

Luminescent Metal-Organic Frameworks for Photonic Applications

Mario GUTIÉRREZ¹, Francisco SÁNCHEZ¹, Cristina MARTÍN², Jin-Chong TAN³, Abderrazzak DOUHAL¹

¹University of Castilla-La Mancha, Physical Chemistry - INAMOL, Avenida Carlos III s/n, Toledo, Spain

²University of Castilla-La Mancha, Physical Chemistry, C. Almansa, 14, Albacete, Spain

³University of Oxford, Engineering Science, Parks Road, Oxford, United Kingdom.

E-mail: mario.gutierrez@uclm.es

Metal-organic frameworks (MOFs), a class of porous crystalline hybrid organic-inorganic materials, have emerged as one of the most significant materials in the last two decades [1]. Their exceptional physicochemical properties have enabled their integration into a wide range of applications and technologies. A notable subclass of MOFs, known as luminescent MOFs (LMOFs), is distinguished by its ability to emit light and has demonstrated great potential for advanced photonic applications, such as light-emitting diodes (LEDs) and luminescent sensors [2]. Beyond the intrinsic emission properties of LMOFs, their accessible porosity provides a platform for encapsulating a diverse array of luminescent compounds [3]. This offers several advantages including the mitigation of aggregation-induced quenching in certain dyes — thereby enhancing their luminescent quantum yield — and the ability to modulate the emission color.

Here, we present some of our latest advancements in LMOFs with strong potential for integration into fluorescent sensing of multiple external stimuli and LED applications. Specifically, LMOFs fabricated with ESPT linkers, as well as guest@MOF composites incorporating CT or ESPT dyes, will demonstrate their capability to detect chemical compounds in the vapor phase and respond to variations in temperature and applied pressure (Fig. 1A). Additionally, an Ag-MOF and a Gaq3@ZIF-8 composite will highlight the potential of LMOFs as electroluminescent materials in multilayer MOF-LED architectures (Fig. 1B). Finally, I will underscore the importance of in-depth spectroscopic and photophysical characterization in enhancing LMOFs performance.

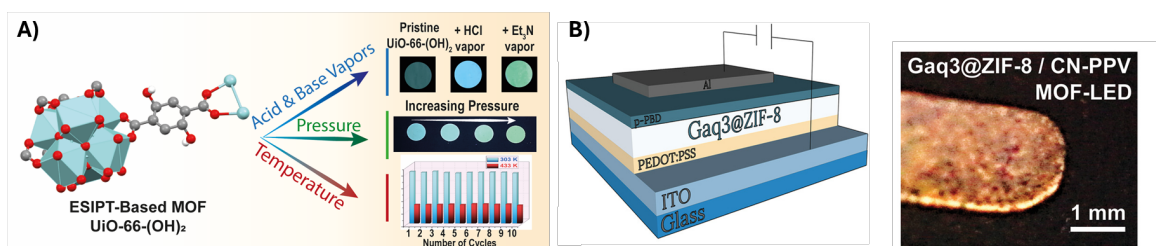


Fig 1. A) Representation of a luminescent ESPT-MOF exhibiting a response for multiple external stimuli. **B)** Illustration of a multilayer MOF-LED alongside a real photo of the device under operational conditions.

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