**Effect of Al content on the microstructure and corrosion resistance of plasma electrolytic oxidation (PEO) coatings on Mg-Al alloys**

Fangfang Wei, Tao Zhang*, Wei Zhang, Fuhui Wang

Laboratory for Corrosion and Protection, Institute of Metal Research, Chinese Academy of Sciences, Wencui RD 62, Shenyang, 110016, China

**Abstract** Effect of Al on the microstructure and corrosion resistance of plasma electrolytic oxidation (PEO) coating of Mg-Al alloys was investigated by means of microstructure observation and electrochemical measurement. The PEO coatings on Mg-Al alloy consisted of two layers, including an inner layer near the coating/substrate interface and an outer layer. The outer layer was composed of MgO and $Mg_2SiO_4$. While, the inner layer on different phases showed distinguishing microstructure, the inner layer on α phase, eutectic phase and β phase was mainly consisted of MgO and $MgF_2$, $Mg_2SiO_4$, $Mg_2SiO_4$ and $MgF_2$, respectively. Therefore, the Al content had two influences on the corrosion resistance of PEO coating of Mg-Al alloys, on one hand, the volume fraction of β phase increased with Al content, and then increased the $MgF_2$ composition of the inner layer, enhancing of corrosion resistance of PEO coating. On the other hand, the increasing Al content evoked the increase of eutectic phase, due to high misfit degree and difference of Femi level, corrosion preferentially initiated on the interface of the PEO coating above the eutectic phase and β phase, which decreased the corrosion resistance of PEO coating. In brief, with the increase of Al content, the corrosion resistance of PEO coating of Mg-Al alloys increased and then decreased.

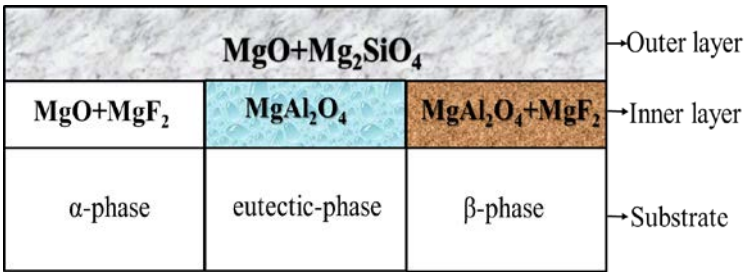


**Fig. 1.** Schematic of the microstructure of the PEO coatings on Mg-Al alloys.

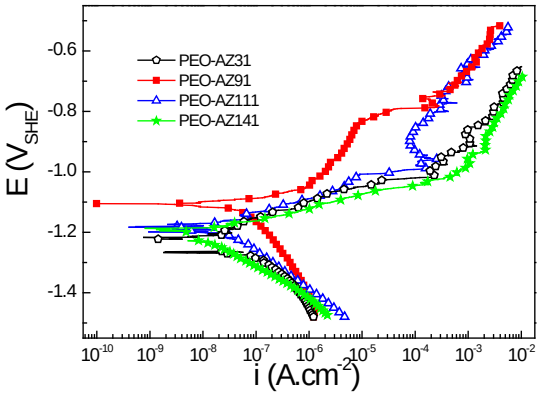


**Fig. 2.** Polarization curves for PEO coatings of Mg-Al alloys in 3.5 wt. % NaCl solution.