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Abstract

Shape memory alloys take place in advanced smart materials by exhibiting a peculiar property called shape memory effect, with dual thermoelastic and superelastic characteristics. These alloys have shape reversibility at different conditions and shape of material cycled between original and deformed shapes at different condition. Shape memory effect is initiated by cooling and deformation the material and performed thermally on heating and cooling after first cooling and stressing treatments. Therefore, this behavior is called thermoelasticity. Superelasticity is another property and performed in only mechanical manner. These alloys can be stressed in the elasticity limit in parent phase region of the material and recover the original shape on releasing the external forces. These phenomena are result of crystallographic transformations in the materials, called martensitic transformations. Shape memory effect is governed by successive thermal, and stress induced martensitic transformations. Thermal induced martensitic transformation occurs on cooling along with lattice twinning and ordered parent phase structures turn into twinned martensite structures; these twinned structures turn into detwinned martensite structures by means of strain induced martensitic transformation with deformation in martensitic state. Superelasticity is also the result of stress-induced martensitic transformation, and parent austenite phase structures turn into the fully detwinned martensite with the stressing. Superelasticity exhibits normal elastic material behavior, but it is performed in non-linear way; loading and unloading paths are different, and hysteresis loop reveals energy dissipation. Thermal induced martensitic transformations occur with cooperative movement of atoms by means of lattice invariant shears in <110> - type planes on {110} - type planes of austenite.

Biography

Dr Adiguzel 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 60 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.

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