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磁热处理对La-Mg-Ni-Co合金微结构与电化学性能的影响

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摘 要：考察$La_{0.67}Mg_{0.33}Ni_{2.5}Co_{0.5}$合金分别在铸态、热处理及磁热处理3种状态下的微结构及其电化学性能。通过XRD衍射及SEM分析贮氢合金的物相组成和电极合金循环后的形貌，研究Co部分替代Ni以及有无外加磁场下热处理对合金微结构与电化学性能的作用规律。结果表明：经Co部分取代的La-Mg-Ni铸态合金经过50次循环后，放电容量保持率从64.46%提高到74.80%；经磁热处理后，$La_{0.67}Mg_{0.33}Ni_{2.5}Co_{0.5}$合金的最大放电容量为324.80 mA·h/g，较常规热处理合金的容量提高了10.59%，放电容量保持率为83.07%，其放电平台更为宽广且平坦；磁热处理的引入进一步降低贮氢合金电极的极化电阻，改善合金电极动力学性能。

关键字： La-Mg-Ni型贮氢合金；磁热处理；微结构；电化学性能

Effects of magnetic-heat treatment on microstructure and electrochemical properties of La-Mg-Ni-Co alloys

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Abstract: The microstructure and electrochemical performances of La0.67Mg0.33Ni2.5Co0.5 hydrogen storage alloys treated by casting, heat treatment and magnetic-heat treatment were studied. The influence of the substitution of Co for Ni and heat treatment with and without magnetic field on the structures and electrochemical performances of La-Mg-Ni alloys were investigated by XRD and SEM. The results show that the retention of discharge capacity of as-cast La0.67Mg0.33Ni2.5Co0.5 alloy increases from 64.46% to 74.80% for as-cast La0.67Mg0.33Ni3.0 after 50 cycles. The maximum discharge capacity of La0.67Mg0.33Ni2.5Co0.5 alloy heat treated under magnetic field is 324.8 mA·h/g, which is larger by 10.59% than that of La0.67Mg0.33Ni2.5Co0.5 alloy after conventional heat treatment. The retention of discharge capacity of the former is 83.07%. The discharge voltage platform of La0.67Mg0.33Ni2.5Co0.5 alloy after magnetic-heat

treatment is more broadened and flatter. The magnetic-heat treatment reduces the polarization resistance and improves the electrochemical kinetic properties of alloy electrode.

Key words: La-Mg-Ni-based hydrogen storage alloys; magnetic-heat treatment; microstructure; electrochemical properties

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