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Loading Path Dependence of Inelastic Behavior: X-cut Quartz[1]

SETH ROOT, JAMES ASAY, Sandia National Laboratories — Shock and shockless compression methods were used to examine the loading path dependence of single crystal x-cut quartz. In these experiments, x-cut quartz samples were dynamically compressed to stresses above the Hugoniot elastic limit. An analysis of the transmitted wave profiles show remarkably different behavior between shock and shockless loaded samples. Shock loaded x-cut quartz shows inelastic deformation below 5 GPa. Ramp loaded samples, however, do not show significant inelastic behavior until approximately 10 GPa, with the onset of this behavior dependent on sample thickness. The results demonstrate that both loading path and loading rate play important roles in the inelastic behavior of materials.

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