

STUDIES OF THERMAL EXPANSION OF CALCIUM ALUMINATES USING HIGH TEMPERATURE SYNCHROTRON X-RAY DIFFRACTION

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Accurate measurements of thermal expansion coefficients of various calcium aluminates were carried out using high-temperature X-ray powder diffraction at National Synchrotron Light Source, Brookhaven National Laboratory. The studies of these materials at high temperatures are of commercial interest to us due to their application in polycrystalline alumina seals.

The experimental setup includes a newly designed heater that can be operated up to 1000°C for capillary samples, and a MAR345 image plate detector. The heater has demonstrated excellent temperature repeatability and reproducibility, which is essential to the data reliability and to the industrial applications behind these studies. The capillary configuration (vs. heating strip) permits the use of minute amount of sample materials. Image plate detector allows fast data acquisition and can be used for *in-situ* studies of various dynamic processes at elevated temperatures.

Even though thermal expansion through lattice parameter measurement can be performed using in-house diffractometer, the high angular resolution achieved by using synchrotron source is extremely important for obtaining accurate lattice parameters, in particular for materials with lower crystallographic symmetry, such as monoclinic, for which the peak overlap can hamper the accuracy of the resultant thermal expansion values.