From self-sorting of dynamic metal-phenanthroline complexes to (supra)molecular machinery in action

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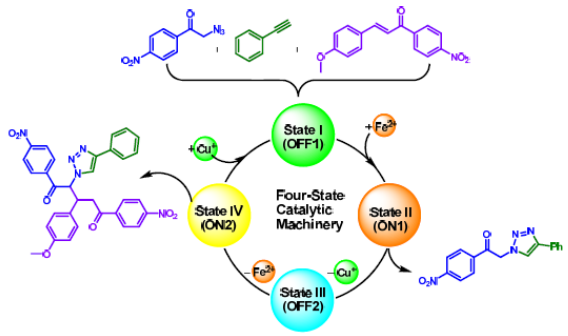
At present, the field of chemistry is still mainly focused on individual systems and not well prepared for interacting chemical systems (Breslow), a gigantic and promising terra incognita. Once this area is opened up, chemistry will be no longer characterized by individual transformations, pure compounds or static mixtures only. Instead chemistry will become alive and responsive through the interaction and communication within molecular networks. As a result, the arena of molecular cybernetics has the potential to fundamentally change our view of the field of chemistry.

From a design point of view, the highly dynamic networking of a variety of distinct components under thermodynamic control requires a rich tool box of orthogonal binding motifs, because non-interfering inputs are needed for the operation of individual machines, for intermolecular communication and even more for running interdependent ensembles of individual (supra)molecular devices/parts that we prefer to denote as machinery.

In this context, the lecture will cover self-sorting of dynamic heteroleptic metal diamine (mostly phenanthroline) complexes and their evolution into singly and multiply selfsorted catalytic machinery.

Since all catalytic machinery was run in presence of all constituents (ligands, nanoswitches, nanorotors, reactants, products, inputs) and additionally tested in two or more cycles, it was imperative to develop completely orthogonal chemical actuation and switching protocols.



Scheme 1. Four-state catalytic machinery.4

Some key references

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