Ikeda, T.

Analytical investigation of strain loading frequency effect on stress-strain-temperature relationship of shape-memory alloy. (English) Zbl 1327.74109

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Summary: In this paper a set of simple governing equations of shape-memory alloys was derived by introducing some assumptions and a formula giving temperature variation was obtained by integrating one of the governing equations. The factors affecting the temperature variation depending on loading frequency were analytically investigated from the formula. The obtained temperature variation agreed qualitatively with the measured data. The calculated stress-strain-temperature relationship also agreed qualitatively with the measured data. It was found from the formula that the temperature vibrates sinusoidally and approaches a certain value asymptotically, and that the temperature variation is affected by the ratio of frequency to heat transfer and the ratio of latent heat to generated heat.

MSC:

74M05 Control, switches and devices ("smart materials") in solid mechanics
74F05 Thermal effects in solid mechanics

Keywords:

shape-memory alloy; phase transformation; frequency dependence; analytical investigation; thermo-mechanical properties

Full Text: Link