Metal Triazolites
Tech ID: 30078 / UC Case 2011-250-0

SUMMARY
UCLA researchers in the Department of Chemistry and Biochemistry have developed a novel metal-organic framework (MOF) using triazole ligands that allows for facile modification with a variety of metals, which has unique gas separation and adsorption properties.

BACKGROUND
Previous MOFs with advantageous porosity and stability have been synthesized, but only with a few types of organic building units. Metal-organic frameworks with alternative linker functionalities have not been fully realized. Likewise, conductive MOFs are relatively unexplored, despite great interest in using multifunctional material with high surface area and high electrical conductivity.

INNOVATION
UCLA researchers have developed a unique synthetic approach to develop a new class of MOF materials. This method uses triazole and triazole derivative ligands, which can be easily modified via click chemistry, with several metal atoms, leading to a diverse set of MOFs. Six metal-triazole (METs) with varying divalent metals (Mg, Mn, Fe, Co, Cu, and Zn) have been synthesized (MET-1 to MET-6). Ultimately, this synthetic method can be used to tune the gas sorption properties and the topologies of the MET depending on the application at hand by varying the functionality of the triazole and the metal atom, respectively. These materials have been shown to have permanent porosity, stability in air, high thermal stability, and surface area that is comparable to zeolites and other MOF materials. Interestingly, MET-3 has been discovered to be electrically conductive, with a conductivity of 0.77 x 10^4 S/cm.

APPLICATIONS
▶ Gas separation
▶ Gas adsorption

ADVANTAGES
▶ Click chemistry
▶ Defined topologies
▶ Abundant metal materials
▶ Possibility to make mixed elements within framework
▶ Controllable pore size and surface area based on metal used
▶ Conductive, porous materials

STATE OF DEVELOPMENT
Six new compounds have been prepared and characterized, having the same structure type, with tunable pore size and surface area. Mixed metals METs are in preparation, where preliminary results show that two different elements can be used in the same framework.

RELATED MATERIALS

PATENT STATUS
<table>
<thead>
<tr>
<th>Country</th>
<th>Type</th>
<th>Number</th>
<th>Dated</th>
<th>Case</th>
</tr>
</thead>
<tbody>
<tr>
<td>United States Of America</td>
<td>Issued Patent</td>
<td>8,852,320</td>
<td>10/07/2014</td>
<td>2011-250</td>
</tr>
</tbody>
</table>

RELATED CASES
2011-250-0

ADDITIONAL TECHNOLOGIES BY THESE INVENTORS
▶ Multi-Dimensional Networks
▶ Catalytic Coupling Reactions Using Frameworks with Open-Metal-Sites
▶ Oxidative CH Activation of Non-Activated Alkanes Using Metal-Organic Frameworks (MOFs) as Catalysts
▶ Metallation of Open Frameworks
▶ Reversible Ethylene Oxide Capture in Metal Organic Frameworks (MOFs)
▶ Design and Synthesis of New Metal-Organic Frameworks (MOFs) With Unique Topologies
▶ Complex Mixed Ligand Open Framework Materials