PhD position available at the Université de Rennes 1, France

Organometallic chemistry of alkaline earth metals: Design, reactivity and molecular catalysis

Project supervisor: Dr. Yann SARAZIN  \texttt{ORCID 0000-0003-1121-0292}

Institut des Sciences Chimiques de Rennes UMR 6226 CNRS – Université de Rennes 1
Building 10C, Campus de Beaulieu, 35042 Rennes Cedex, France
\texttt{yann.sarazin@univ-rennes1.fr}  \texttt{(+33)} (0)2.23.23.30.19  \texttt{Web page}

Keywords: organometallic chemistry • alkaline-earth metals • molecular catalysis • reactivity small molecules

Our team in Rennes is composed of 4 permanent researchers as well as 10-15 PhD students and post-doctoral research assistants. We specialise in the design of original organometallic complexes and in their utilisation as molecular catalysts for atom-efficient reactions to produce polymers and fine chemicals. We work in close collaboration with several research groups in and beyond France, and with major industrial partners (Total Petrochemicals, Arkema, Bostik, Triskem Int.).

We are seeking to recruit a highly motivated PhD student, starting on October, 1st 2020 or as soon as possible thereafter, to pursue our existing program with the large alkaline earth metals (= Ae): calcium, strontium and barium. The chemistry of these elements is in its infancy, key compounds are still to be synthesised, and the range of potential applications in homogenous catalysis is virtually boundless. The multidisciplinary project proposed here consists in exploring specific aspects of the synthetic organometallic chemistry of the large alkaline-earth metals, with a view to producing competent molecular catalysts that will in a second stage be used in dehydrocoupling catalysis (see references below). The recruited PhD student will:

(i) **Synthesise elusive alkaline-earth complexes**, in particular Ae-hydrides or heterobimetallic compounds that contain direct Ae-to-metal bond with another main group element from groups 14 (Sn, Pb) or 15 (Sb, Bi);

(ii) Study their reactivity towards specific small molecules: CO, H₂SiR₂, H₂SnR₂;

(iii) **Implement them in dehydrocoupling catalysis** to produce hybrid/inorganic polymers, e.g. functionalised polysilanes (SiR₂)ₙ or polystannanes (SnR₂)ₙ. We will aim to gain a thorough understanding of the mechanisms that operate in the chosen catalysed reactions, notably with the assistance of theoretical computations.

The successful applicant must have a good command of the English language. (S)He will gain a set of competences in organometallic synthesis under controlled atmosphere, alkaline-earth chemistry, catalysis science, polymer chemistry and analytical tools (1- and 2D multinuclear NMR, FTIR, X-ray diffraction crystallography, gel permeation chromatography, GC chromatography, MALDI-ToF mass spectrometry etc.) for the characterisation of molecular and macromolecular compounds. Previous experience in the handling of air-sensitive compounds and a keen flair for synthetic organometallic chemistry will be an advantage. The 3-year fully funded grant (net salary ca. 1,400 € per month; status University employee) will run from 2020 to 2023.

**Students interested in this position should contact Y. Sarazin by email:** yann.sarazin@univ-rennes1.fr