

Strain localization during tension and compression test and the plasticity of amorphous alloy

Kyoung-Won Park¹, Hong-Seok Chin¹, Eric Fleury¹ and Jae-Chul Lee²

¹Advanced Functional Materials Research Center, Korea Institute of Science and Technology, Hawolgok, Seong-buk gu, Seoul 130-650, Republic of Korea

²Department of Materials Science and Engineering, Korea University, Anam 5-1, Seong-buk gu, Seoul, Republic of Korea

Experiments in Cu-Zr binary alloys demonstrated that the difference in the structural disordering, softening, shear localization and energy absorption during deformation control the plasticity of amorphous alloys introducing a structural parameter, normalized relaxation heat, which allows the prediction of the global plasticity of bulk amorphous alloys.

To investigate the decreased plasticity and strength during tension test when comparing with that during compression test, we explore the deformation behavior and degree of structural softening during tension and compression tests using molecular dynamics simulations. The results demonstrated that the degree of structural softening and strain localization is high and the strength decreased when tensile stress is applied to the alloy, whereas the degree of shear softening is low and the strength increased by the compressive stress. We clarify this different deformation behavior during tension and compression tests, by exploring the relationship between the stress state during tension and compression test and its effect on the strain localization.

Keyword : amorphous alloy, strain localization, tension and compression, plasticity