Youngstown State University Chemistry
Seminar Program - Fall 2005

Friday December 2nd (3:15)

9th Fall Seminar

Dr. Cora Lind

cora.lind@utoledo.edu
419-530-1505
http://www.chem.utoledo.edu/FAC_INFO/Lind/SOURCE.htm

University of Toledo

Department of Chemistry

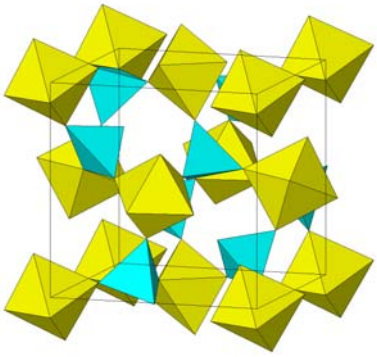
"Shrinking from the Heat: Negative Thermal Expansion Materials"

Abstract

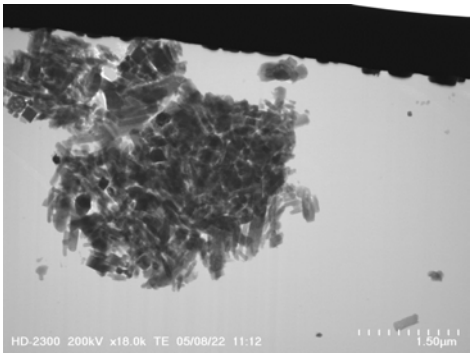
Negative thermal expansion (NTE) materials (i.e., those that *shrink* when they are heated) have received considerable scientific interest because of their potential for use as fillers in composites. Mixing of a positive thermal expansion material with a NTE filler should reduce the overall expansion coefficient of the composite while maintaining other desirable properties of the matrix material.

Dedicated research on NTE materials started only during the last decade. Much progress has been made in the synthesis and characterization of NTE compounds, but many show properties like irreversible phase transitions under pressure that could interfere with the processing of composites. In addition, a number of NTE oxides are metastable, thus requiring synthetic approaches that use kinetic control.

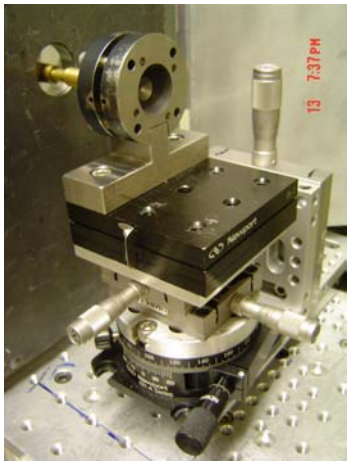
In this talk, a brief overview of important aspects relating to the field of NTE research will be given. We will then focus on synthetic approaches to metastable NTE materials. The materials are characterized by variable temperature diffraction experiments and *in-situ* high-pressure diffraction studies. Finally, some first results on the preparation of NTE/polymer composites will be discussed.



Crystal structure of the
NTE material cubic ZrW_2O_8



TEM picture of a $ZrMo_2O_8$/polyimide composite.



Setup for high-pressure diffraction
experiments in a diamond anvil cell