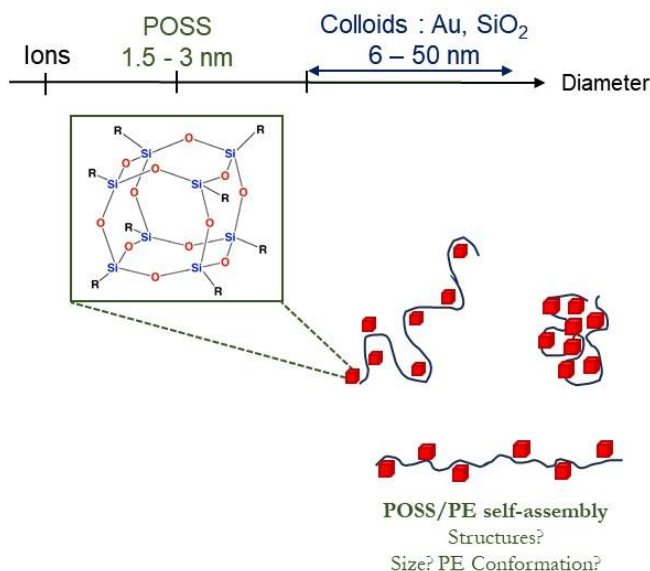


Self-assembly of charged molecular colloids with model polyelectrolytes



Abstract: Polyhedral oligomeric silesquioxanes (POSS) are small molecular colloids which, thanks to their size of 1-3 nm and their easily tunable pendant groups, can be placed in a little explored area between ions and nanoparticles. This project aims to study their interactions with model polyelectrolytes (PEs) to form self-assemblies having various structures (complexes, coacervates or precipitates) which would allow to control phase separation interesting for extraction or depollution applications. The objectives of this thesis are i) the synthesis of POSS of controlled charge and size and ii) the characterization of these POSS and their self-assemblies with model PEs of variable flexibility using several experimental techniques in order to identify the physico-chemical relevant parameters (charge ratio, colloid size, PE persistence length and ionic strength) to modulate the structure of self-assemblies and extend the phase separation domain.

PHENIX Lab: The PhD student will work in the Multiscale Experiments and Modeling team in the multidisciplinary PHENIX laboratory located in the campus Pierre et Marie Curie of Sorbonne Université, in the center of Paris. The MEM team gathers 16 permanent researchers and 16 non-permanents researchers (postdocs and PhD students) from different nationalities. The team focuses on the understanding and prediction of the behavior of charged systems (polymers, nanoparticles, electrolytes...) under many conditions such as confinement using experimental techniques or simulations. The involved complementary skills coupled with regular team meetings provide a stimulating scientific environment for young PhD students.

Candidate profile: A master degree in Soft Matter, Chemical physics, Physics, Materials science or related fields is required. The candidate should have a strong background in physical chemistry with an interest for experiments in lab. Knowledge in polymer physics and physico-chemical characterization would be appreciated. The candidate should be highly motivated and have the ability to work with different scientists, internal or external to the PHENIX laboratory.

Starting : October 2024

Techniques et methods : Synthesis and POSS chemical modification, mass spectrometry, zeta potential, NMR, scattering techniques (light, SANS, SAXS), formulation

Application : Send a CV (with references) and motivation letter to Lingsam Tea and/or Nicolas Jouault

Contact: lingsam.tea@sorbonne-universite.fr, nicolas.jouault@sorbonne-universite.fr

