Abstract Submitted
for the SHOCK05 Meeting of
The American Physical Society

Shock wave response of a Zr-based bulk metallic glass and its composite YABEI GU, GURUSWAMI RAVICHANDRAN, Division of Engineering and Applied Science, California Institute of Technology, Pasadena, California 91125, USA — A series of plane wave impact experiments were carried out at peak impact stress up to 6 GPa on Zr-based Bulk metallic glass $Zr_{41.2}Ti_{13.8}Cu_{12.5}Ni_{10}Be_{22.5}$ (Vit1) and its composite $Zr_{56.3}Ti_{13.8}Cu_{6.9}Ni_{5.6}Nb_{5.0}Be_{12.5}$ (β Vit1). The experiment set up was designed to obtain the stress history signal and VISAR data simultaneously, so that three different methods which include impedance matching method, stress signal data deduction and VISAR signal data deduction could be applied to obtain the particle velocity information. Linear shock speed – particle velocity relation, standard two wave elastic-plastic shock front structure with reasonable HEL behavior were obtained from collected data. A sudden drop of shock velocity happens in the $D - u$ Hugoniot relation which indicates a strong and sudden internal failure. Before the appearance of such drop of shock speed, standard two-wave shock front structure and negative strain rate sensitivity behavior are exhibited clearly in obtained VISAR signals. The non-plane shock wave generated due to this local wave scattering and interactions from the internal failure are believed to lead such shock speed drop and in turn lead to lower frequency response of VISAR signal. A descriptive three stage failure model was proposed.

Yabei Gu
California Institute of Technology

Date submitted: 06 Apr 2005 Electronic form version 1.4