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Review Article

Porphyrin-Based Nanostructures for Sensing Applications

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Abstract

The construction of nanosized supramolecular hosts via self-assembly of molecular components is a fascinating field of research. Such intriguing class of architectures, beside their intrinsic intellectual stimuli, is of importance in many fields of chemistry and technology, such as material chemistry, catalysis, and sensor applications. Within this wide scenario, tailored solid films of porphyrin derivatives are structures of great potential for, among others, chemical sensor applications. The formation of *supramolecules* relays on noncovalent interactions (electrostatic, hydrogen bond, π-π, or coordinative interactions) driven by the chemical information stored on the assembling molecules, such as shape and functional groups. This allows, for example, the formation of large well defined porphyrin aggregates in solution that can be spontaneously transferred onto a solid surface, so achieving a solid system with tailored features. These films have been used, covering the bridge between nanostructures and microsystems, for the construction of solid-state sensors for volatiles and metal ion recognition and detection. Moreover, the variation of peripheral substituents of porphyrins, such as, for example, chiral appended functionalities, can result in the formation of porphyrin aggregates featuring high supramolecular chirality. This would allow the achievement of porphyrin layers characterised by different chiroptical and molecular recognition properties.