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Fuel-Driven Temporal Control on Supramolecular Assemblies

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Self-assembly has always been a promising route to achieve novel materials. This has been possible by decades of research and laying down of principles governing the phenomenon. Almost all of this assembly is under thermodynamic parameters and provide minimal help in exploring a temporally driven dimension of self-assembly. On the other hand in biological systems, which have always served as an omnipresent inspiration for self-assembly, control their aggregates and function temporally with unparalleled deft. Considering the conventional self-assembly one wonders if the complexity and dexterity of biological systems is ever to be matched and perhaps one might tread on diverse scientific routes for kinetically controlled self-assembly.

We, in our laboratory, are driven by this philosophy and are currently trying to understand both thermodynamic and kinetic aspects of self-assembly. This talk describes our efforts in understanding a very key concept of biological self-assembly which is temporal control over aggregates via a chemical fuel as we think this approach can singlehandedly cater to various existing challenges of supramolecular chemistry such as a living supramolecular polymerization, control over nucleation rate, transient materials and formation of supramolecular hetero-structures.

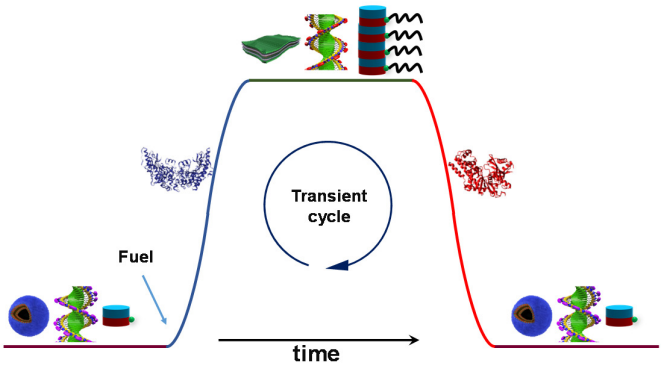

Fig. 1. Fuel-Driven, Transient supramolecular assemblies or conformations in our laboratory.

I will be discussing our results by taking supramolecular systems, which we have been working on during the last few years.