Abstract Submitted
for the MAR12 Meeting of
The American Physical Society

Ion irradiation induced suppression of shear banding in amorphous ZrCuAl nanowires under simulated compression QIRAN XIAO, Department of Materials Science and Engineering, Rensselaer Polytechnic Institute, HOWARD SHENG, School of Physics, Astronomy and Computational Sciences, George Mason University, YUNFENG SHI, Department of Materials Science and Engineering, Rensselaer Polytechnic Institute — Metallic glasses (MG) are amorphous metallic solids which exhibit extraordinary mechanical properties including large elastic strain limit and high tensile strength; at the same time, MGs are generally brittle due to catastrophic failure of shear banding. Controversy remains, however, as to whether shear banding is size-dependent in MG nanopillar samples prepared using Focused Ion Beam (FIB) technique. Here we modeled Zr50Cu40Al10 MG nanopillars under irradiation via molecular dynamic simulations (MD) and found a transition in deformation mode from dominant shear-banding to homogeneous shear-flow. Our results call for careful consideration of irradiation damage as a result of FIB sample-preparation-technique. In addition, we also show the amorphization of icosahedral structures as a result of irradiation, which might be responsible for the homogeneous deformation mode of irradiated MG nanowires upon compression tests.

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Date submitted: 24 Oct 2011 Electronic form version 1.4