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Effect of Ce addition on mechanical properties and shape memory effect of Cu-14%Al-4.5%Ni shape memory alloy

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This paper aims to study the effect of Ce addition on mechanical properties and shape memory effect of Cu-based based shape memory alloys (SMA) in which Ce was added in three different percentages (0.3, 1.0 and 3%) to base alloy (Cu-14%Al-4.5%Ni). Many tests and inspections such as: XRD, compression test, (Vickers hardness) HV hardness and thermo-mechanical tests were performed on the Ce-modified alloys. Also, differential scanning calorimetry (DSC) test and microstructure observation by optical and scanning-electron-microscopy (SEM) for all alloys were done. The results showed that an increase in hardness, yield strength and maximum strain (ϵ_{max}) with increasing Ce% in base SMA (except in case of 3% Ce). It was seen that the thermo-mechanical properties showed an increase in recovery strain up to 98.72% with decrease in martensite modulus of elasticity and increase in austenite modulus of elasticity. Also the transformation temperatures shifted to beyond the domain of the base SMA (100–170°C) and the SMA modified with 3% Ce showed better results than other alloys.

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