Porphyrins/Bile Salts interplay towards new nano-composite materials

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Porphyrins are versatile building blocks both in natural and synthetic systems. Their self-assembly occurs *via* hydrophobic effects and electrostatic interactions, enabling the formation of various supramolecular architectures. In presence of chiral agents or specific chiral functionalizations, the achiral macrocycles easily organize into chiral aggregates with chiroptical properties. The underlying mechanisms of chirality transfer have both fundamental and applicative relevance for understanding the emergence of homochirality in life and leading processes of stereoselective recognition, i.e. sensors and drug-delivery systems. Bile salts (BS) are chiral biomolecules, having unconventional surfactant properties, due to their facial amphiphilicity. The self-assembly of natural BS has been proved to generate peculiar aggregates, while the array of morphology and properties is even more enlarged in BS derivatives. Here we exploit the BS as chiral effectors for driving the construction of chiral porphyrins-based molecules. We designed new building blocks having porphyrins covalently linked to BS cholate. To define the optimal conditions driving the aggregation, the assembly has been characterized as function of different environmental parameters, combining spectroscopy (UV-Vis, CD, fluorescence) and microscopy (AFM, SEM) techniques. Intense CD signals unambiguously confirm the arise of chiral aggregative patterns. Well-formed tubules, with a hierarchical fine structure (Fig. 1), were imaged, whose size (from nano to micro scale) depends on the selected conditions. Slight variations in solvents composition can strongly affect the kinetic of the aggregates formation. Such supramolecular structures might be relevant for the realization of stereoselective sensing films and soft materials, with potential biocompatibility.

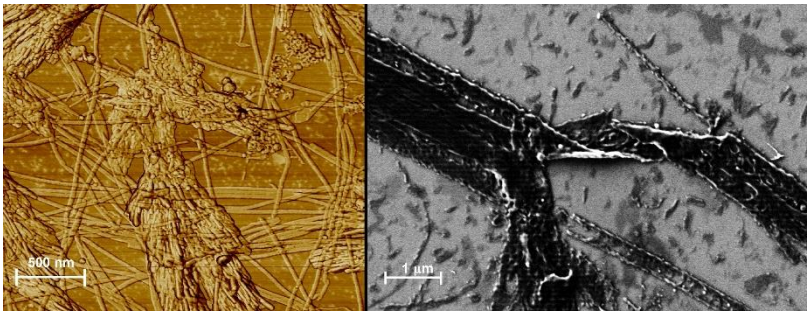

Figure 1:Micrometric tubular elongated structures observed with AFM (left) and SEM (right).