

Constitutional Dynamic Chemistry and Soft Matter **Jean-Marie LEHN**

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ABSTRACT: Supramolecular chemistry is intrinsically a dynamic chemistry in view of the lability of the non-covalent interactions connecting the molecular components of a supramolecular entity and its resulting ability to exchange components. Similarly, dynamic covalent chemistry concerns molecular entities containing covalent bonds that may form and break reversibly, so as to allow a continuous modification in constitution by reorganization and exchange of building blocks. These features define a Constitutional Dynamic Chemistry (CDC) on both the molecular and supramolecular levels.

Applying these considerations to polymer chemistry leads to the definition of constitutionally dynamic polymers, dynamers, of both molecular and supramolecular types, whose monomeric components are linked through reversible covalent or non-covalent connections and which may thus undergo constitutional variation, i.e. change in constitution by assembly/deassembly processes in a given set of conditions. Because of their intrinsic ability to exchange, incorporate and rearrange their components,

they may in principle select them in response to external stimuli or environmental factors and therefore behave as adaptive polymers of either molecular or supramolecular nature.

Supramolecular polymers may be generated by the polyassociation of components/monomers interconnected through complementary recognition groups. Dynamic covalent polymers result from polycondensation via reversible chemical reactions. They may undergo modifications of their properties (mechanical, optical, etc.) via incorporation, exchange and recombination of their monomeric components. These features give access to higher levels of behavior such as healing and adaptability in response to external stimuli (heat, light, medium, chemical additives, etc.).

CDC introduces a paradigm shift in Soft Matter Chemistry, opening wide perspectives towards adaptive soft matter science and technologies.

References (arial 12)

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