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Corrosion Fatigue of Al-Mg Alloy 5052 in Sodium Chloride Solution Contains Some Inhibitors

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Abstract : In this study, Al-Mg alloy 5052 was used as the testing material. Corrosion fatigue life was studied for the alloy in 3.5% NaCl (pH=1, 3, 5, 7, 9, and 11), and 3.5% NaCl (pH=1) with inhibitors. The compound inhibitors were composed mainly of phosphate ($PO4^{3}$-), adding a certain proportion of other nontoxic inhibitors so as to select alternatives to environmentally hazardous chromate ($Cr2O7^{2}$-). The inhibitors were sodium dichromate Na2Cr2O7, sodium phosphate Na3PO4, sodium molybdate Na2MoO4, and sodium citrate Na3C6H5O7. The total amount of inhibiting pigments was at different concentrations (250,500,750, and 1000 ppm) in the solutions. Corrosion fatigue behavior was studied by using plane-bending corrosion fatigue machine with stress ratio R=0.5 and under the constant frequency of 13.3 Hz. Results show that in 3.5% NaCl the highest fatigue life (number of cycles to failure Nf) is obtained at pH=5 where the oxide film on aluminum has very low solubility, and the lowest number of cycles is obtained at pH=1, where the media is too aggressive (extremely acidic). When the concentration of inhibitor increases the cycles to failure increase. The surface morphology and fracture section of the specimens had been characterized through scanning electron microscope (SEM).

Keywords : Al-Mg alloy 5052, corrosion, fatigue, inhibitors
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