

Soutenance de thèse

Vendredi 06 juillet

13 heures 30

Salle 2, Collège de France

Elisa BINDINI

“Understanding in vivo degradation of mesoporous silica therapeutic vectors through in situ ellipsometry”

Composition du jury proposé

Prof. Mika Linden

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Abstract

The last decades have seen the fast development of mesoporous silica nanoparticles as a biocompatible platform for drug delivery, thanks to their tunable porosity, high loading capacity and the possibility to be functionalized with organic molecules to control cargo release and cell surface recognition.

To design efficient nanocarriers and also to assess toxicity issues on human health, a good understanding of mesoporous silica particles biodegradability is mandatory.

This research work wants to determine the dissolution rate of mesoporous silica under physiological conditions and identify some of the factors affecting silica behavior in biological media. The conducted study leads to interesting results which can be used to design in vivo tests.

Structure and composition of mesoporous silica nanoparticles have been reproduced on 2D thin films and studied through in situ ellipsometric analysis in phosphate buffer, concentrated protein solution and in real biological media such as serum and blood.

In particular, we explored dissolution under flow conditions, reproducing the dynamic nature of bloodstream, which can affect the mechanisms of protein adsorption, particle dissolution and drug release. To do so, we developed a special ellipsometric setup which make us able to use opaque liquids (serum, blood) coupled with a microfluidic cell to control flow conditions.

We monitored the influence of surface functionalization, pore size and geometry and medium flow on the interfacial behavior of mesoporous silica thin films in biological fluids.