

## Formulation de polyoxométalates comme agents de contraste en imagerie médicale. Formulation of polyoxometalates as medical imaging contrast agents

Supervisor: Yves Chevalier: [yves.chevalier@univ-lyon1.fr](mailto:yves.chevalier@univ-lyon1.fr)  
Co-supervisor: Éloïse Thomas: [eloise.thomas@univ-lyon1.fr](mailto:eloise.thomas@univ-lyon1.fr)

**Keywords:** polyoxometalates, formulation, imaging contrast agent, physicochemical characterizations.

### Project description:

**Background:** The Spectral Photon Counting Scanner (SPCCT) is a new imaging modality with advantages over CT (high count rate and spatial resolution). SPCCT can also simultaneously quantify multiple features providing valuable diagnostic information. To exploit the full potential of SPCCT, new contrast agents must be developed. For high sensitivity, these must be composed of elements with high K-edge energies, such as tungsten (W) and tantalum (Ta). One of the challenges is to develop contrast agents with a size between 1 and 10 nm for optimal biodistribution. The goal of this project is to develop efficient SPCCT contrast agents using polyoxometalates (POM). The diversity of their structure and composition allows a great versatility of their properties which explains the growing interest for their applications in diagnosis or therapy. However, many POM present poor stability in water, non-specific interactions with biomolecules or toxicity.

**Objectives:** To overcome these problems, POM will be formulated by physisorption with polymers or proteins of interest. The encapsulation of POM in small nanoparticles may also be evaluated. After formulation, the physicochemical properties of formulated POM will be studied: stability and influence of the concentration, pH, etc ; interactions with biomolecules,... Various techniques will be used (DLS, spectroscopy, ICP...). During the PhD, biocompatibility will also be evaluated on cells by the PhD student (the selected student will be trained to performed *in vitro* work). During the PhD, the student will collaborate with different academic partners for deeper physicochemical characterizations of the formulation (CEA, ICSM, Marcoule) and *in vivo* evaluation (CREATIS, Lyon).

**Candidate profile:** Skills and knowledge in chemistry, formulation, physicochemical analysis. Interest in transdisciplinary subjects. Motivated, curious, autonomous.

**Application:** please send a resume and a letter of motivation (including references). Master 1 results should also be provided to support the application.

**Laboratories:** The **LAGEPP** (<https://lagepp.univ-lyon1.fr/en/home/>) is a research laboratory of the University Lyon 1 and the French national Institute for scientific research (CNRS UMR 5007). The LAGEPP-Gepharm "pharmaceutical engineering" team gathers strong pluridisciplinary competences (pharmaceutical formulation, cosmetic formulation, physical chemistry) in close collaboration with national and international research and development centers in industry or in academia. The laboratory is located on the La Doua campus (UCBL, 69100 Villeurbanne).

