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Extraction of the pressure dependence of the bulk sound velocity of metals from the calculated precompressed Hugoniot in laser-driven shock wave experiments NOAZ NISSIM, SHALOM ELIEZER, MEIR WERDIGER, LIOR PERELMUTTER, Soreq NRC, APPLIED PHYSICS DEPARTMENT TEAM — Recently [1] a novel route to approach the cold compression curve in laser-plasma induced shock waves was suggested. This effect is achieved with a precompression in a diamond anvil cell (DAC). In order to keep the necessary structure of one dimensional shock wave it is required to use a diamond anvil cell with a partially perforated diamond anvil. Precompression pressures of about 50 GPa, that are an order of magnitude higher than the currently reported pressures, are possible to obtain with presently existing diamond anvil cell technology. In this paper, precompressed Hugoniot curves for Al, W and Ta were calculated up to 15 Mbar for different initial pressures reaching to 50 GPa. From the calculated precompressed Hugoniot curves of Al, W and Ta the pressure dependence of the bulk sound velocity was extracted and was used as a consistency check for the calculations' assumptions. It was found that this method provides a good prediction to the pressure dependence of the bulk sound velocity of metals.

[1] N. Nissim, S. Eliezer, M. Werdiger, L. Perelmutter, "Approaching the "cold curve" in laser-driven shock wave experiment of a matter precompressed by a partially perforated diamond anvil," Laser and Particle Beams, First view 2012 (to be published in March 2013).

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