POM-BASICS Summer School

"Polyoxometalate Chemistry for Fundamentals and Applications"

La Rochelle-France, June 13-15th 2022

Session 1- Condensation processes and POM design

Part. 1 - Directed polycondensation processes and self-assembly engineering of polyoxometalates

Former : Emmanuel Cadot (Versailles, France)

Abstract of the course:

The high structural diversity of polyoxometalates is often pinpointed in many introductive written works and constitutes probably one of the most fascinating features of this class of compounds. This area of research has undoubtedly benefited from the extraordinary development of structural methods such as X-ray diffraction, which have become an accessible and easy-to-use toolbox. Nevertheless, the resulting solid-state arrangement gives only partial information which corresponds to the ending-shot of numerous, complex and successive elemental sequences occurring in liquid solution, at the origin of the so-called "virtual dynamic library of oxo-metalate building blocks". In the course, self-assembly processes will be discussed by dissecting the different directing effects that play key roles within the polyoxometalates synthesis. Thus, a few selected examples will be given showing how weak interactions resulting from solvation or ion pairing effects and subtle compositional changes such as pH, ionic strength or the presence of exogenous nonionic species can alter radically the mechanism, kinetics and thermodynamics of self-assembly processes. These case studies will include analysis of experimental data arising from multinuclear NMR (liquid state, DOSY), isothermal calorimetric titration (ITC), Small-Angle X-ray Scattering (SAXS), UV-vis or electrochemistry… Finally, this course ambitions to give to the chemist a comprehensive survey about the conglomerate of effects that interfere upon the polycondensation process, whose balanced control is required for the fine design of targeted POM species..