Effects of Graphene/Silver Nanocomposite on the Microstructure of Amorphous Mg-based Hydride

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The influence of a graphene/silver (G/A) nanocomposite coating layer on the microstructural evolution and surface oxidation of a Mg–Ni–La hydride is investigated systematically by XRD, SEM, EDS and HRTEM in detail. SEM and EDS reveal that the existence of the G/A composite prevents the electrode from pulverizing and oxidizing. The oxygen content in the surface of the electrode is reduced from 21.26% to 9.83% after 50 cycles for a Mg–Ni–La electrode with 0.2 mass fraction of G/A. HRTEM shows that the amorphous electrodes with no G/A coating are almost all crystallized, and that the stable Mg₂NiH₄, α -Mg, MgH₂ and LaH₂ phases are present with grain sizes as large as 100–120 nm after 50 cycles of charging/discharging. The G/A coating reduces the corrosion and oxidation of the electrode alloy and provides both a pathway for hydrogen diffusion and active sites for the redox reaction of hydrogen. All these factors generate a significant enhancement of the discharge capacity by about 250 mAhg⁻¹ in each cycle (after activation) for Mg–Ni–La electrodes with 0.2 G/A nanocomposites.

Keywords: electrode alloy; graphene coating; electrochemical property; surface modification.

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