Ph.D. defense

Institut de Chimie Séparative de Marcoule / CEA Marcoule
(UMR 5257, CEA, CNRS, Université Montpellier, ENSCM)

ROMAIN BESNARD

will present his Ph.D. dissertation

Synthesis of hybrid silica with high density of extractant functions.

The defense will take place on **Monday, November 9, 2015** at **10.00 am**
in the ICSM Auditorium

The aim of this study is to develop a suitable “all-in-one” approach involving amphiphilic organosilane precursors in order to prepare hybrid materials for solid phase extraction processes. Such molecules combine both condensable and functional parts around a long hydrophobic alkyl chain.

Similarly to a surfactant, the amphiphilic behavior of the organosilane molecules is governed by the size of the hydrophilic extractant function. By playing with the curvature agent size, it is possible to adjust the size of the couple extractant part/curvature agent at the interface between the aggregates and the surrounding media. Therefore, the aggregation shape is tunable. This approach constitutes an efficient and original method in order to tune the nanostructure of highly functionalized silica at the early stage of the elaboration. Hybrid organic-inorganic planar objects and vesicles are obtained for smaller curvature agents. Increasing the size of the curvature agent results in a transition of the aggregation geometry from vesicles to cylindrical direct micelles, leading to highly functionalized nanofibers.

Comparatively, the addition of a silica precursor as TEOS in the preparation results in the swelling of the condensable part of the amphiphilic organosilane molecules. Thereby, as a curvature agent, the addition of TEOS allows tuning the aggregation towards reverse cylindrical micelles. Solvent effects have also been evaluated, appearing as a critical morphological parameter. Macroporous materials, blackberry-like particles and elongated or spherical nanoparticles can be obtained depending on the solvent.

Finally, the accessibility of the functions and the extraction properties of the materials have been studied through chemical modifications and metallic ion extraction experiments (Rare earth elements, platinoids …).