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Preparation and Study Corrosion and Electrical Resistivity of Al-Ni-Cr Alloy

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Abstract : Al-Ni-Cr alloy contains different ratios of Ni and Cr was prepared by mixing Al, Ni and Cr at 800oC under an argon atmosphere. The prepared alloys were heated for 1300 hr to 560oC, and then cooled rapidly by water at the ambient temperature. Surface morphology for alloys is studied by scanning electron microscope (SEM). The resultant homogeneous surface is a result of heat treatment. The X-ray diffraction patterns showed (111), (200), and (220) diffraction lines from cubic Al crystal structure, and suggested that the intensity of peak (111) orientation is predominant. Three binary phases were observed and grown in alloys: Al3Ni (Orthorhombic, a = 6.598Å, b = 7.352 Å, c = 4.802 Å), Cr9Al17 (Rhombohedra, a = 12.910 Å, c = 15.677), and Ni2Cr3 (Tetragonal, a = 8.82 Å, c = 4.58 Å). The average crystallite sizes of the prepared samples were found to be from 3000 to 3094 nm by SEM, which is much smaller than that estimated from XRD data. Corrosion resistance increases with increasing Ni-Cr content in Al alloys. The electrical volume resistivity decreased with increasing Ni-Cr content at low frequency. This behavior can be seen generally at 50Hz, where the electrical volume resistivity reached the value of 3.98×10-8Ω.cm for the ratio Al-1.8 at.%Ni-0.18at.%Cr.

Keywords : Al-Ni-Cr alloy, corrosion current, electrical volume resistivity, binary phase, homogeneous surface
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