

Abstract Submitted  
for the SHOCK05 Meeting of  
The American Physical Society

**Crystal Structure Effects on Surface Fractures of Impacted Cubes**

WILLIAM H. HOLT, WILLIS MOCK, JR., Naval Surface Warfare Center Dahlgren Laboratory, Dahlgren, VA 22448-5100 — Cubes (9.53 mm on edge) of polycrystalline and single-crystal forms of a nickel-based superalloy (62.5 percent Ni) were impacted in vacuum at 747 m/sec by gas-gun-accelerated 3.18-mm-thick disks of 7075-T6 aluminum. Each cube was supported in a frangible holder on the gun muzzle. Impacts occurred between a disk flat surface and a cube flat surface, followed by soft recovery of these items. Visible fractures on the cubes were primarily associated with the impact surfaces. The polycrystalline cube showed an irregular pattern of many open cracks, forming columnar regions with axes normal to the impact plane; some of these regions at the edges were broken away. The single crystal cube (impacted on a face perpendicular to the [100] direction) showed only minor cracks at the center of the cube face and near the centers of the face edges. The observed differences suggest higher impact toughness for the single crystal material; the absence of grain boundaries may increase the threshold for fracture initiation.

William H. Holt  
Naval Surface Warfare Center Dahlgren Laboratory

Date submitted: 07 Apr 2005

Electronic form version 1.4