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Experimental Equation of State of Hafnium Metal to 210 GPa[1]
YOGESH VOHRA, JEFFREY MONTGOMERY, SPENCER SMITH, GEORGIY TSOI, University of Alabama at Birmingham — The equation of state of hafnium metal has been measured using a platinum pressure marker to 210 GPa. Beveled diamonds with 35 micron central flats were used to compress a sample consisting of a mixture of platinum and hafnium that was packed with 6 nm diamond powder. It was hoped that this geometry would provide an alternative method of creating a second-stage pressure region to reach multi-megabar pressures. Powder diffraction patterns were collected across the high-pressure region using an x-ray beam collimated to 1x2 microns in a grid with a spacing of 1 micron. At the highest loads, a pressure gradient of 90 GPa was observed across the sample. This gradient allows for the construction of an equation of state over this range from data collected in only 3 minutes of synchrotron x-ray time. A new analysis program suite employing a measurement of spectral overlap has been developed to identify the multiple structures present, fit lattice parameters, and analyze the newly available gradient information.

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