Discharge and Corrosion Behaviors of Mg-Li and Mg-Li-La Alloys as Anodes for Seawater Battery

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The electrochemical performance of Mg-8Li-0.5La and Mg-8Li-1La alloy as anodes for seawater battery were investigated by electrochemical techniques. Scanning electron microscopy (SEM) was used to characterize the microstructures and the corroded surfaces of the above anodes. X-ray diffraction (XRD) was used to analyze the composition and the crystalline pattern of the discharging products. Results show that Mg-8Li-1La anode has the higher electrochemical activity and the better corrosion resistance. Potentiodynamic polarization shows that the corrosion potentials of Mg-8Li-1La alloy anode and Mg-8Li-0.5La alloy anode are -1.64 V and -1.67 V (vs. SCE), respectively, which are more active than the Mg-8Li alloy anode (-1.57 V vs. SCE). The current densities for anodes at the discharge voltage of -1.0 V increase with the following order: Mg-8Li ($31 \text{ mA} \cdot \text{cm}^{-2}$) < Mg-8Li-0.5La ($35 \text{ mA} \cdot \text{cm}^{-2}$) < Mg-8Li-1La ($42 \text{ mA} \cdot \text{cm}^{-2}$). The Mg-8Li-1La alloy anode provides a more negative voltage than Mg-8Li-0.5La alloy anode and Mg-8Li alloy anode during the galvanostatic discharge test. Therefore, the content of La in alloys obviously affects the electrochemical performance of alloys.

Keywords: Mg-8Li-0.5La; Mg-8Li-1La; Alloy anode; Discharge behaviors; Electrochemical performance; Sodium chloride solution

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