

Super-Critical Elasticity (SCE) in Metals

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Abstract

Different from the traditional martensitic transformation (MT), a kind of new-type martensitic transformation called as confined martensitic transformation in shape memory alloys was experimentally evidenced in the past two decades. Recently a novel alloy design strategy was proposed to achieve a non-hysteretic superelasticity over a broad temperature region in alloys exhibiting an atomic-level entanglement of ordered and disordered structures. The entangled structure does not just hinder the dislocation movement, but rather suppress the first-order MT. The in-situ synchrotron X-ray diffraction and neutron scattering measurements demonstrate that the non-hysteretic elasticity originates from the stress-induced continuous phase transition, rather than the weak first-order phase transformation. The new superelasticity is noted as Super-Critical Elasticity (SCE), which also renders Elinvar effect and superior strength-toughening properties in other technical metals such as multi-principal element alloys. The finding history of SCE and its physical mechanism and application will be presented in the talk.

Biography

Yandong Wang is currently a Changjiang distinguished professor in the State Key Laboratory for Advanced Metals and Materials, University of Science and Technology Beijing. His research topics include: (1) applications of the neutron and synchrotron x-ray diffraction methods to the studies of deformation and phase transformation, (2) research development of ferromagnetic shape-memory materials or metallic alloys with superelastic behavior, and (3) simulations of mechanical properties by various microscopic models. He received the NSFC Outstanding Young Scientist Award. His research team was awarded as one of the excellent Sci-Tech innovation teams by Ministry of Science and Technology of China. He has over 400 publications in referred journals, including **Science**, **Nature**, **Nature Materials**, **PNAS**, **Acta Mater**. His work was cited over 13,000 times by the SCI journal papers, including some achievements reported, highlighted or reviewed by the magazines such as **Science** or text books etc.