# Electrochemically Induced Synthesis and Surface Deposition and Growth of Crystalline Metal-organic Frameworks

Technology #14833

## Applications

Applications for this technology are found in materials for gas storage, gas separation, drug transport, molecular separations, catalysis, or sensors.

## Problem Addressed

Addresses the need to grow metal organic frameworks (MOFs) on surfaces to make continuous crack-free membranes.

## Technology

The invention describes a novel approach to the growth and synthesis of MOFs that result in direct deposition of MOF crystals and crystalline films on a conductive surface. The approach involves electrochemical generation of base equivalents (such as hydroxide) by the reduction of water, oxoanions, or other reductive processes that increase the local pH near a conductive surface (electrode). The base equivalents (such as hydroxide anions) generated at the cathode deprotonate precursor ligands in the electrolyte solution, which then react with metal cations to form crystallite particles on the conductive surface.

## Advantages

- Single step at room temperature, no need for solvothermal conditions
- Fast reaction times that can be controlled by varying current density at electroactive surface
- Flexible: can take any conductive surface and deposit MOFs composed of any metal ions and organic ligands

## Categories For This Invention:

Energy
Hydrocarbons
Other (Hydrocarbons)
Life Sciences
Chemicals
Catalysts
Therapeutics
Drug Delivery

255 Main Street, room NE 18-501
Cambridge, MA 02142-1601
Phone: 617-253-6966 Fax: 617-258-6790
http://tlo.mit.edu
Contact the Technology Manager: tlo-inquiries@mit.edu

## Intellectual Property:

Methods for electrochemically induced cathodic deposition of crystalline metal-organic frameworks
Issued US Patent
8,764,887

## Inventors:

Mircea Dinca
Minyuan Li

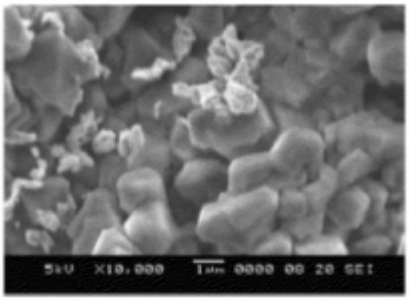
## Publications:

Transparent-to-Dark Electrochromic Behavior in Naphthalene-Diimide-Based Mesoporous MOF-74 Analogs
Chem. Volume 1, Issue 2, p264–272
11 August 2016
On the Mechanism of MOF-5 Formation under Cathodic Bias
Chemistry of Materials. Vol. 27, pp 3203−3206
2015
Selective Formation Of Biphasic Thin Films Of Metal– Organic Frameworks By Potential-Controlled Cathodic Electrodeposition
Chemical Science. Vol. 5, pp 107-111
2014
Reductive Electrosynthesis of Crystalline Metal-Organic Frameworks
Journal of the American Chemical Society
2011, 133, 12926-12929
MIT Develops Self-Shading Windows
MIT News
August 11, 2016

## External Links:

Dinca Group
http://web.mit.edu/dincalab/

## Image Gallery:



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