Temperature deformation relations in reversibility of shape memory alloys

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Shape memory alloys exhibit a peculiar property called shape memory effect, which is initiated by cooling and deformation, and performed on heating and cooling. This phenomenon is governed by thermal and stress induced martensitic transformations on cooling and stressing. Thermal induced martensite occurs on cooling with cooperative movements of atoms in $\langle 110 \rangle$-type directions on the $\{110\}$-type plane of austenite matrix, along with lattice twinning, and ordered parent phase structures turn into twinned martensite structures, and these structures turn into detwinned martensitic structures with the deformation by means of stress induced transformation. These alloys exhibit another property called superelasticity, which is performed by stressing and releasing at a constant temperature in parent phase region, and Temperature has great importance in the memory behavior of these alloys. Superelasticity is also governed by stress induced martensitic transformation and ordered parent phase structures turn into detwinned martensitic structures by stressing. Copper based alloys exhibit this property in metastable β-phase region, Lattice twinning is not uniform in these alloys and cause to the formation of complex layered structures. In the present contribution; x-ray and electron diffraction studies were carried out on two solution treated copper based CuZnAl and CuAlMn alloys. Specimens of these alloys were aged at room temperature, and a series of x-ray diffractions were taken at different stages of aging in a long-term interval. X-ray diffraction profiles taken from the aged specimens in martensitic conditions reveal that crystal structures of alloys chance in diffusive manner, and this result refers to the stabilization.