

Crystallographic basis and mechanism of shape reversibility in shape memory alloys

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Abstract

A series of alloy systems take place in class of advanced smart materials with adaptive properties and stimulus response to the external changes. Shape memory alloys take place in this group, due to the shape reversibility and capacity of responding to changes in the environment. These alloys exhibit a peculiar property called shape memory effect, which is characterized by the recoverability of two certain shapes at different temperatures. This phenomenon is initiated by cooling and deformation processes and performed thermally on heating and cooling. Therefore- this behavior can be called thermoelasticity. These alloys have dual characteristics called thermoelasticity and superelasticity, from viewpoint of memory behavior. Two successive structural transformations, thermal and stress induced martensitic transformations govern shape memory phenomena in crystallographic basis. Thermal induced transformation occurs along with crystal twinning on cooling and ordered parent phase structures turn into twinned martensite structures, and twinned structures turn into the detwinned structures by stressing material in low temperature condition by means of stress induced transformation. Superelasticity is performed mechanically by stressing and releasing material at a constant temperature in parent phase region, and shape recovery is performed simultaneously upon releasing the applied stress. Superelasticity is performed in non-linear way; stressing and releasing paths are different in the stress-strain diagram, and hysteresis loop refers to energy dissipation.

Biography

Abdeen Adiguzel O graduated from Department of Physics, Ankara University, Turkey in 1974 and received PhD- degree from Dicle University, Diyarbakir-Turkey. He has studied at Surrey University, Guildford, UK, as a post-doctoral research scientist in 1986-1987, and studied on shape memory alloys. He worked as research assistant, 1975-80, at Dicle University and shifted to Firat University, Elazig, Turkey in 1980. He became professor in 1996, and he has already been working as professor. He published over 80 papers in international and national journals; He joined over 100 conferences and symposia in international and national level as participant, invited speaker or keynote speaker with contributions of oral or poster. He served the program chair or conference chair/co-chair in some of these activities. In particular, he joined in last seven years (2014 - 2020) over 70 conferences as Keynote Speaker and Conference Co-Chair organized by different companies. He supervised 5 PhD- theses and 3 M.Sc- theses.



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