

6th RaDIATE Collaboration Meeting



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Developing ultra-strong and ultra-tough metallic materials with gradient nano-grained structures.

Wednesday, 11 December 2019 09:00 (25 minutes)

Controlling microstructural features in crystalline materials is one of the keys to achieving materials that combine mutually exclusive properties, such as strength and toughness. In this presentation, I will show the efforts made in my group to understand the generation of gradient nano-grained (GNG) structures in metallic materials under several manufacturing methods, including the impact of particles at high-velocities, and surface mechanical treatments. Specifically, I will show what are the main ingredients needed to achieve GNG in the high-velocity impact of particles, obtained directly from atomistic simulations. These results are compared with experimental works carried out in using laser impact techniques of Silver (Ag) microcubes. Our results suggest that the GNG transformation happens if three factors are present during the impact, i) large shock-wave stress, ii) at least eight slip systems are available to accommodate plastic deformation and iii) the kinetic energy is large enough to produce severe plastic deformation. Possible application of GNG materials under radiation environment will be also discussed in the presentation.

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