2018

# The role of synthesis solvent in particle size of metal organic frameworks

Jonathan Krisak
*Cleveland State University*

# *Investigating Particle Size Manipulation for the Metal Organic Framework Cu-BTCs*

Washkewicz College of Engineering

**Student Researcher:** Jonathan Krisak

**Faculty Advisor:** Sasidhar Gumma

## Abstract

Metal organic frameworks are a class of nanoporous materials with pore sizes ranging from 0.5 to 3 nm and high surface areas (500-6000 $m^2/g$). These materials have potential applications in industrial catalysis, separation and purification, bio-mimetics, drug delivery, semiconductors, sensors and other electronics. The aim of this study is to understand the role of solvent in control of the particle size of the final MOF product. CuBTC MOF has been used as a model MOF in this study to understand this effect.

Altering the dielectric constant of solvents is a potential method of controlling the particle size. The data obtained in this work depicts a direct correlation between the particle size and the dielectric constant of the solvent mixture. Deviations from this rule can be potentially explained by slow evaporation rate, longer nucleation growth, as found in literature, or instability of the hydroxide ions.

Literature states that the donor number and vapor pressure of the solvents also seem to affect the particle size. We observed that, while there is a direct correlation between particle size and donor number, no clear trend was observed between vapor pressure and particle size in this study.