Investigation of electrochemical properties and mechanism of $NiWO_4/CoMoO_4$ nanoplates applied as a supercapacitor electrode

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Abstract

Binary transition metal oxide $NiWO_4/CoMoO_4$ nanoplates grown on a Ni foam had been successfully synthesized via a two-step hydrothermal process. The $NiWO_4/CoMoO_4$ composite nanoplates exhibited excellent areal capacity as high as 0.464 mA h cm^{-2} at a current density of 5 mA cm^{-2} and great cycle stability about 92.5% retention after 3000 cycles with a high current density of 40 mA cm^{-2}. Our research find that the mechanism of the electrochemical reactions studied with the in-situ X-ray absorption spectroscopy technique obviously shows that the Co and Ni elements simultaneously participate in the faradaic reactions with the electrolyte. On the contrary, the Mo and W elements still keep stable in the faradaic reaction, indicating that the Mo and W play an important role for the structure stability. The electrochemical properties and mechanism results indicate that the excellent electrochemical performance of $NiWO_4/CoMoO_4$ nanoplates is attributed to synergistic effect between $NiWO_4$ and $CoMoO_4$. This combination of two binary transition metal oxides can hence provide a route to develop a high-performance electrode material for supercapacitor.

Keywords – $NiWO_4$, $CoMoO_4$, In-situ XAS, supercapacitor