Institut Européen de Chimie et Biologie

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Soutenance de thèse

Cationic Gemini Amphiphiles: From chiral organic self-assembly towards functional composite micro- and nanomaterials.

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Due to their unique physical properties chiral materials are used in a wide range of applications in chemistry, physics and biology. In this work we focus on the fabrication of chiral functional materials for NanoElectroMechanical systems (NEMS) based on the inorganic transcription of self-assembled surfactants.
At first we introduce a new Nucleoamphiphile based system that self-assembles into micrometer sized helical fibers in aqueous medium. The effect of a wide range of chemical and physical parameters on the morphology of the aggregates was investigated. Then the synthesis of chiral silica structures based on the organic micro- and nanohelices as templates was studied to achieve the required mechanical properties of the material. Control over the precursor reactivity is crucial for the transcription of the morphology of the template into the silica replica. Secondary mineralization with TiO_2 or ZnO was performed to provide the necessary electrical properties and functionality to the chiral material. Different approaches and the optimization parameters are described in detail. Finally measurement of the mechanical properties of the silica nanotubes and nanohelices by AFM as the first step of the NEMS development is discussed.

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