not only unique objects of structural organic chemistry in relation to the nature of aromaticity, but also play an important role in science of carbon nanomaterials and organic functional materials because of their interesting structures and promising applications. This lecture will present three types of curved polycyclic aromatics designed and synthesized by my research group. The first type is negatively curved polycyclic arenes containing seven- or eight-membered rings.[1] They are not only segments but also synthetic precursors for theoretical carbon allotropes of negative curvature, which are known as Mackay crystals or carbon Schwarzites. The second type is carbon nanobelts that represent sidewall segments of armchair and chiral single-wall carbon nanotubes.[2] The recently achieved synthesis of these carbon nanobelts is a key step towards ultimate bottom-up synthesis of uniform carbon nanotubes of single chirality and predefined diameter. The third type is organic semiconductors based on twisted hexabenzoperylenes (HBPs). Functionalized HBPs present an unusual type of π-stacking that allows a variety of functional groups to be grafted onto organic semiconductors without sacrificing π-π interactions in the solid state. This unprecedented supramolecular platform, in a device integrating an organic field effect transistor channel and a microfluidic channel, has enabled electronic sensors for detection of highly sensitive and selective detection of chemical and biological species.[3]



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