Abstract Submitted
for the SHOCK19 Meeting of
The American Physical Society

Amorphization of covalently bonded solids under dynamic compression[1] SHITENG ZHAO, UC Berkeley, ERIC HAHN, Los Alamos National Laboratory, CHRISTOPHER WEHRENBERG, HYE-SOOK PARK, BRUCE REMINGTON, Lawrence Livermore National Laboratory, MARC MEYERS, UC SAN DIEGO — In this investigation, we show pulsed laser-driven, shock-induced amorphization in four different covalently bonded solids, namely, silicon, germanium, boron carbide and silicon carbide. The critical threshold for the amorphization scales with the hardness of these materials, yielding $B_4C>SiC>Si>Ge$. Post shock microstructural characterization was conducted to study the deformation/failure mechanism of these materials. The directional feature of the amorphous band suggests that shear stress play a crucial role triggering the crystalline-to-amorphous transition. Shear manifests itself in three possible ways: (1) it causes massive inelastic lattice displacement that can lead to the loss of long-range order; (2) it lowers the melting temperature of; (3) it causes localized heating which lead to localized thermal softening. Nanobeam electron diffraction provides an unprecedented spatial resolution to study the detailed microstructure of the shock-induced amorphous materials. The interfacial strain between the crystalline-amorphous interface will be discussed.

[1]This research is funded by a UC Research Laboratories Grant (09-LR-06-118456-MEYM) and a National Laser Users Facility (NLUF) Grant (PE-FG52-09NA-29043) and was performed under the auspices of the U.S. Department of Energy by Lawrence Livermore National Laboratory under Contract DE-AC52-07NA27344.

Shiteng Zhao
UC Berkeley

Date submitted: 28 Feb 2019 Electronic form version 1.4