

Seminar

Design and synthesis of metal-organic framework thin films for diffusion-controlled catalysis

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Crystalline nanoporous materials, such as metal–organic frameworks (MOFs), are widely recognized for their efficiency as heterogeneous catalyst. However, their true catalytic potential is often underestimated due to significant reactant diffusion limitations, lowering turnover frequency and product selectivity. Literature precedents emphasize the importance of mass diffusion control; however rational strategies for its systematic implementation remain unexplored. In our study, we addressed these above mentioned limitations by integrating a MOF-based catalyst thin film into a continuous cross-flow microfluidic reactor, enabling precise control over reactant diffusion length and residence time. Its applicability is demonstrated through thermal, photocatalytic, and enantioselective reactions. This approach provides a versatile route toward diffusion-controlled heterogeneous catalysis with substantially improved performance. The synopsis seminar will focus on two key aspects of the research work: a) the development of a methodology for fabricating chemically robust MOF thin films, and b) the underlying principles and design strategies for diffusion-regulated catalysis.

Tuesday, Jul 28th 2026

11:30 Hrs (Tea / Coffee 11:15 Hrs)

Auditorium, TIFRH