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Shape memory alloys for super elastic shape effects

Abstract:

Shape memory alloys (SMAs) are materials that have the capacity to regain their original shape after deformation through the application of heat or stress. The purpose of this research is to create and describe SMAs based on nickel and titanium, as well as to explore the impact of annealing heat treatment on them after cold rolling. The alloy ingot was prepared using metallic Nickel and Titanium strips in a vacuum arc melting furnace operating in an Argon environment. As received, the NiTi alloy was solution treated and then analyzed by FESEM and EDX for microstructure and elemental content. EDX revealed the alloy's elemental composition, which includes 50.14 and 49.86 atomic percent Ni and Ti, respectively. The FESEM picture demonstrated the presence of dendrites in the alloy's microstructure. Cold-rolling of percent NiTi resulted in the formation of a square-shaped rod. The structural and annealing behavior of cold rolled rod was now studied utilizing XRD and DSC. The XRD investigation of the rolled rod identified the presence of two phases in the crystal structure: B2 and B19'. The NiTi rod was annealed for 30 minutes at the temperatures range from 400°C to 800°C with a 100°C increment. The wide and compromised peak of R-phase and martensite on the DSC graph at early annealing temperatures, together with the smaller peak of austenite, indicated that the rod alloy is stressed. Annealing has a Considerable effect on the phase transition response of NiTi SMA. The constant changing of transformation temperatures during annealing demonstrated that tensions were being relieved and the austenitic and martensite plates were becoming free to move in any direction. The annealing hysteresis reduced when the annealing temperature was increased.

Biography

Waqar Mahmood has completed his PhD at the age of 35 years from COMSATS University Islamabad. He is the Associate Professor of Physics at Rawalpindi Women University Rawalpindi a premier education organization. He has published more than 35 papers in reputed journals and has been serving as an editorial board member of repute.