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PhD thesis project

MOF (Metal Organic Framework) thin films for pollutant capture / degradation

MOFs (Metal Organic Frameworks) are porous crystalline materials obtained by assembling metal ions and organic ligands. Their porosity and wide range of structural and physico-chemical properties - adjustable by the choice of precursors - give them great potential for numerous applications (fluid storage, membranes, catalysis, sensors, (opto-)electronic devices...). Developments involving these materials - most often synthesized in the form of (nano)microcrystalline powders - have long focused on the synthesis of new materials, the study of their properties and the scaling-up of their production for fluid storage or catalysis applications. In recent years, their shaping on surfaces - a prerequisite for their integration in devices (sensors, (opto-)electronic devices, heterogeneous catalysis, etc.) - gives rise to major research efforts. [1] Although this field is very active, the fabrication of thin films with well-controlled properties, for targeted applications, often remains a challenge.

The aim of this thesis project is to develop synthesis methods enabling the preparation of MOF thin films by direct growth on surfaces, and to study the properties of these thin-film materials. The studied systems will be MOFs based on iron (an abundant, inexpensive and non-toxic metal) and carboxylate ligands, which offer a diversity of structural properties (pore size and shape, specific surface area) and exhibit interesting properties (optical, (photo)catalytic, redox...) for various applications. [2-4] The focus will be on developing synthesis procedures for growing these materials on surfaces, controlling their structural properties and studying their photo-catalytic properties, in the context of their use for the detection/capture or (photo)conversion of chemical pollutants.

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Project description and candidature on ADUM plateform:
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