

## **Nanocrystalline Coating Technology (DoD, ARL-ARO)**

With the support of the U.S. Army Research Office, Professor Schuh's research group has sought to develop processing science for nanocrystalline alloys, to characterize such alloys, and to explore their mechanical behavior across a range of grain sizes. The processing science developed under this program was patented, and formed the basis for a start-up company (Xtalic Corporation) to commercialize the technology. Specifically, this technology controls crystal formation through the interaction of chemistry and waveforms to engineer crystal structure and tailor properties. Xtalic has scaled the electrodeposition of nanocrystalline Ni-W alloys to industrial capacity, and now sells the technology to produce these alloys as coatings. Unique advantages of these coatings include: superior wear performance, excellent corrosion resistance, improved properties under heat, and chrome-free compositions. This technology has now been successfully scaled up to the industrial scale and entered pilot trials with three major customers who intend to use nanocrystalline Ni-W in applications ranging from decorative finishes, to wear surfaces, to electronics.



Choi, I.S., A.J. Detor, R. Schwaiger, M. Dao, C.A. Schuh and S. Suresh, "Mechanics of Indentation of Plastically Graded Materials: II. Experiments on Nanocrystalline Alloys with Grain-Size Gradients", *Journal of the Mechanics and Physics of Solids*, 56, 172-183 2008.