Study the Growth Mechanism and Corrosion Resistance of LZ91 Magnesium Lithium Alloy Conversion Coatings

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ABSTRACT

In this conversion treatment study, LZ91 magnesium lithium alloy is selected as the experimental material. Meanwhile, both acidic permanganate and alkaline phosphorous conversion coatings solution are used. By controlling the operation parameters, conversion temperature and immersion time, to investigate the growth mechanism and corrosion resistance of coatings. Using SEM, EDS and XRD to observe the surface morphology of coatings and analyze their chemical composition.

From experimental results shown, the growth mechanism of acidic permanganate conversion coatings is the magnesium oxide depositing on the matrix to form the bottom layer. With increasing the immersion time, the content of manganese in coatings continues to increase, the multi-metal composite oxide is the major component of upper layers. However, the composition of alkaline phosphorous conversion coatings is magnesium oxide which deposited on the surface of matrix to be the meticulous layer, only a few phosphorous and sodium element is detected in layers.

From the results of polarization test, the acidic permanganate conversion coating, the best parameter of corrosion resistance is at 40 ℃ and 2 minutes, due to the coating layer forms completely can provide well corrosion resistance. If continues lengthen the conversion time, the corrosion resistance will not further improve and not conform to the economic efficiency. If further increasing the conversion temperature up to 60℃, the best result conversion time can be shorten to about 0.5 minutes, because the coating layer already can provide good resistance.

Again, for the alkaline phosphorous conversion coating, the best parameter of corrosion resistance is at 40℃ and 5 minutes, the forming layer already meticulous and almost no crevice exists, which can provide a very good corrosion resistance. The conversion temperature up to 60℃, the best conversion time is about 0.5 minutes.

Keywords : LZ91 Magnesium Lithium Alloy、Acidic Permanganate Conversion Treatment、Alkaline Phosphorous Conversion Treatment、Growth Mechanism、Polarization Test

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