Microstructure and Corrosion Performance of Hypereutectic Al-4 at. % Co Alloy

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Abstract. In the current paper, we have investigated the microstructure, phase constitution and corrosion resistance of the Al-4 at.% Co alloy. The alloy was produced by arc melting of Co and Al lumps in argon. The microstructure and phase constitution of the alloy were examined by scanning electron microscopy and room temperature X-ray diffraction. The as-cast Al-4Co alloy consisted of primary Al_9Co_2 and eutectic. The eutectic was a mixture of Al(ss) and Al_9Co_2 lamellae. The corrosion performance of the alloy was investigated electrochemically in a dilute NaOH solution (0.01 mol dm^{-3}). The experiments were conducted at room temperature in a three-electrode glass vessel controlled by potentiostat. Corrosion potentials and corrosion current densities were obtained by Tafel extrapolation of experimental polarization curves. By inspecting the post-corroded surface, a preferential corrosion attack on the eutectic has been found. The primary Al_9Co_2 was significantly less corroded. This phase was nobler compared to the eutectic because of higher concentration of Co. The corrosion rate of the Al-4Co alloy was higher compared to previously studied eutectic and near-eutectic Al-Co alloys. It is found that the primary Al_9Co_2 had an activating effect on the eutectic.

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