Universität Augsburg
Mathematisch-Naturwissenschaftlich-Technische Fakultät

GDCh
Gesellschaft Deutscher Chemiker

GDCh-Kolloquium im WiSe 2024/25
am Institut für Physik der Universität Augsburg

28.10.2024 17:15, Raum: T-1004
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The age of Metal Organic Frameworks at the onset of commercialisation

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Metal Organic Frameworks are one of the most fascinating class of porous solids due to their highly versatile structural and chemical features. They tuneable crystalline micro- or meso-porous solids can be obtained with almost any metal cation from the periodic table combined with an almost infinite set of organic ligands, leading to >100,000 reported architectures. If at their early stage more than two decades ago, most MOFs suffered from a lack of stability in the presence of moisture, this is not anymore the case due to the use of either high valence metal cation based MOFs or metal(II) azolates systems. These water stable MOFs have consequently paved the way for their utilization for a wide range of potential applications. Consequently, within the past decade, several of these MOFs have been produced at large scale and the first industrial application has recently come out for the capture of CO_2 in flue gases. Other more specific applications have been proposed by MOF startups in the field of air remediation, heat reallocation, water harvesting or gas storage. In my group, we have been long term developing a series of robust scalable high valence-based MOFs for potential applications in the field of indoor air quality, nanomedicine and more recently for the production of hydrogen or membranes for energy related applications. I will disclose a few representative examples of “success stories” including from their performance at the lab scale to their real conditions testing. A particular attention will also be given to discuss their scale-up, shaping and technico-economic analysis of their production cost.