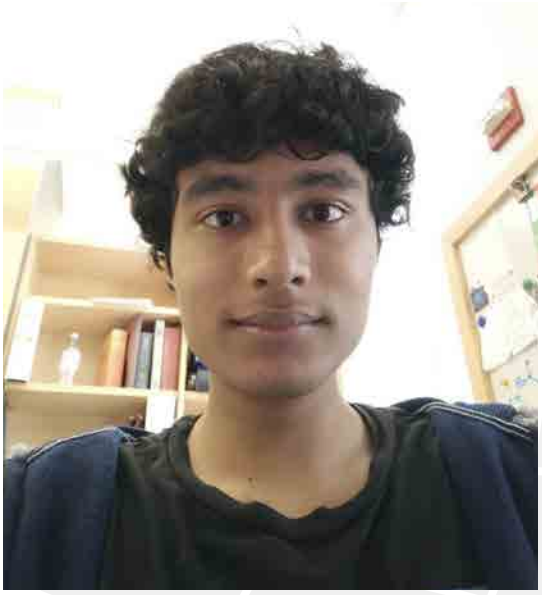

Mr. Anirudh Hari
PhD student, NSF Graduate Research Fellow
Department of Materials Science and Engineering
Stanford University

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Ehime Univ.

Keywords:
1. Laser-shock
2. in-situ XRD
3. SACLA

Nanosecond grain reorientation in shock-compressed nano-polycrystalline diamond

Understanding the shock-induced deformation of high strength materials is important to advance both fundamental science and engineering. However, because of the short timescales and irreversibility of shock-waves, direct observation of the ultrafast deformation behind shock wavefronts has been challenging. The shock response of diamond in particular has been hotly contested—nanosecond laser-driven methods suggest an elastic-plastic response akin to metals, while longer timescale plate-impact experiments report brittle fracture above the elastic limit.

In this seminar, I will share the results of recent in situ X-ray diffraction measurements that resolve the lattice deformation and microstructural evolution of nano-polycrystalline diamond in response to laser-driven shock compression. Within a nanosecond of compression, the initially randomly textured diamond begins to develop a fiber texture aligned with the direction of shock propagation, indicating grain-rotation-mediated plasticity. I will present possible mechanisms for the grain reorientation, as well as supporting molecular dynamics simulations

GRC