

Molybdenum nitrides/ Nafion interface as a component of electrochemical capacitor

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Abstract

Some transition metal nitrides such as molybdenum, titanium or iron nitrides have recently been proposed as inorganic materials for use in electrochemical capacitors. According to a recent study by Conway et al molybdenum nitride in sulfuric acid medium has rather smaller voltage operating range, about 0.7 V, compared to the ruthenium oxides exhibiting ca. 1.4 V range. Despite such a severe drawback in a narrow potential window the nitride still has a big advantage in cost, less than 1% the cost of ruthenium oxides. We studied the electrochemical behavior of MoN_x interfaced with Nafion electrolyte. The membrane-electrode-assembly (MEA) was assembled by loading MoN_x particles (manufactured by CERAC, 325 mesh) into carbon paper with the help of the ionomer and hot pressing this onto Nafion 113 membrane. Electrochemical cell was constructed by attaching a hydrogen electrode made of carbon-supported platinum catalyst layer on this MEA. Cyclovoltammograms taken on this electrode with the hydrogen electrode as the reference electrode show that its faradaic capacity is comparable to that taken in sulfuric acid medium (Figures 1 and 2).

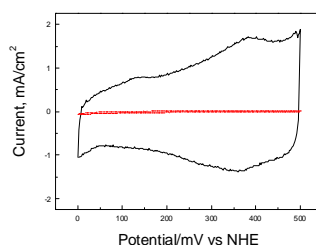


Fig. 1. Cyclovoltammogram for MoN_x electrode contacting sulfuric acid, at a sweep rate of 25 mVsec^{-1}

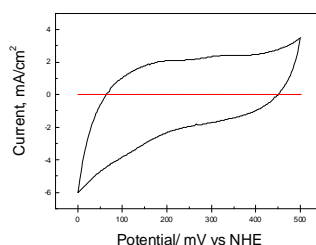


Fig. 2. Cyclovoltammogram for MoN_x electrode contacting Nafion, at a sweep rate of 25 mVsec^{-1}

