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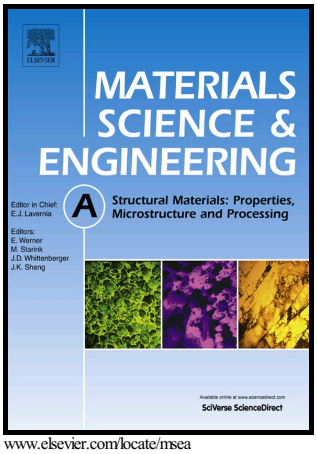

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Stress-Induced Phase Transformation and Room Temperature Aging in Ti-Nb-Fe Alloys

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Abstract

Room temperature deformation behavior of Ti-17Nb-1Fe and Ti-17Nb-2Fe alloys was studied by synchrotron X-ray diffraction and tensile testing. It is found that, after proper heat treatment, both alloys were able to recover a deformation strain of above 3.5% due to the Stress-induced Martensite (SIM) phase transformation. Higher Fe content increased the beta phase stability and onset stress for SIMT. For the same reason, a strong $\{110\}_\beta$ texture was produced in Ti-17Nb-2Fe compared to the $\{210\}_\beta$ texture that was observed in Ti-17Nb-1Fe. Room temperature aging was observed in both alloys, where the formation of the omega phase increased the yield strength (also SIM onset stress), and decreased the ductility and strain recovery. The phenomenon might be a common feature of most metastable beta Ti alloys and should draw more attention to scientist and engineers in material designs and selections.

Keywords
beta Ti alloy; synchrotron X-ray; stress-induced phase transformation; room temperature aging; super-elasticity; omega phase

1. Introduction