

Scanning Electrochemical Microscopy Studies of Magnesium-Iron Galvanic Couple

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Abstract : Magnesium galvanic corrosion plays an important role in the commercialization of Mg alloys in the automobile industry. This study aims at visualizing the electrochemical activity of the magnesium surface being coupled with pure iron in sulfate-chloride solutions. Scanning electrochemical microscopy was used to monitor the chemical activity of the surface and the data was compared with the conventional corrosion results such as potentiodynamic polarization, linear polarization, and immersion tests. The SECM results showed that the chemical reactivity of Mg is higher than phosphate-permanganate-coated Mg. Regions in the vicinity of the galvanic couple boundary are very active in the magnesium phase and fully protected in the iron phase. Scanning electrochemical microscopy results showed that the conversion coating provided good corrosion resistance for magnesium in the short-term but fails at long-term testing.

Keywords : corrosion, galvanic corrosion, magnesium, scanning electrochemical microscopy

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