Enhanced plasticity of amorphous alloys at cryogenic temperatures

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초저온에서는 비정질 합금의 강도와 소성이 동시에 증가한다는 매우 흥미로운 사실이 여러 실험결과로부터 밝혀졌다. 예를 들어 상온에서 강도와 소성이 2 GPa과 2%인 $Cu_{57}Zr_{43}$ 비정질 합금은 초저온(77 K)에서 2.5 GPa과 24%의 강도와 소성을 나타내었다. 본 연구에서는 Cu-Zr 이원계 비정질 합금이 나타내는 전단띠 생성 및 전파거동을 실험적으로 측정함으로써 초저온에서 비정질 합금이 나타내는 소성증가 현상을 규명하였다.

Poster session

A number of experiments carried out on various amorphous alloys at cryogenic temperatures demonstrated very interesting mechanical behaviors that were not observable in crystalline metals. Unlike the crystalline metals, amorphous alloys exhibited a higher strength, but became more ductile at cryogenic temperatures. For example, the strength and plasticity of the $Cu_{57}Zr_{43}$ bulk amorphous alloy are 2.0 GPa and 2%, respectively, at room temperature. However, when tested at cryogenic temperature, it showed a dramatic increase in strength and plasticity, reaching 2.5 GPa and 24%, respectively. In this study, we used a simple Cu-Zr binary alloy to explain the basis of the enhanced plasticity at cryogenic temperatures by exploring the behaviors of the shear band initiation and its propagation.