Porous Metal-Organic Framework Glasses

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The last two decades has seen intensive research into developing metal-organic framework (MOF) materials in which the pore size and architecture can be specifically tailored by the assembly of metal co-ordinates together with rigid organic ligands. Many of the applications for MOFs include separation, gas adsorption, water purification [1]. The ability to control the positioning and growth of these materials into devices [2], membranes and sensors [3] is currently the focus of our research.

We have recently been characterizing porous glass MOFs in which a crystalline MOF is melt-quenched (MQ) to produce an amorphous glass [4-5]. MQ glasses are formed by quenching a liquid from above the melting temperature to below the glass transition temperature at a rate fast enough to avoid crystallization. Being able to retain and control the porosity of these highly novel materials is key to future applications. Positron Annihilation Lifetime Spectroscopy has been at the forefront of precisely measuring pore sizes and distributions. Here we present the latest results on glassy materials and potential future applications [4-5].

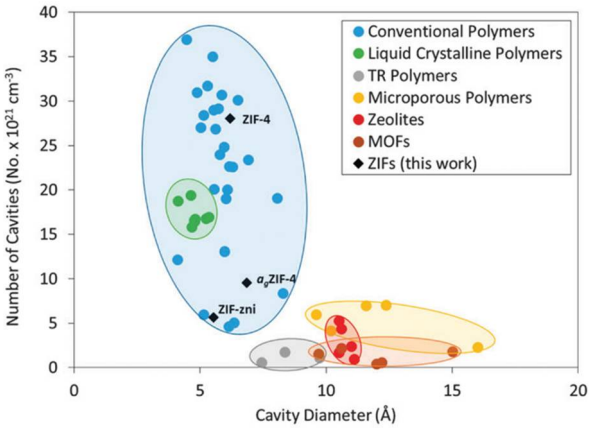

Figure 1 *Comparison of PALS results for a range of materials including glassy MOFs [4].*

References

[1] P. Falcaro, R. Ricco, C. M. Doherty, K. Liang, A. J. Hill and M. J. Styles, *Chem. Soc. Rev*. **43**, 5513 (2014).
[2] C. M. Doherty, D. Buso, A. J. Hill, S. Furukawa, S. Kitagawa and P. Falcaro, *Acc. Chem. Res*. **47**, 396 (2014).
[3] C. M. Doherty, G. Grenci, R. Riccò, J. I. Mardel, J. Reboul, S. Furukawa, S. Kitagawa, A. J. Hill and P. Falcaro, *Adv. Mater*., **25**, 4701 (2013).
[4] A.W. Thornton, K. E. Jelfs, K. Konstas, C. M. Doherty, A. J. Hill, A. K. Cheetham and T. D. Bennett, *Chem. Commun*., **52**, 3723 (2016).
[5] A. Qiao, T. D. Bennett, H. Tao, A. Krajnc, G. Mali, C. M. Doherty, A. W. Thornton, J. C. Mauro, G. N. Greaves and Y. Yue, *Sci. Adv*. **4**, eaao6827 (2018)

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