**Synthesis and Characterization of Luminescent Metallapolymers**

**Project description**

The aim of this project is to further develop the ongoing research activity dealing with the exploitment of the photoactive Ir(III) cyclometalated complexes in polymer science. More specifically, following the first stage of the research centred on the role of Ir(III) cyclometalates as photocatalysts for controlled ATRP polymerization of MMA, [1] and on the use of Ir(III) based phosphors as dopants for hybrid polymeric materials,[2][3] the core activity to be carried out in the framework of this project will be represented by the optimization of the design, as well as the synthesis, of metalla polymers in which the Ir(III) cyclometalated fragments are covalently linked to MMA-based polymers. Along with the synthesis of mononuclear Ir(III) cyclometalated complexes and the corresponding metallapolymers, a strikingly important part of the project is related to the structural and photophysical characterization of both chemical entities, i.e either the mononuclear/monomer Ir(III) based species and the corresponding MMA copolymers. Beyond to the synthetic/characterization part, the main applicative perspective for these hybrid materials is currently involving their use as a new class of luminescent solar concentrators to improve the solar light harvesting performance of Si-based solar cells.

References

[1] G. Vigarani, E. Marchini, E. Previati, L. Giorgini, S. Zacchini, R. Argazzi, M. Massi, V. Fiorini, S. Caramori and S. Stagni, *Chem. –Eur. J.*, **2024**, *30*, e202400393

[2] V. Fiorini, N. Monti, G. Vigarani, G. Santi, F. Fasulo, M. Massi, L. Giorgini, A. B. Munoz-García, M. Pavone, A. Pucci, and S. Stagni, *Dyes and Pigments*, **2021**, *193*, 109532.

[3] N. Monti, E. Previati, G. Vigarani, M. Cocchi, F. Tinti, P. Raiteri, S. Zacchini, L. Giorgini, M. Massi, S. Stagni and V Fiorini, *Dalton Trans.*, **2025**, *54*,10304.

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**Candidate Skills**

Applicants must possess consolidated expertise in the synthesis of coordination and organometallic compounds as well as in the preparation of MMA-based polymer materials Advanced knowledge of all the techniques used for the identification and structural characterization of small molecules (i.e. organinc ligands and metal complexes) and polymer matrices: (mass spectrometry, multinuclear NMR spectroscopy, Gel Permeation Chromatography (GPC), voltammetric (CV, OSWV) analyses). In addition, special focus is also placed on compulsory expertise related with the photophysical characterization (absorption and emission spectroscopy, this latter including steady state and time resolved measurements of all type of chemical entities in liquid (r.t. and 77K) solutions as well as in the solid state. In addition, advanced knowledge of common softwares for drawing chemical entities, as well as high level writing and communications skills are expected from applicants.