304-233

ANALYSIS OF COMPOSITIONAL MODIFICATION OF COMMERCIAL ALUMINIUM BRONZES FOR OBTAINING FUNCTIONAL SHAPE MEMORY PROPERTIES

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In shape memory alloys (SMA), some exceptional phenomena, such as the shape memory effect (SME) or superelasticity (SE) are observable. Moreover, commercial aluminum bronzes are Cu-Al based alloys which originally do not have these functional properties SME and SE. However, these bronzes have about 4% Ni, and other trace elements. Thus, considering that one of the main copper based SMA are the Cu-Al-Ni alloys, this paper aims to analyze the modification of these commercial bronzes by the addition of small amounts of Cu and/or Al, verifying the appearance of the phase transformation that gives rise these phenomena of SME and SE. These bronzes, with new additions of Cu and/or Al, were remelted by induction and injected into a ceramic coating mold by centrifugation (investment casting), obtaining specimens of approximately 25 grams. Modifications were made seeking the nominal composition of a Cu-13,0Al-4,0Ni (%wt) SMA. The verification of the effectiveness of the modification process was realized by DSC thermal analysis, to detect the reversible phase transformation commonly observed in SMA. It was verified that all modified Cu-Al-Ni bronzes by investment casting process showed DSC peaks of phase transformation, before and after a quenching heat treatment (850 oC for 30 min, water cooling). The phase transformation was observed in the range of 100 oC to 250 oC. On the other hand, the non-modified bronzes revealed no DSC peaks, even after subjected to water quenching treatment. This study was complemented by analysis of optical microscopy, microhardness and tensile tests to characterize these new Cu-Al-Ni bronzes with phase transformation and functional properties varying with temperature.