Metal-Organic Frameworks from Design Strategies to Applications

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ABSTRACT

Demand for functional materials targeted for specific applications is ever increasing as societal needs and demands mount with advancing technology. The building-block approach, [1] whereby at the design stage the desired properties and functionality can be introduced in preselected molecular building blocks (MBBs) prior to the assembly process, has emerged as a prominent pathway for the rational construction of functional solid- state materials.

One class of inorganic-organic hybrid materials, metal-organic frameworks (MOFs), has burgeoned in recent partly years due to effective design strategies (i.e. reticular chemistry) for their synthesis and their inherent [and readily interchangeable] hybrid, functional character.

MOFs have emerged as a unique class of materials amenable to design and manipulation for desired function and application. Several design strategies have been utilized and developed to target viable MOF platforms, from the single-metal-ion molecular building block (MBB) approach to the hierarchical supermolecular building block and supermolecular building layer approaches (SBB and SBL, respectively). This inherent built-in information allows access to highly stabile and made-to-order porous materials toward applications pertaining to energy and environmental sustainability.

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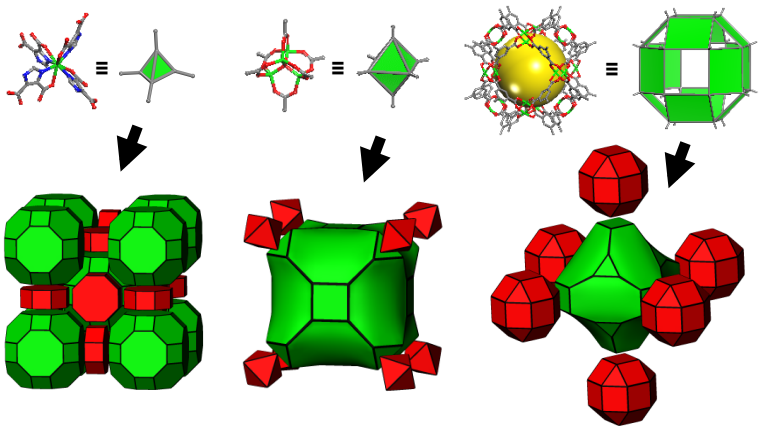

Prof. Mohamed Eddaoudi is is a Professor of Chemical Science and Associate Director of the Advanced Membranes and Porous Materials Center at KAUST.

Dr. Eddaoudi is a member of the American Chemical Society. He received the Outstanding Faculty Research Achievement Award (2004 and 2007) and the Chemistry Outstanding Teaching Award (2005 and 2008) from the University of South Florida.

He was awarded the prestigious National Science Foundation Career Award in 2006. He was selected as one of the 30 rising stars and young chemists in the U.S. and been invited to present their research at the Second Transatlantic Frontiers of Chemistry Symposium in 2006.

Dr. Eddaoudi was selected in 2014, 2015 and 2016 as Thomson Reuters Highly Cited Researchers and world's most influenced scientific minds (2014).

Dr. Eddaoudi has given more than 150 invited talks at conferences and universities since 2002. His contribution to the field of metal-organic frameworks has been highly visible in peer-reviewed journals, as evidenced through his recognition by ISI in 2007 as one of the top 100 most cited chemists of the past 10 years (ranked #68), http://in-cites.com/nobel/2007-che-top100.html.

Dr. Eddaoudi received his master's and doctorate in Chemistry from Denis Diderot University (Paris VII) in Paris, France.

Dr. Eddaoudi is regarded as one of the world leaders in the field of Metal-Organic Frameworks (MOFs), a fast emerging field of solid state materials. He implemented the single-metal-ion-based molecular building block (MBB), the supermolecular building blocks (SBB) and the supermolecular building layers (SBL) approaches as means for the design and synthesis of functional MOFs.
Dr. Eddaoudi has developed novel strategies, based on the molecular building block approach, for the construction of functional porous solids namely Zeolite-like Metal-Organic Frameworks (ZMOFs) with tunable extra-large cavities and periodic array of organic and inorganic moieties. Dr. Eddaoudi has introduced various MOFs (e.g. ZMOFs, **soc**-MOFs, **rht**-MOFs, **gea**-MOFs and **tbo**-MOFs) as potential tunable platforms for applications pertaining to energy and environmental sustainability: Hydrogen storage, Carbon dioxide capture, Gas separations, Toxic Industrials Chemicals filters, Sensing applications, Catalysts immobilization.