Ph.D. defense

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

BENOÎT GOUZE

will present his Ph.D. dissertation

Self-organization of semifluorinated alkanes in non-aqueous media: a first step towards a mesoporous silicon carbide

The defense will take place on **Monday, April 18, 2016** at **10.00 am**

in the ICSM Auditorium

Silicon carbide (SiC) is a light material with numerous interesting properties: strong mechanical resistance, weak thermal expansion, good heat conductivity and chemically inert on a large range of temperatures. These characteristics make SiC an appropriate material for various applications in extreme conditions, from catalyst to generation IV nuclear fuel cladding material. Nevertheless, to fulfill these application specificities, SiC has to show high specific surface area, and a controlled porosity. We have studied the possibility to synthetize mesoporous SiC by a soft templating approach using semifluorinated alkanes (SFA) to structure a SiC molecular precursor, the 1,3,5-trisilacyclohexane (TSCH). The TSCH polymerization into polycarbosilane around SFA aggregates can structure the matrix, that will create porosity after the template removal. Then polycarbosilane is converted into a SiC by a calcination process conserving the porosity. In a first time, we studied the self-aggregation capacities of SFA in cyclohexane as model solvent, and then in TSCH, by X-ray scattering techniques and simulations of scattering patterns. We discussed the behavior of SFA and determined the parameters controlling the size of the aggregates. Then, we proceeded to SiC synthesis from TSCH in presence of SFA. As resulting materials didn't show the expected specific surface area and porosity characteristics, we enlarged our studies to other templates such as a triblock copolymer styrene-butadiene-styrene, which finally allowed us to obtain mesoporous SiC, amorphous or crystalline, by an approach involving the grafting of the SiC precursor onto the copolymer.

Keywords: silicon carbide; semifluorinated alkanes; polycarbosilane; mesoporous materials; soft templating; SAXS