CMCC Mechanochemistry Discussions

Online Seminar Series

Thermodynamic Stability of MOFs Made by Mechanochemistry

Livestreaming at 10:00 AM (CT)

THURS., January 19, 2023

on the CMCC YouTube Channel:
https://www.youtube.com/channel/UC7eCYPKbGTKpgO7W2bNABxg

Dr. Alexandra Navrotsky

Arizona State University
https://search.asu.edu/profile/3503975

ABSTRACT:

A large number of new metal organic frameworks (MOFs) have been synthesized by mechanochemistry, with and without the addition of small amounts of solvent, especially by the Friscic group in Montreal. Extended grinding often leads to further phase transformations, often to denser polymorphs not attainable by solvothermal synthesis. A first order question is whether this sequence of syntheses and transformations reflects increasing thermodynamic stability brought about by overcoming kinetic barriers or decreasing thermodynamic stability induced by incorporating mechanical energy. Solution calorimetry in Navrotsky's laboratory has unequivocally shown the former, with the metastability of MOF polymorphs diminishing with decreasing molar volume, as has been seen for zeolites. The nature of the metal node and of the organic linker each play a major role in determining stability.

The CMCC is supported by the Division of Chemistry of the National Science Foundation under grant: 2023644.