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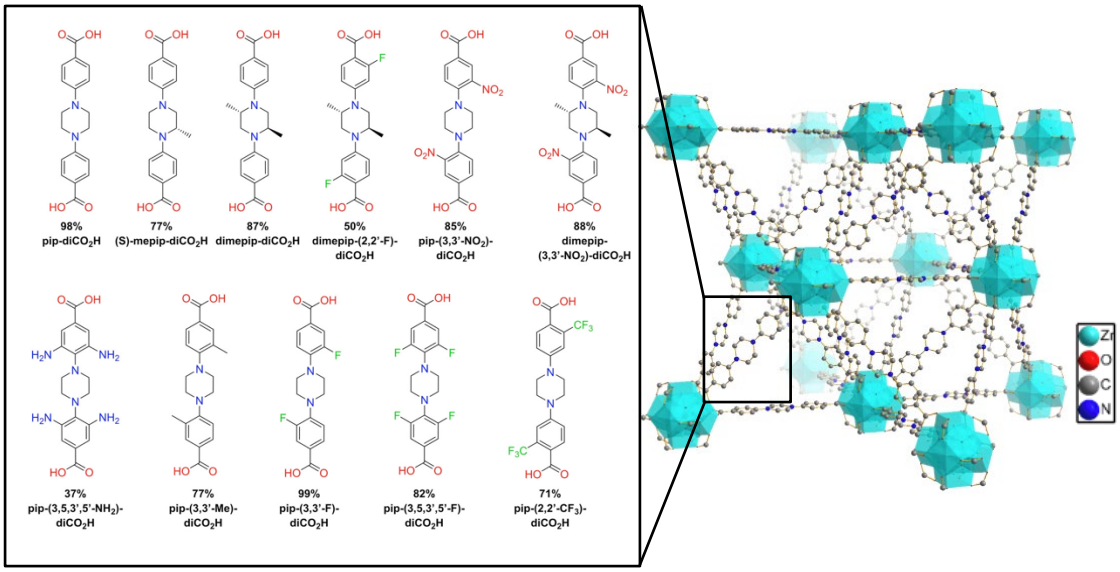
Licensing Opportunity

TTO – Technology Transfer Office

Ligands for Metal-Organic Frameworks

Examples of di-carboxylate ligands (left) made from piperazine building blocks and a porous MOF (right) constructed from the ligand referred to as pip-diCO2H.



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Intellectual Property

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Description

Metal-organic frameworks (MOFs), consist of metal building units that are interlinked by organic ligands. MOFs are a highly recognized class of adsorbents due to their record internal surface areas and the ease with which their pore structure can be precisely engineered for a given application. Unfortunately, to date, the design of MOFs having large pore sizes and volumes often requires the use of complex organic ligands that are synthesized using costly and time-consuming palladium-catalyzed coupling chemistry. To overcome this, EPFL has devised a new strategy to design MOF ligands using either piperazine and dihydrophenazine building units in the ligand backbone. This new chemistry can be carried out without the use of transition metal catalysts and requires minimal purification. Moreover, the ligands can be designed with varying functionality (such as aliphatic piperazines, aromatic dihydrophenazines, and side –NO2, –NH2, –F, –CF3, –CH3 groups) size, shape, and denticity. This variability allows one to control the pore size, shape, and surface functionality of the resulting MOF. Moreover, the ligands can be used for the design of other classes of porous materials, such as COFs (covalent organic frameworks),HOFs (Hydrogen-bonded organic frameworks) and POPs (porous organic polymers).

Advantages

- cost effective synthesis
- improved environmentally friendly procedures
- less time intensive

Applications

- gas and liquid separations
- gas storage
- carbon capture
- water purification
- capture of high value metals from waste