Subject: Joint webinar Division de Chimie du Solide – SCF / Division of Solid State and Materials Chemistry – EuChemS. Time: Thursday 7th May 2026 01:30 PM Paris-time

zoom connection link :
https://univ-nantes-fr.zoom.us/j/89388274201?pwd=6Z16eb3i4q4jgqj3bzlXIvpzPX7O8b.1
Meeting ID: 893 8827 4201
Code: 128888

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Functional Porous Materials: From Transition-Metal and Lanthanide Silicates to MOFs

Beyond zeolites, certain microporous silicates constructed from transition metal- and lanthanide-containing heteropolyhedra constitute a particularly promising class of functional materials. In addition to the properties conventionally associated with zeolites, these materials may also exhibit magnetic and luminescent behaviour of considerable interest. In my laboratory, we have demonstrated the application potential of these materials in hydrogen/nitrogen separation membranes, light-emitting devices [1], and the treatment of hyperkalaemia (elevated serum K+ levels), culminating in the development of a drug that is now available on the market.

In parallel, our research on metal–organic frameworks (MOFs) seeks to exploit the remarkable modularity of these nanoporous hybrid materials, which are composed of polyatomic metal assemblies interconnected by organic ligands. Although MOFs are generally less robust than zeolitic materials, they offer a decisive advantage in terms of rational design and post-synthetic functionalisation. Within this context, we have developed several research directions focused on luminescence-based thermometry, anti-mosquito textiles, and the capture of uranyl ions in aqueous media. We have furthermore designed MOFs based on tetrathiafulvalene phosphonates and lanthanide ions, exhibiting mixed ionic and electronic conductivity [2], thereby opening significant prospects for applications in (opto)electronics, catalysis, and energy storage.

[1] Wang, Z.; Ananias, D.; Carné-Sánchez, A.; Brites, C.D.S.; Imaz, I.; Maspoch, D.; Rocha, J.; Carlos, L.D. *Adv. Funct. Mater.* **2015**, 25, 2824-2830.

[2] Ribeiro, C.; Tan, B.; Figueira, F.; Mendes, R.; Calbo, J.; Valente, G.; Escamilla, P.; Paz, F.A.; Rocha, J.; Dincă, M.; Souto, M. *J. Am. Chem. Soc.* **2025**, *147*, 63-68.