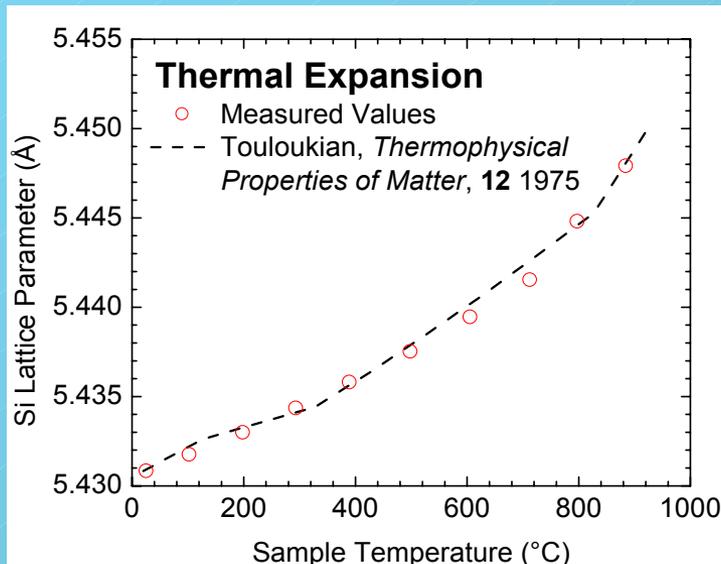
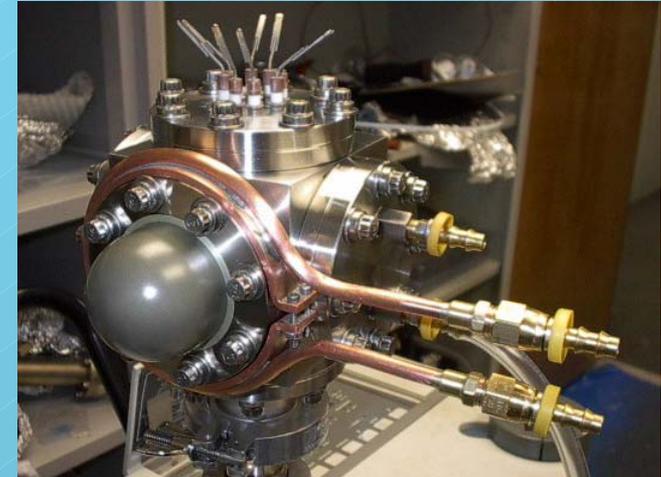


# Development of X-Ray Diffraction Equipment for Research, Education, Training and Outreach at a Synchrotron Source

Shefford P. Baker, Instrumentation for Materials Research (DMR-0216881)

- This grant has provided funding for:
  - An ultra-high vacuum (UHV) oven (right)
  - A general purpose, six-circle, Kappa diffractometer
  - X-ray detectors for high speed data acquisition
- The UHV oven will be used to understand fundamental mechanical properties of thin metal films
  - Thin films are used to make devices such as MEMS, Integrated Circuits and optical coatings
  - Understanding mechanical properties of thin films is important to prevent failure from electromigration, de-adhesion, and fracture



- Attributes of the UHV oven include:
  - Real-time sample positioning that allows high accuracy mechanical properties measurements
  - Sample geometries that can be used to isolate and measure specific features of a film
  - A controlled chemical environment
- Commissioning experiments (left) demonstrate the capability of the oven by measuring the temperature dependent lattice parameter of silicon and comparing the results to literature values

# Development of X-Ray Diffraction Equipment for Research, Education, Training and Outreach at a Synchrotron Source

Shefford P. Baker, Instrumentation for Materials Research (DMR-0216881)

- The diffractometer (schematic shown) will become the new end station in the G2 hutch at the Cornell High Energy Synchrotron Source (CHESS)
- Used for a wide variety of research:
  - Failure mechanisms in thin metal films
  - Self-assembly processes with organic thin films
  - Characterizing physical properties of Organic Light Emitting Diodes (OLEDs)
- Attributes of the diffractometer include:
  - Low cost with the re-use of existing parts
  - No obstacles to incident or diffracted x-ray beams
  - Supports large sample loads
  - Sample stages are interchangeable with other common CHESS diffractometers
  - Fast drive time
- A new position sensitive detector that will decrease measurement time will be mounted to the diffractometer

