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Compressive strength of shocked aluminum for stresses of 4-22 GPa HONGFA HUANG, JAMES ASAY, Institute for Shock Physics, Washington State University, Pullman, WA 99164 — Measurements of the compressive strength are presented for several aluminum alloys shocked to 22 GPa. Five well characterized alloys were studied, including 6061 with grain sizes of 50 μm, 30 μm and <5 μm, and both pure and ultra pure Al with 300 μm grain size. Yield strength was estimated using reshock and release techniques. These results show that quasi-elastic recompression occurs for all materials investigated and is independent of grain size and impurity level. The present data, together with other data, illustrate that the yield strength of Al increases with shock stress to 90 GPa and suggest that the increase in strength at shock states, $\Delta Y (\Delta Y = Y_{yield} - Y_{HEL})$, increases with applied stress and plastic strain. A new model was developed to describe this increase and fits all data accurately to 55 GPa. The agreement strongly indicates that initial material properties, influence the ambient yield strength, but not the change in strength, which appears to be controlled by shock-deformation.

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