TOWARDS ADAPTIVE FUNCTIONAL MATERIALS AND NANOARCHITECTURES

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Supramolecular chemistry is actively exploring systems undergoing *self-organization*, i.e. systems capable of spontaneously generating well-defined functional supramolecular architectures by self-assembly from their components, on the basis of the *molecular information* stored in the covalent framework of the components and read out at the supramolecular level through specific interactional algorithms, thus behaving as *programmed chemical systems*. It allows for the spontaneous but controlled generation of well-defined, functional molecular and supramolecular architectures of nanometric size. It represents a means of performing programmed *engineering* and *processing* of *functional nanostructures*.

Supramolecular entities as well as molecules containing reversible bonds are able to undergo a continuous change in constitution by reorganization and exchange of building blocks. This capability defines a *Constitutional Dynamic Chemistry* (CDC) on both the molecular and supramolecular levels. CDC allows for the generation of dynamic materials and nanoarchitectures, which may operate component selection in response to external stimuli or environmental factors and therefore behave as *adaptive functional materials and nanoarchitectures* of either molecular or supramolecular nature. Applying the previous considerations to polymer chemistry leads to the definition of *constitutionally dynamic polymers*, DYNAMERS, of both molecular and supramolecular types.

These approaches have been implemented in the generation of functional organic and inorganic materials and nanostructures for molecular and supramolecular electronics, optics and mechanics. They point to the emergence of *adaptive* and *evolutive chemistry,* towards *systems of increasing complexity.*

General references

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