Supramolecular Control: Strategic Uses of Carbon Nanohoops, Fluorinated Cyclohexanes and Organophosphates

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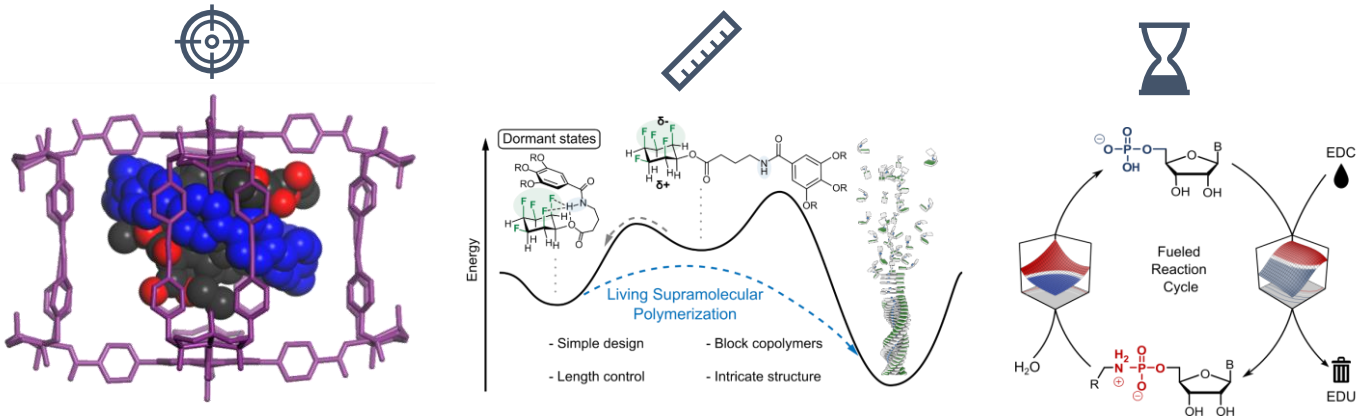
In this talk, I will present recent work by our group on the use of supramolecular chemistry to address challenges in synthesis, materials science and systems chemistry.

Control over the **selectivity** of fullerene bis-addition reactions was achieved by encapsulating C_{60} in a three-shell complex ("Russian Doll"). Thanks to the combined template effects of a self-assembled cage and nanohoop [10]CPP,[1] the C_{60} *trans-3* bis-adduct (Fig. 1 left) was obtained with ideal chemo-, itero- and regioselectivity,[2] which has recently enabled the synthesis of unprecedented C_{60}/[10]CPP [2]catenanes.[3]

Control over the **length** of self-assembled nanofibers was achieved by the living supramolecular polymerization of *all-cis* fluorinated cyclohexanes.[4] The exceptionally high dipole moment of the $C_6H_6F_5OR$ motif gave rise to folded monomers that only polymerized into nanofibers of double-helical topology upon addition of seeds.

Control over the persistence of supramolecular assemblies over **time** was achieved in chemically-fuelled phosphoramidate[5] and acylphosphate[6] systems. Generating chemically-driven steady states from organophosphates is far from trivial, but holds great promise for the creation of chemically-driven molecular machines and transient self-assemblies.



References

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