

#ICMoTalks

**Jia Min Chin****University of Vienna,  
Austria**April 3<sup>rd</sup> - 15:30h

📍 Assembly Hall



## Abstract

### **Structural control of MOF composites for enhanced performances**

Biological composites bear complex designs and hierarchical structures that are key to their specific function and exceptional properties. However, the structural and functional complexities of natural materials are difficult to integrate into synthetic composites, as the control of materials across multiple length scales is a major scientific challenge. We work on the preparation, assembly, and multi-length scale structuring of Metal-Organic Frameworks (MOFs) and other colloidal materials and composite systems for optical and ion conduction applications, using an interdisciplinary approach. Most MOFs possess non-cubic lattices and anisotropic functionality dependent upon crystallographic direction and are generally synthesized in bulk as loose as microcrystalline powders. As such, for practical purposes, general methods to manipulate and orient free-standing MOF crystals would be useful to harness their anisotropic functionality. This talk will focus on our exploitation of physicochemical interactions at air/liquid/solid interfaces, as well as top-down processing methods and external fields to manipulate MOF materials, ranging from tuning MOF crystal size and shapes to the dynamic alignment of NU-1000 MOF microrods as well as E-field assisted liquid crystalline assembly of MOF particle superstructures. Examples of the impact of MOF orientation and positioning on their performances for sensing and actuation will be given.

#### References

- 1 "Physicochemical Methods for the Structuring and Assembly of MOF Crystals" Zorlu, T.; Hetey, D.; Reithofer, M.R.; Chin, J. M.\* *Acc. Chem. Res.*, 2024, 57, 2105-2116.
- 2 "Magnetic Control of MOF Crystal Orientation and Alignment" Cheng, F.; Marshall, E. S.; Young, A. J.; Robinson, P. J.; Bouillard, J-S. G.; Adawi, A. M.; Vermeulen, N. A.; Farha, O. K.; Reithofer M. R.; Chin, J. M. , *Chem. Eur. J.*, 2017, 23, 15578.
- 3 "Dynamic electric field alignment of metal-organic framework microrods" Cheng, F.; Young, A. J.; Bouillard, J-S. G.; Kemp, N. T.; Guillet-Nicolas, R.; Hall, C. H.; Roberts, D.; Jaafar, A. H.; Adawi, A. M.; Kleitz, F.; Imhof, A.; Reithofer, M. R.\*; Chin, J. M.\* *J. Am. Chem. Soc.*, 2019, 141, 12989.
- 4 "Metal-Organic Framework superstructures with long-ranged orientational order via E-field assisted liquid crystal assembly" Allahyarli, K.; Reithofer, M. R.; Cheng, F.; Young, A. J.; Kiss, E.; Tan, T. T. Y.; Prado-Roller, A.; Chin, J. M.\* *J. Colloid Interface Sci.*, 2022, 610, 1027.

## Biography

Jia Min Chin has a background in inorganic coordination complex chemistry from the Massachusetts Institute of Technology (MIT) and started her work on materials chemistry subsequently at the Institute of Materials Research and Engineering, Singapore where she headed a Laboratory of Advanced Porous Materials and developed novel methods for structuring materials for various applications. After several years in the United Kingdom, she moved to the University of Vienna and obtained an ERC Consolidator grant and now focuses on developing MOF, COF and other composites by exploiting a combination of top-down and bottom-up processing techniques.