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Corrosion and Corrosion Protection of AZ31 Mg Alloy

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Professor Dr. Sungmo Moon has obtained his PhD in Materials Science and Engineering in 1997 at Korea Advanced Institute of Science and Technology (KAIST) and enjoyed postdoctoral positions at KAIST and the University of Manchester Institute of Science and Technology (United Kingdom). He continued his research career as a JSPS researcher at Hokkaido University (Sapporo, Japan) and a Visiting Researcher at National Research of Council of Canada (Ottawa, Canada). He is currently a Principal researcher at Korea Institute of Materials Science (KIMS) and a Professor in the Korea University of Science and Technology (UST). The research interests of Professor Moon encompass electrochemical surface treatments and corrosion protection of light alloys, including Mg, Al and Ti.

Abstract

Corrosion behavior of AZ31 Mg alloy was studied in chloride and alkaline solutions, and two different surface treatments of chemical conversion coatings and plasma electrolytic oxidation (PEO) coatings were prepared on AZ31 Mg alloy for corrosion protection. Fe-containing impurity particles were found to be present at the positions where continuous gas evolution occurs in chloride and alkaline solutions. Corrosion of AZ31 Mg alloy was not initiated around the cathodic particles but occurred preferentially at the scratches, showing that protective properties of surface film is crucial in the initiation of corrosion. Formation of thick oxide film around cathodic particles can explain why corrosion is not initiated around the cathodic particles. Denser and thinner surface films were more effective in the corrosion protection if E-paint is applied to the film surface. PEO coatings were found to be very effective in corrosion protection if they are sealed. PEO films were formed only when oxide forming anions are present together with OH- ions, and PEO film formation on Mg alloys is critically dependent upon the applied current form. PEO film formation behavior was investigated by voltage-time curves and epoxy replicas of pores in the PEO films.

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