Supramolecular Chemistry: Some Contributions to Life Sciences

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Abstract

Molecular chemistry has developed a wide range of very powerful procedures for building ever more complicated molecules from atoms linked by covalent bonds. Beyond molecular chemistry lies *supramolecular chemistry* which aims at constructing highly complex chemical systems from components held together by intermolecular forces.

Numerous receptors capable of selectively binding specific substrates have been developed. They perform *molecular recognition* which rests on the *molecular information* stored in the interacting species. Suitably functionalized receptors may perform *supramolecular catalysis* and selective *transport processes* . In combination with polymolecular organisation, recognition opens ways towards the design of *molecular* and *supramolecular* devices based on functional (photoactive, electroactive, ionoactive, etc.) components.

Supramolecular chemistry has relied on more or less preorganized molecular receptors for effecting such molecular recognition, catalysis and transport processes. A step beyond consists in the design of systems undergoing *self-organization* , i.e. systems capable of spontaneously generating well-defined supramolecular architectures by *self-assembly* from their components. Self-organization processes may be directed via the *molecular information* stored in the covalent framework of the components and read out at the supramolecular level through specific interactions. They thus represent the operation of *programmed chemical systems* .

A number of investigations have been performed at the interface between supramolecular chemistry and biology. They concern developments in areas such as : optical sensing of biomolecular recognition, medical diagnostics based on photonics molecular devices, modified liposomes bearing recognition groups (recosomes), dynamic combinatorial chemistry for drug research, gene transfer methodology, self-assembly processes. Some selected achievements in these areas will be presented. They will serve to illustrate the close relationship between supramolecular chemistry and life sciences.

General references

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