

**For submission to the 2003 APS/DPP press releases, David D. Meyerhofer,
University of Rochester**

**Observation of a shock-induced crystalline-phase-transformation in Titanium using
EXAFS**

The study of shock-compressed metals is a topic of great importance within the high energy density physics community. In particular, the properties of materials after shock passage are of significant interest. In a collaborative effort, scientists from the University of Rochester's Laboratory for Laser Energetics and the Lawrence Livermore National Laboratory have observed, for the first time, a crystalline-phase change in Ti, from the alpha (room-temperature) to omega solid-state phases, under the influence of a laser-driven shock wave. Measurements of the extended x-ray absorption fine structure (EXAFS) are routinely made at synchrotron light sources to determine the inter-atomic spacing and chemical bonding in static materials. A laser-based radiation source allows dynamic EXAFS measurements on the nanosecond time-scale. This technique has recently been extended to shock-compressed metals using 57 of the 60 beams on the OMEGA laser system to compress a spherical target to provide a smooth and bright x-ray source for backlighting a Ti foil shocked by the remaining beams. An x-ray spectrometer identifies the EXAFS-induced modulations on the backlighter spectrum. A significant change in the EXAFS spectrum was observed for shock strengths in excess of 100 kBar. The attached figure shows a comparison of the predicted EXAFS spectrum for the alpha and omega phases and the experimental observations. It shows clear evidence for a crystalline-phase change. Dr. B. Yaakobi will present these results in talk GI1.003. For further information contact Dr. R.L. McCrory (rmcc@lle.rochester.edu, 585-275-5286) or Dr. D.D. Meyerhofer (ddm@lle.rochester.edu, 585-275-0255).

EXAFS figure attached