Abstract Submitted
for the MAR11 Meeting of
The American Physical Society

Pressure induced phase transition in FeGa alloys CHRISTOPHER DEVREUGD, Virginia Tech University, MUHTAR AHART, Carnegie Institution of Washington, PETER GEHRING, NIST Center for Neutron Research, DWIGHT VIEHLAND, Virginia Tech University, RUSSELL HEMLEY, Carnegie Institution of Washington — Giant magnetostriction in Fe– x Ga alloys (15 – x - 27) offers potential for future generations of sensors and actuators. A maximum in the magnetostrictive strain is found at Ga content of about 19 percent, which is ten times higher than that of pure alpha-Fe. To investigate the behavior of FeGa alloys under pressure, we chose a slow cooled alloy of FeGa-19 as our sample and performed x-ray diffraction experiments in a diamond anvil cell up to 45 GPa. Diffraction pattern shows powder rings associated with (110), (200), and (211) Bragg reflections from expected bcc structure of iron below 24 GPa. We also observed the intensity increases along the powder rings associated with the crystal structure of Galfenol. Considering the (110) Bragg peak splits into three peaks above 24 GPa, our results indicate that FeGa alloy undergoes a bcc cubic to a hexagonal transition around 24 GPa. When the pressure is decreased, the hcp phase transforms back to the bcc phase. The transition mechanism can be understood by using the analogy to the bcc-hcp phase transition in pure iron under pressure. The transition in iron is a martensitic or displacive one. The hcp structure can be derived from the bcc structure through a relatively minor distortion of the bcc structure.

Christopher DeVreugd
Virginia Tech University

Date submitted: 19 Nov 2010 Electronic form version 1.4