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ABSTRACT

From Supramolecular to Adaptive Chemistry Aspects of Nanoscience and Nanotechnology

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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.

The implementation of molecular information controlled, "programmed" and functional systems allows the spontaneous but controlled generation of well-defined, functional molecular and supramolecular architectures of nanometric size through self-organization by design. It represents a means of performing programmed engineering and processing of functional nanostructures and offers attractive perspectives to nanoscience and nanotechnology.

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 allows for self-organisation with selection and defines a Constitutional Dynamic Chemistry (CDC) on both the molecular and supramolecular levels. CDC introduces a paradigm shift with respect to constitutionally static chemistry. It takes advantage of dynamic constitutional diversity to enable variation and selection and thus allow for adaptation leading to the emergence of an adaptive chemistry.

These approaches have been implemented over the years in the generation of functional organic and inorganic nanostructures for molecular and supramolecular electronics, spintronics and mechanics.

General references

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