Abstract Submitted
for the MAR11 Meeting of
The American Physical Society

Calorimetry of epitaxial thin films[1] FRANCES HELLMAN, DAVID COOKE, University of California at Berkeley, JAMES GROVES, BRUCE CLEMENS, Stanford University — Thin film growth allows for the manipulation of material on the nanoscale, allowing for the creation of metastable phases not seen in the bulk. Heat capacity provides a direct way of measuring thermodynamic properties of these new materials, but traditional bulk calorimetric techniques are inappropriate for such a small amount of material. Micro- and nanocalorimetry techniques exist for the measurements of thin films but rely on an amorphous membrane platform, limiting the types of films which can be measured. In this work, ion-beam-assisted deposition is used to provide a biaxially-oriented MgO template on a suspended membrane microcalorimeter. Synchrotron X-ray diffraction was used to successfully assess the biaxial order of the MgO template. X-ray diffraction was also used to prove the high level of epitaxy of a film grown onto this MgO template. The contribution of the MgO layer to the technique will be discussed. An $Fe_{.49}Rh_{.51}$ film grown epitaxially onto the device was measured, comparing favorably to literature data on bulk crystals. This shows the viability of the MgO microcalorimeter as a way of measuring the thermodynamic properties of epitaxial thin films.

[1]This work was supported by the U.S. Department of Energy under Contract No. DE-AC02-05CH11231

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Date submitted: 19 Nov 2010 Electronic form version 1.4