Atomistic modeling of heat treatment processes for tuning the mechanical properties of amorphous alloys

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Abstract:

The development of novel fabrication techniques for metallic glasses is important for various structural and biomedical applications. The processing routes often involve mechanical and thermal treatments of disordered alloys that lead to changes in potential energy, microstructure as well as mechanical and physical properties. In this presentation, we discuss recent results of molecular dynamics simulations of a novel processing method that involves freezing of a metallic glass under applied strain. It will be shown that with increasing tensile stress, glasses are relocated to higher energy states and become more ductile. Moreover, for a given cooling rate, the initial temperature determines the maximum value of the applied stresses and therefore the maximum strain rate during freezing. These results are useful for the thermomechanical processing of metallic glasses with optimized mechanical properties.

Short Bio:
Nikolai Priezjev received his Ph.D. in computational soft condensed matter physics from Brown University in May 2002. Since 2013, he has been an Assistant Professor in the Department of Mechanical and Materials Engineering at Wright State University. Prior to this position, he was a faculty in the Department of Mechanical Engineering at Michigan State University (2005-2013) and a Postdoctoral Research Associate in the Department of Chemical Engineering at Princeton University (2002-2005). His research interests involve numerical modeling of interfacial flows in micro and nanofluidic systems, mechanics of amorphous materials, and microfiltration of oil-in-water emulsions. During his career, he has published over 70 papers, delivered about 120 presentations at various meetings and conferences, and supervised the research and education of three Ph.D. students.