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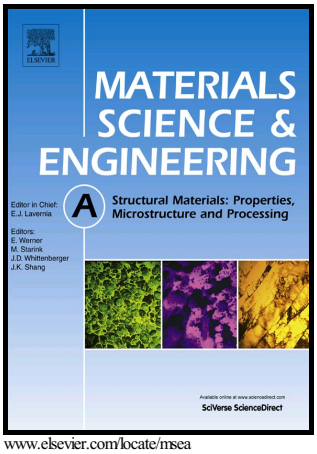

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Room temperature superelastic responses of NiTi alloy treated by two distinct thermomechanical processing schemes

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Abstract

The room temperature superelastic response of NiTi alloy was investigated through two distinct thermomechanical processing (TMP) approaches. In the first TMP route, the experimental material was primarily cold compressed (up to true strains of 0.2 and 0.5) and then annealed at different temperatures (400 and 500°C) for 10, 30, 60 and 120 min. In the second TMP course however, the material was hot compressed at temperatures of 700, 800 and 900°C up to the true strains of 0.2 and 0.5. The results indicated that the cold pressing to true strain of 0.5 followed by annealing at 400°C for 60 min on the one hand, and hot pressing at 800°C to true strain of 0.5 on the other hand, were ended to the higher superelasticity effects (2.1% and 3.5% residual strain, respectively) in the courses of applied TMP routes. The detailed analysis showed that the superelasticity was improved at room temperature in the former one through increasing the critical stress for dislocation slip due to the occurrence of static restoration processes and the presence of higher austenite fraction. In the latter case however, the improvement was related to the occurrence of dynamic restoration processes; these were justified by microstructural examinations, precise flow curves analyses and the high transformation enthalpy in the second approach. The overall results directed to the capability of hot deformation to improve the superelasticity effects, which were enhanced formerly by conventional cold processing followed by subsequent annealing methods.

Keywords: *NiTi; Superelasticity; Cold compression; Hot deformation; Recrystallization*