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Derivation of the constitutive model of high elastic limit window materials RON WINTER, PETER KEIGHTLEY, AWE, Aldermaston, UK — Transparent materials with a high Hugoniot Elastic Limit are often used as optical windows in shock experiments. Parameterised constitutive models for both compressibility and elastic distortion are needed to support the computer analysis of past experiments and to allow future experiments to be optimised. The AWE Heterodyne Velocity (Het-V) technique has been used to generate shock velocity versus particle velocity data for sapphire shocked within its elastic regime. The data is consistent with other workers findings. The elastic distortion of the sapphire was modelled by assuming that Poissons Ratio remains constant. This elastic model then allowed the fluid Hugoniot to be derived. The effect of taking account of the elastic contribution to the internal energy of the shocked material was assessed but this was found to have only a trivial effect on the derived fluid Hugoniot. Knowledge of the fluid Hugoniot allowed the compressibility of the sapphire to be described by a Mie-Gruneisen equation of state. Wave profiles computed using the derived constitutive model have been compared with experimentally measured profiles.

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