CMDWC 2021

MDPI

Article

Corrosion behavior of $Al_7Cu_{0.2}Si_{0.2}Zn_{0.2}Mg_{0.1}$ complex concentrated alloy, in 3wt% and 5wt% Na Cl solution

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Abstract: Complex concentrated alloys (CCAs) are new types of materials, where the equimolar rule proposed by high entropy alloys (HEAs) is modified in relation to the potential of the obtained structures. CCAs expend the compositional space of the conventional alloys, revealing new pathways for material design. The $Al_7Cu_{0.2}Si_{0.2}Zn_{0.2}Mg_{0.1}$ alloy was prepared in an induction furnace, in controlled atmosphere and was cast in a copper ingot mold. The resulted samples of $Al_7Cu_{0.2}Si_{0.2}Zn_{0.2}Mg_{0.1}$ were analysed by chemical, structural, and corrosion resistance. Also, the alloy has been subjected to mechanical tests of hardness, elongation and tensile strength. The corrosion immersion tests, were performed in 3wt% and 5wt% NaClsolution, and corrosion indices were measured periodically. The obtained corrosion film was analized by SEM-EDS to determine the composition and structural behaviour. Depending on the adhesion level, the corrosion film remained stable or partially broken and separated in the solution. The sample weight loss presented large variations between the various experimental conditions, but the general tendency was the decrease in the weight of the samples during the corrosion tests. The formation of oxide and chloride layers, during the corrosion process, determined only the dealloying in Al. Other elements remained in initial concentrations. Overall, the resistance of the alloy in saline environment seems to be promising, with significant improvement over the comparable compositions of 2000 and 7000 series alluminum alloys.

Keywords: complex concentrated alloys; induction melting; corrosion immersion tests