

Corrosion Behaviour of Hypereutectic Al-Si Automotive Alloy in Different pH Environment

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Abstract : Corrosion behaviour of hypereutectic Al-19Si automotive alloy in different pH=1, 3, 5, 7, 9, 11, and 13 environments was carried out using conventional gravimetric measurements and was complemented by resistivity, optical micrograph, scanning electron microscopy (SEM) and X-ray analyzer (EDX) investigations. Gravimetric analysis confirmed that the highest corrosion rate is shown at pH 13 followed by pH 1. Minimum corrosion occurs in the pH range of 3.0 to 11 due to establishment of passive layer on the surface. The highest corrosion rate at pH 13 is due to the presence of sodium hydroxide in the solution which dissolves the surface oxide film at a steady rate. At pH 1, it can be attributed that the presence of aggressive chloride ions serves to pick up the damage of the passive films at localized regions. With varying exposure periods by both, the environment complies with the normal corrosion rate profile that is an initial steep rise followed by a nearly constant value of corrosion rate. Resistivity increases in case of pH 1 solution for the higher pit formation and decreases at pH 13 due to formation of thin film. The SEM image of corroded samples immersed in pH 1 solution clearly shows pores on the surface and in pH 13 solution, and the corrosion layer seems more compact and homogenous and not porous.

Keywords : Al-Si alloy, corrosion, pH, resistivity, scanning electron microscopy (SEM)

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