Abstract Submitted
for the SHOCK13 Meeting of
The American Physical Society

Phase Transformation of U_3O_8 and Enhanced Structural Stability at Extreme Conditions[1] FUXIANG ZHANG, MAIK LANG, RODNEY EWING, University of Michigan — A powder sample of β-U_3O_8 was pressurized at room temperature up to 37.5 GPa with a symmetric diamond anvil cell. XRD patterns clearly indicated that a phase transition occurred between 3-11 GPa. The high-pressure phase is a fluorite-like structure. The fluorite-like structure is stable up to 37.5 GPa. The high-pressure phase was then laser heated to over 1700 K in the diamond anvil cell at high pressure conditions. No phase transition was found at high pressure/ temperature conditions, and the fluorite-like structure of U_3O_8 is even fully quenchable. The lattice parameter of the fluorite-like high-pressure phase is 5.425 Å at ambient conditions, which is smaller than that of the stoichiometric UO_2. Previous experiments have shown that the stoichiometric uranium dioxide (UO_2) is not stable at high pressure conditions and starts to transform to a cotunnite structure at ∼30 GPa. When heating the sample at high pressure, the critical transtion pressure is greatly reduced. However, the fluorite-like high-pressure phase of U_3O_8 is very stable at high pressure/high temperature conditions. The enhanced phase stability is believed to be related to the presence of extra oxygen (or U vacancies) in the structure.

[1]This work was supported by Materials Science of Actinides, an Energy Frontier Research Center funded by the US Department of Energy, Office of Science, Office of Basic Energy Sciences, under Award No. DE-SC0001089.

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Date submitted: 19 Feb 2013 Electronic form version 1.4