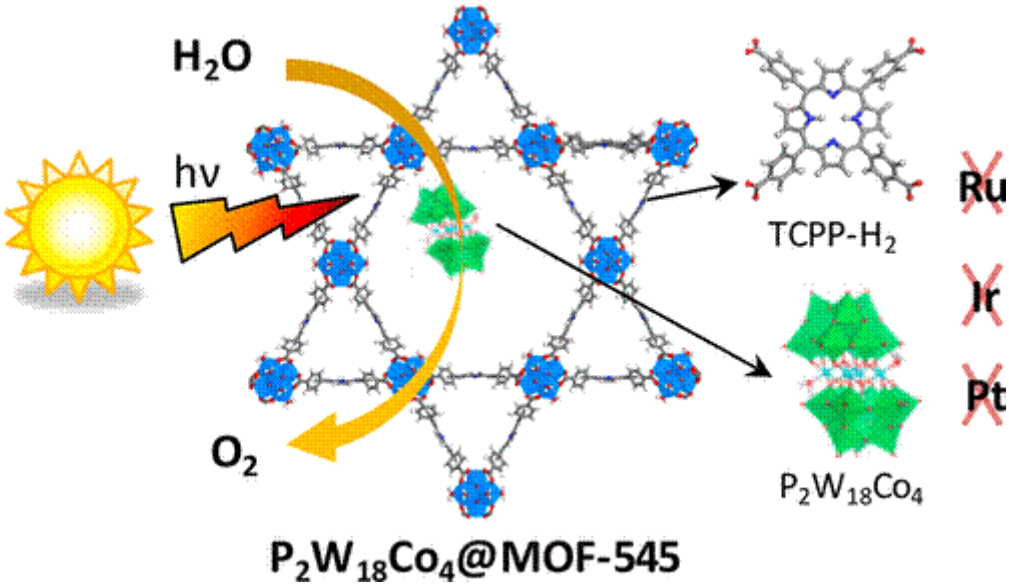
MATERIALS@MIM

POM@MOFs

The immobilization of polyoxometalates in MOFs is a research area that has grown significantly in recent years. One of our striking results concerns the encapsulation of a POM having properties of magnet molecule. Recently, we also demonstrate that the encapsulation of POM within MOFs offers a new way to design photocatalysts built exclusively from aboundant metals. For instance, cobalt polyoxometalate ("Co4") was immobilized in the hexagonal channels of the Zr(IV) porphyrinic MOF-545 hybrid framework. The resulting composite exhibits a high photocatalytic activity and good stability for visible-light-driven water oxidation.



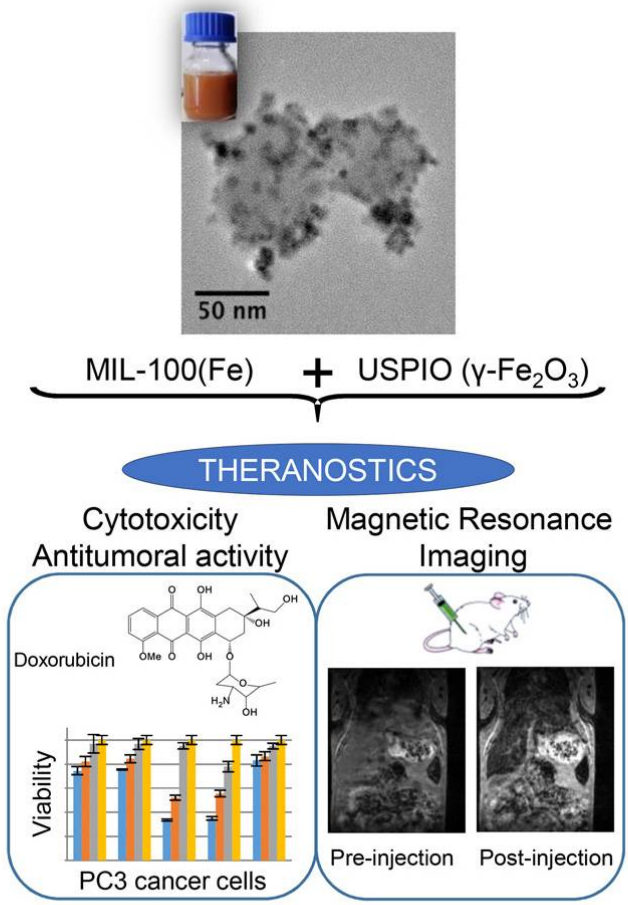
Recent publications

Chem. Eur. J. 2016, 22, 6564 (link)

J. Am. Chem. Soc. 2018, 140, 3613 (link)

Nano-based MOFs for biomedicine

The nanoparticles (NPs) of porous iron polycarboxylates of the MIL-100 (Fe) type are very promising therapeutic vectors for the delivery of drugs, thanks to their biodegradability, the absence of toxicity, the very important capacities of encapsulation of drugs but also their gradual release into the biological environment. Recently, we have developed nano-objects coupling MIL-100 (Fe) NPs to maghemite NPs or gold nano-sticks. The objective here is to develop new therapeutic vectors for theranostics, allowing both medical imaging for the diagnosis and release of an active species in the body.



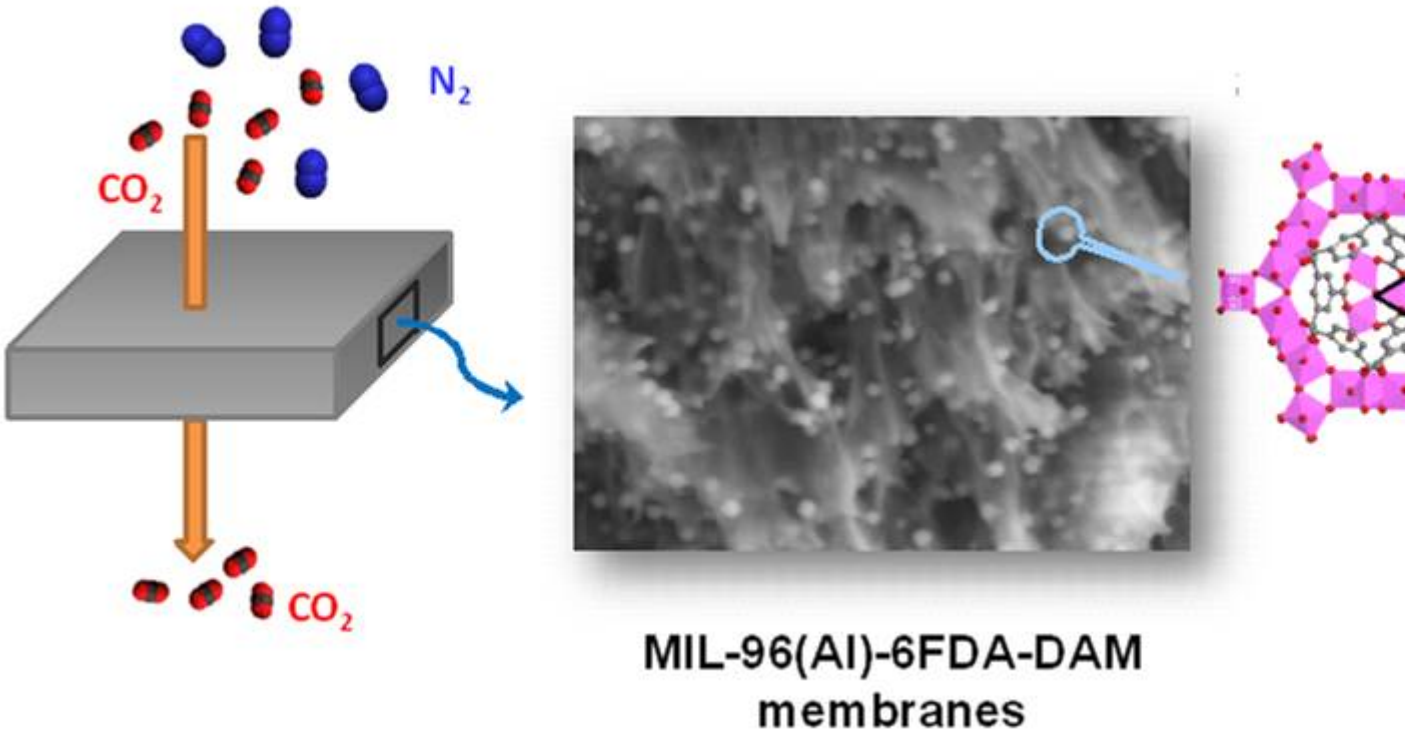
Recent publications

Chem. 2017, 3, 303 (link)

Membrane composites and thin films for environmental remediation

In the field of environmental remediation, we are interested in the preparation of composite membranes coupling high flux vitreous polymers to MOF NPs for CO2 capture (European project M4CO2). The role of MOFs is to improve the transport properties of

polymers by increasing the permeability and / or selectivity for the separation of CO2 / N2 (post-combustion) or H2 / CO2 (pre-combustion) mixtures.



Recent publications

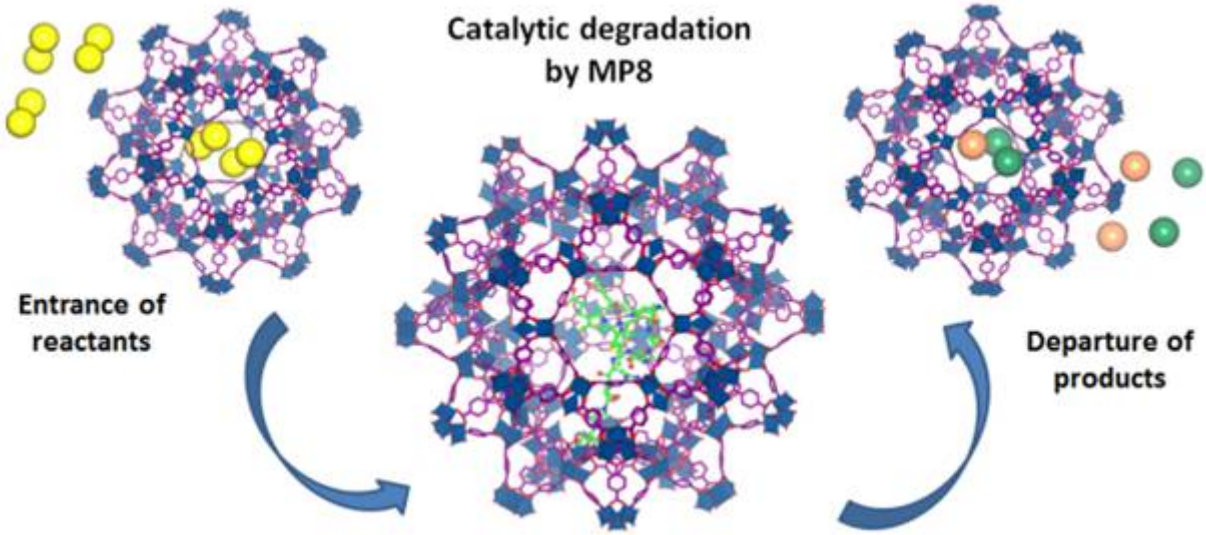
ACS Appl. Mater Interfaces 2016, 8, 27311 (link)

Chem. Mater. 2017, 29, 10326 (link)

Chem. Eur. –J. 2018, 24, 7949 (link)

MOF-enzyme composites for environmental clean-up

We use MOFs as immobilization matrix of active species in catalysis as certain enzymes. In particular, we immobilized a micro-enzyme (microperoxidase 8) in the cavity of MIL-101 (Cr) in order to prepare a biocatalyst for environmental remediation. We study the peroxidase activity of MP8 against model substrates (ABTS) or dyes.

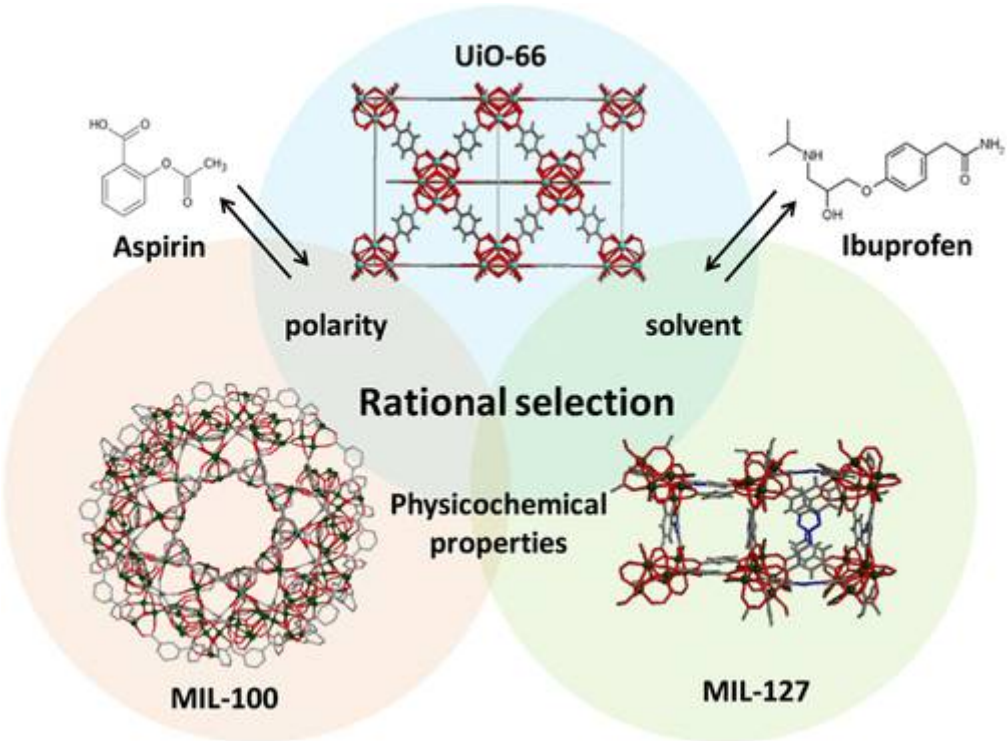


Recent publications

Angew. Chem. Int. Ed., 2018, 57, 16141 (link)

BioMOFs for detox

We study the synthesis and characterization of MOFs for human / animal detoxification and water depollution. The studies carried out on the encapsulation and the release of two model drugs (aspirin and ibuprofen) show the importance of the structural parameters of the MOF but also the balance between the hydrophilic character of the host and hydrophobic framework of the drug. (European project "CleanUp-MOFs).

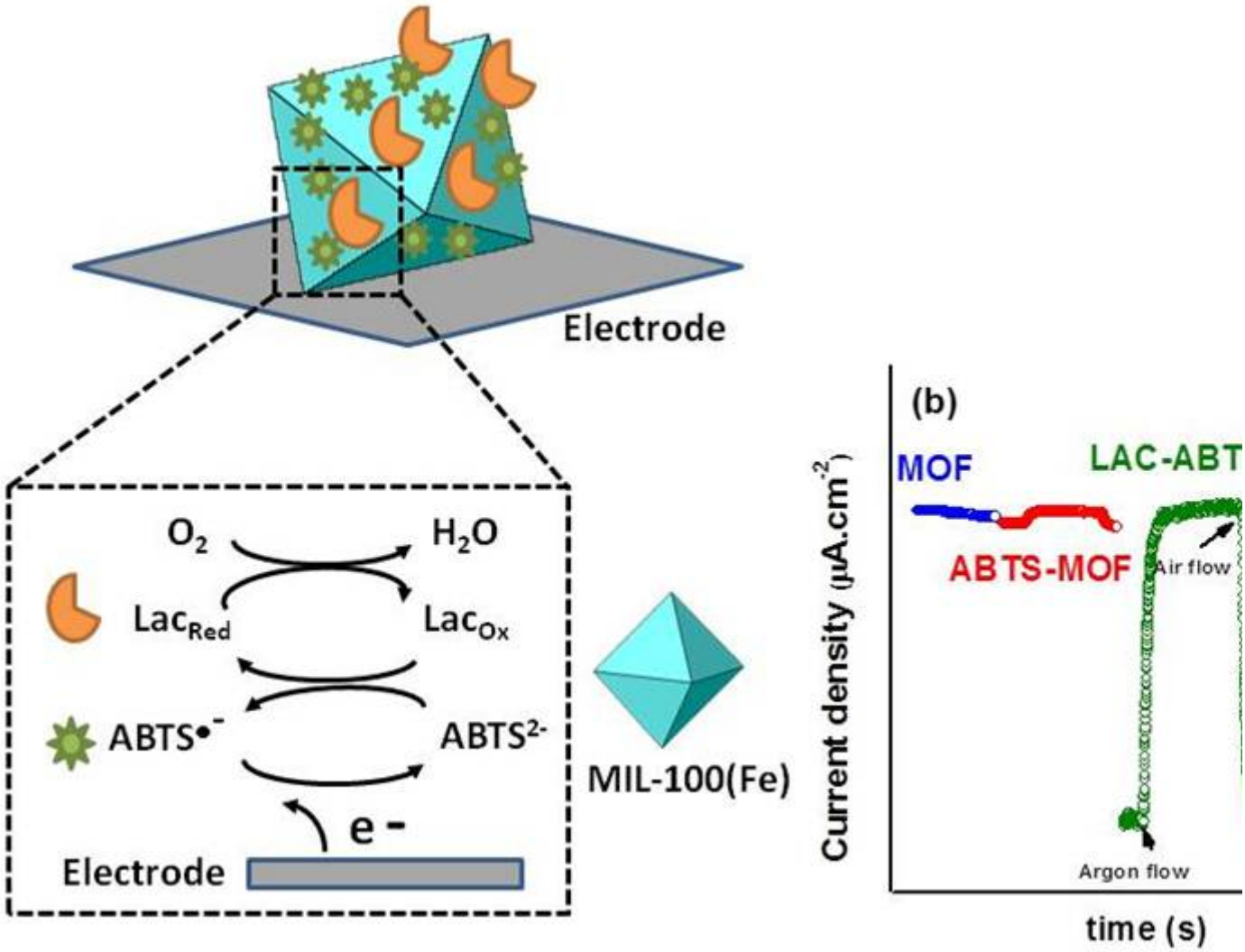


Recent publications

ACS Omega 2018, 3, 2994 (link)

Composite membranes and thin film for detection

Porous bioelectrodes combining MIL-100 (Fe) with glucose oxidase or laccase enzymes allow the detection of glucose and oxygen (Labex Charmmmat project). In the field of heritage conservation, thin films developed by combining a mesoporous Cr (III) terephthalate (MIL-101 (Cr)) and nanoparticles of gold bipyramids show quite remarkable performances for optical detection acetic acid in the presence of moisture (Labex Patrima project).



Recent publications

J. Mater. Chem. B, 2015, 3, 8983 (link)

ACS Appl. Mater. Interfaces, 2016, 8, 20012 (link)