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Short biography

Mariolino Carta completed his PhD in Organic Material Chemistry at Cardiff University in 2008. He then held PDRA positions at Cardiff University until 2014 and at the University of Edinburgh. Since 2017, he moved to Swansea University where he currently works as a Senior Lecturer. His research involves the design and synthesis of novel organic monomers for Polymers of Intrinsic Microporosity (PIMs) and their structural modification, with the objective of tailoring the polymeric structures and tuning the physical properties of the final materials.

PIMs are known for important applications such as:

- Gas separation
- Gas storage (H_2, CH_4, CO_2)
- Heterogeneous catalysis
- Electrochemistry
- Anion exchange resins
- Flame retardants materials

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Abstract

Polymers of Intrinsic Microporosity (PIMs): versatile materials for gas separation and catalysis

Polymers of Intrinsic Microporosity (PIMs) are materials which microporosity is due to the rigidity of the monomers used in their synthesis that cannot pack space efficiently, leaving pores of nano-dimension.[1]

This talk focuses on two recent projects, which involved the synthesis and characterization of series of novel networked PIMs.

The first part concerns a recent work where we reported the synthesis of a series of novel hypercrosslinked Polymers of Intrinsic Microporosity (PIMs) employed for ***carbon capture*** and for the ***separation*** of CO_2 from N_2 and CH_4.[2] The starting hydrocarbon structures of these PIMs is highly microporous, but also non-polar. Their functionalisation, though, facilitates the introduction of either basic (amines) or acidic sites (sulfonic groups). The difference in polarity, along with the altered hydrophilicity/hydrophobicity, helped the tuning of the permselectivity for different gases. This was especially evident when the materials were used to prepare new fillers for Mixed matrix membranes (MMMs).

The second part will be about a new class of PIMs, prepared via the *in-situ* formation of the Tröger's Base (TB). These polymers combine the typical high porosity of PIMs with the presence of two basic nitrogens[3] that can be used as ***heterogeneous catalyst***.[4] PIMs are relatively new in catalysis and, despite recent improvements, their often small pore size can pose a problem when reacting large substrates, as they cannot fit the pores.[5] To work around this issue, we combined ***rigid monomers*** and slightly more flexible "***side-arms***". The latter reduces the overall porosity, but it also confers a higher degree of flexibility of the molecular chains that leads to the expansion of the pores, enhancing the accessibility of the catalytic sites.

References

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