

Development of Lithium Ion Battery Nano-Synthesized Electrode Materials Using Fe₃O₄ and rGO

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Lithium-ion batteries are one of the most popular secondary batteries in modern society. Therefore, electrode materials are actively developed to increase the efficiency and stability of lithium-ion batteries. Fe₃O₄ and rGO (reduced graphene oxide) were used to develop nano-synthesized electrode materials. It was applied to lithium-ion batteries to test for efficiency and stability. First, rGO was made using graphene and synthesized with Fe₃O₄. Second, developed electrode materials in which nano-sized Fe₃O₄ was placed on rGO. Third, the made a coin cell type lithium-ion battery. Fe₃O₄/rGO were comparatively analyzed and experiments with commercial Fe₃O₄ (Sigma-Aldrich). It was tested to x-ray diffraction pattern analysis, transmission electron microscope analysis, battery cycle performance experiments, and battery rate capability experiments. As a result of comparing commercial Fe₃O₄ with nano-synthesized electrode material Fe₃O₄/rGO, the initial theoretical capacity of commercial Fe₃O₄ was 600mAh/g~400mAh/g, the dose showed about 67% of the initial capacity. On the other hand, the initial theoretical capacity of Fe₃O₄/rGO was 1200mAh/g to 1000mAh/g, the capacity was about 84% of the initial capacity. Commercial Fe₃O₄ exhibits a low capacity of about 50mAh/g even at a fast charge/discharge rate of 2000mA/g. On the other hand, Fe₃O₄/rGO exhibits a high capacity of about 500mAh/g even at a fast charge/discharge rate of 2000mA/g. The nanostructures of Fe₃O₄/rGO revealed the potential of electrode materials to improve the efficiency and stability of lithium ion batteries by improving the reaction process of electrons and ions. Compared with commercial Fe₃O₄, Fe₃O₄/rGO showed excellent properties in terms of efficiency and stability.