

Ultrastrong, ultralight nanocrystalline hybrid materials for future aerospace technologies
Faculty advisor: Prof. Chandra Singh

While nanocrystalline metals and alloys have shown substantial enhancements in strength and hardness, improvements in ductility have been rather disappointing. Recently, Integran Technologies has developed novel nanolaminated materials with significantly improved strength and elongation to failure while maintaining light-weight advantage. However, to realize the full potential of the proposed material systems, their failure characteristics need to be properly established. The long-term goal of this project is to develop a fundamental understanding of failure mechanisms at the atomic-scale using molecular dynamics. Large-scale atomistic simulations will be conducted to evaluate material properties inaccessible to experiments and to derive cohesive laws that describe load-deformation characteristics of these nanomaterials.