Abstract Submitted for the SHOCK05 Meeting of The American Physical Society

Simulation of padded lateral stress gauges RON WINTER, ERNEST HARRIS, AWE, Aldermaston, Reading, RG7 4PR, UK — In principle, the strength of a material subjected to a plane shock can be estimated by measuring the stress in a direction perpendicular to the shock direction. A prerequisite to developing an analysis to estimate lateral stress from the resistance change of a lateral piezoresistive gauge is a clear picture of the mechanical response of a lateral gauge to a shock wave. High resolution hydrocode calculations of manganin gauges mounted laterally in an elastic / perfectly plastic steel matrix have been conducted. The stress profiles obtained are shown to agree qualitatively with experiment. The simulations, run with various thicknesses of strength-less polymer mounting layer, show that the stress at the gauge varies with time and position along the polymer layer. During an initial, transient, phase the gauge is subject to deviatoric stresses which cause it to deform plastically. The deformation is more severe for thinner polymer layers. However, in the post-transient phase deviatoric stresses dissipate and the gauge acquires a pressure closely similar to the lateral stress at the matrix/polymer interface.

Ron Winter

Date submitted: 10 Feb 2005

Electronic form version 1.4