

Study of phosphating behavior of AA6014 AA6014 automotive sheets

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Abstract During phosphating process of AA 6014, electrons would transfer from the metal substrate to the solid-liquid interface, where they reacted with zinc dihydrogen phosphate in the electrolyte to form zinc phosphate crystals. In this paper, the influence of Ti/Zr passive film of AA6014 on the formation of zinc phosphate crystals was studied by GDOES, SEM and electrochemical methods. Results showed that the low or ordinary passivated 6014 Ti/Zr sample hardly prevent the passing of active electrons, and the phosphate crystals would nucleate and grow uniformly. The potential curve of the phosphating process showed a gradual rise in the electrode potential. In contrast, the high passivated sample could obviously prevent the passing of active electrons and the crystals were only preferentially formed and coarsened in the relatively weak areas of passive film. Then, the higher passivated area was continuously eroded by fluoride ions in the electrolyte, and new active sites gradually exposed. A second wave of tiny fine crystals began to nucleate and grow. The potential curve of the phosphating process showed multiple fluctuations. For the low or ordinary passivated samples, the zinc phosphate crystals were small and uniform, with a size between 2-8 μm when phosphating reaction finished. For the high passivated samples, the continuous distribution of passivation film would significantly influence the nucleation and growth of zinc phosphate crystals. After phosphating, zinc phosphate crystals showed a distribution of coarse and fine crystals, and some crystal sizes exceeded 20 μm . In order to obtain a compact and uniform phosphating film, which was beneficial to promote filiform corrosion, the Ti/Zr passivation films on the surface of AA 6014 automotive sheets should be controlled at low to medium level.

Keywords Aluminum Alloy, Passive film, Zinc Phosphate, GDOES

Reference

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