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Shock compression of natural and synthetic diamond crystals along [100]: strength and elastic deformation J.M. LANG, Y.M. GUPTA, Institute for Shock Physics and Department of Physics, Washington State University — The strength and elastic response of natural and synthetic diamond was examined under shock compression. Diamond single crystals were shock compressed along the [100] orientation to peak elastic stresses between 60 and 120 GPa. Particle velocity histories and elastic shock wave velocities were measured using laser interferometry. A single elastic wave was observed in samples shocked up to ∼75 GPa and a two-wave elastic-inelastic response was observed in samples shocked to higher peak stresses. The elastic wave amplitudes for both sample types were comparable, however the time-dependent inelastic response showed significant differences between the sample types. Surprisingly, the elastic limits were lower for the higher peak stress. The elastic response of both samples types lie along the same stress-strain curve, from which the third-order elastic constant C_{111} was determined. This is the first measurement of a third-order elastic constant of diamond determined solely from experimental results.

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