Novel Recyclable Multifunctional Biporous Materials Based on Poly(Ionic Liquid)s

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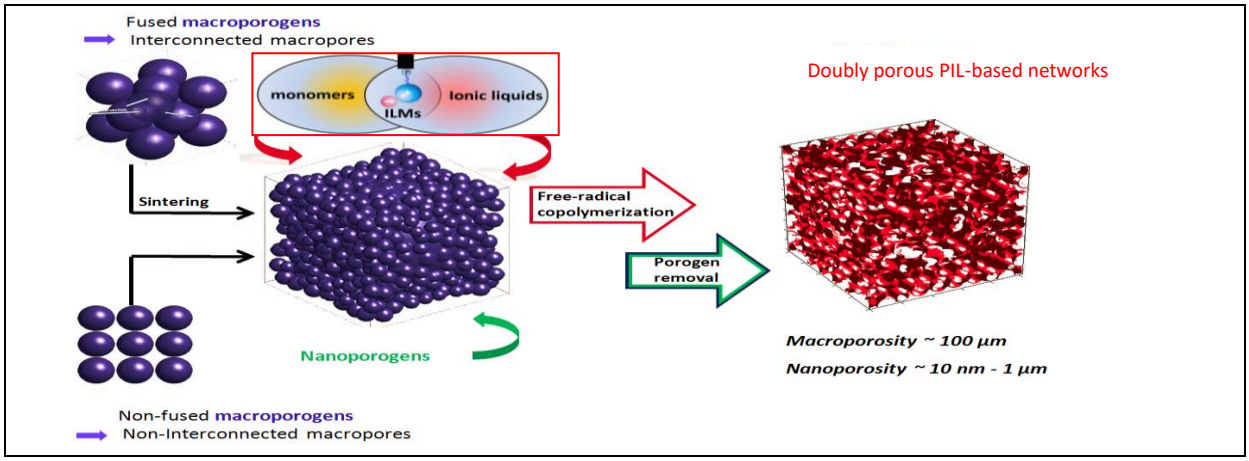
Over the last decade, the generation of organic porous (nano)materials with tunable pore sizes and desired functionalities has been the subject of increasing attention in materials science. Interest in such porous frameworks originates from the large variety of sustainable applications in which they are involved, *e.g.* highly selective membranes, selective adsorbents and filters, high specific area catalytic supports, sensors or insulators [1]. Furthermore, porous ionic polymers, including poly(ionic liquid)s (PILs), exhibit ionic moieties either incorporated into the polymer backbone or covalently attached to a polymeric framework, which may be able to serve as active sensing and reactive sites. Thus, their physico-chemical properties, and functional groups can be easily modified through screening of building blocks and ionic tectons. Meanwhile, their specific surface area, pore size (micro, meso, macro), and pore volume can also be tuned. Their development paves the way to advanced functional materials in a wide variety of areas, including gas separation and adsorption, heterogeneous catalysis, antibacterial applications, and water purification [2].

This PhD thesis aims at developing novel recyclable multifunctional biporous materials based on PILs meant for important environmental applications. First, the double porogen templating approach will be exploited to elaborate biporous PIL networks with controlled pore surface functionality and morphology [3]. Then, such ionic polymer materials will be investigated in CO_2 adsorption and subsequent conversion into fine chemicals, along with their recyclability. Removal of heavy metals or PFAS in contaminated water is another potential application of major interest for the tailor-made PIL networks.



The PhD student will benefit from unique expertise (molecular chemistry, macromolecular engineering, polymer processing) and state-of-the-art platforms (physico-chemical characterization, electron microscopy, X-ray tomography) available at ICS.

[1] Poupart, R.; Grande, D.; Carbonnier, B.; Le Droumaguet, B. *Prog. Polym. Sci.* **2019**, *96,* 21-42.
[2] Hu, H; Wang, B.; Chen, B.; Deng, X.; Goa, G. *Prog. Polym. Sci.* **2022**, *134*, 101607.
[3] Mezhoud, S.; Le Droumaguet, B.; Aimedieu, P.; Monchiet, V.; Bornert, M.; Grande, D. *Colloid Polym. Sci.* **2021**, *299*, 537-550.