Improved Discharge Performance of Mg-6Al-7Pb Alloy by Microalloying with Ce

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Mg-6Al-7Pb (wt.%) alloys with different Ce contents are prepared and their electrochemical discharge performances are measured in this research. Under casting condition, Mg-6Al-7Pb-0.3Ce alloy shows better electrochemical activity than other alloys. Subsequently, the discharge property of Mg-6Al-7Pb-0.3Ce alloy is further enhanced by multi-pass hot rolling. The result is verified by electrochemical tests and morphology observation. Mg₂Pb and Al₄Ce phases are observed, and fine grains are obtained in as-rolled Mg-6Al-7Pb-0.3Ce alloy. For as-rolled Mg-6Al-7Pb-0.3Ce alloy, the increased discharge performance is attributed to the synergistic effect of the dispersive Al₄Ce and Mg₂Pb phases. The Mg-air battery based on as-rolled Mg-6Al-7Pb-0.3Ce alloy supplies higher peak power density (102.7 mW·cm⁻²) than that based on as-rolled Mg-6Al-7Pb anode. Therefore, the as-rolled Mg-6Al-7Pb-0.3Ce alloy is an excellent anode material for Mg-air battery.

Keywords: Magnesium anode; Microalloying; Hot rolling; Microstructure; Discharge performance

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