

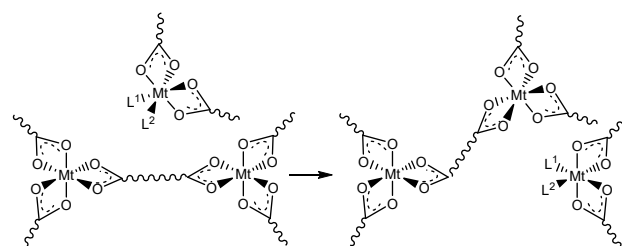
Ph.D. position at the Laboratoire de Chimie de Coordination - Toulouse

Vitrimers based on coordination chemistry (coordination adaptable networks)

Context and motivation: Since their inception in 2011 by Leibler et al.¹ vitrimers (permanent networks with glass-like fluidity), have initiated a paradigm change in the field of materials science. These materials are structurally similar to thermosets, but the linkages are able to exchange, resulting in a dynamic crosslinking and reshaping. So far, only fully organic vitrimers have been developed. The introduction of metal centres has the potential to impart unprecedented new properties (optical, magnetic, catalytic, etc.) to these materials.

¹ D. Montarnal, M. Capelot, F. Tournilhac, L. Leibler, *Science* **2011**, 334, 965-968.

Objectives and methods: The thesis will consist of exploring the fully uncharted territory of coordination adaptable networks. Crystalline 3D networks based on coordination chemistry are well known (porous coordination polymers, PCP, or metal-organic frameworks, MOFs). The target materials are analogues where the carboxylate-based linkers between the metal complexes or clusters are flexible and non-stoichiometric, hence susceptible to undergo material reshaping through ligand exchange reactions at a certain temperature (reshaping, or freezing transition temperature, T_v), as shown schematically in the figure. All known metal precursors in the PCP/MOF toolbox can potentially be combined with flexible analogues of the PCP/MOF linkers. The carboxylate exchange process is crucial for the tuning of T_v and will be studied in model systems. Tuning the electronic structure of the carboxylate linker, e.g. with the introduction of electron-withdrawing substituents, is planned in collaboration with a group at the Institut Charles Gerhardt in Montpellier. The physico-chemical properties of the resulting materials will be investigated.



Period of the fellowship: 1 October 2020 to 30 September 2023 (36 months).

Funding: ANR project AFCAN, grant number ANR-19-CE06-0014-02.

Host group: The thesis will take place within the team "Ligands, Complex Architecture and Catalysis" of the LCC. The team is multifaceted, with interests in a disparate array of topics spanning coordination chemistry, molecular catalysis and metal-catalyzed/mediated polymerization (controlled radical polymerization, ring-opening polymerization). Hence, the recruited student will be exposed to a vibrant interdisciplinary environment. The LCC is a CNRS flagship institution and is equipped with top-notch instrumentation for all necessary compound and material characterization.

Eligibility: The successful candidate must be in possession of a Master's degree, or complete one by the beginning of the Ph.D. thesis, and may have any nationality.

Contact: Prof. Rinaldo Poli (rinaldo.poli@lcc-toulouse.fr).

Application: <https://emploi.cnrs.fr/Offres/Doctorant/UPR8241-RINPOL-002/Default.aspx> (also available in English)