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High Pressure Crystal Structure Refinements and Equation of State of Rare Earth Metal Ytterbium to 226 GPa.[1] CHRISTOPHER PERREAULT, GEORGIY TSOI, University of Alabama at Birmingham, KEVIN HOPE, University of Montevallo, YOGESH VOHRA, University of Alabama at Birmingham — The divalent rare earth metal Ytterbium (Yb) has been studied to a pressure of 226 GPa in a diamond anvil cell utilizing copper as a x-ray pressure standard. High quality image plate x-ray diffraction data was collected at high pressures using HPCAT beamline 16-ID-B at the Advance Photon Source. The crystal structure parameters were determined from the measured x-ray diffraction intensities using the GSAS structural refinement. Yb undergoes a series of transitions from the ambient pressure face centered cubic (fcc) to body centered cubic (bcc) to hexagonal close packed (hcp) to a reentrant fcc phase below 100 GPa. The hexagonal phase with 3 atoms/cell (hP3) is found to be stable between 100 GPa and 200 GPa. We found evidence for yet another structural phase transition at 200 GPa in Yb. The crystal structure parameters for hP3 and the new phase will be presented to 226 GPa. The measured equation of state shows that the rare earth metal Yb is compressed to 25 % of it ambient pressure volume at 226 GPa with implications for its electronic structure under extreme conditions.

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