Evaluation of appropriate behavioral models for numerical simulation of new Cu based shape memory alloy

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ABSTRACT

Previous studies on shape memory alloys often related to one of the most usable type called Ni-Ti. However, many researchers are trying to find alternative alloys because of high cost and complex behavior of this alloy due to the high dependence of strain rate. The present study has been evaluated on properties of new alloy Cu-Al-Mn that has been introduced by Japanese researcher Araki. Also, it has been assessed ability of behavioral models for numerical simulation. The alloy with a superelasticity comparable to Ni–Ti alloys has more suitable cost and low dependence of strain rate. Based on properties of this alloy, the ability of three rate-independent model has been evaluated using; Graesser-Cozzarelli, Fugazza, Self-centering for numerical simulation. Despite the higher complexity of Graesser-Cozzarelli model compared to multilinear Fugazza and Self-centering models, Graesser-Cozzarelli model showed a more detailed description of material behaviour especially in points of transformation of two phases, because of the controller parameters. Also constant parameters of the model were developed to describe the behavior of a bar of 14 mm Cu-Al-Mn by trial and error process in MATLAB. The results of numerical simulation of the behavior of Cu-Al-Mn alloy in tension and pseudo-static test by two models Fugazza and self-centering showed that this model with its simplicity and lack of need for complex laboratory parameters has a good conformity with experimental results.

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