C-4

Electrochemical Properties of Immobilized MnO_2-CNFs Composite Electrode for Supercapacitors

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Electrochemical capacitors are novel charge-storage devices of high power energy density, which exhibit excellent reversibility and a long cycle life. In recent years, electrochemical capacitors have attracted much attention for their higher power density compared to batteries and higher energy density compared to common capacitors.

Activated carbons with very large surface area have a feature of high capacitance per weight. However, such activation methods tend to suffer from low yield below 50%, low in electrode density and capacitance per volume. CNFs (Carbon Nano Fibers) have high surface area polarizability high electrical conductivity and chemical stability, as well as extremely high mechanical strength and modulus, which make them an important material for electrochemical capacitors. MnOx are considered as hopeful materials of faradaic pseudocapacitors not only due to the low cost but also their greater environmental compatibility than other metal oxides. The electrochemical properties of MnO_2-CNFs electrodes were studied for the electrochemical capacitor applications.

CNFs synthesized on directly Ni foam without an additional step at temperatures between 450℃ and 550℃ using ethylene gas. CNFs was composed of nanofibers with diameter ranging from 40 to 60 nm. The performance characteristic was evaluated using cyclic voltammetry and charge-discharge test in an aqueous solution.

Keywords: Carbon Nano Fibers, MnO2, Supercapacitor

C-5

Microstructure of Cu(In, Ga)Se2 Thin Film Prepared by Selenization of Metallic and Selenide Precursors and its Application to Solar Cells

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Thin film solar cells based on Cu(In,Ga)Se2(CIGS) continue to be a leading candidate for thin film photovoltaic devices due to its bandgap, high absorption coefficient, long-term stable performance and potential for low-cost production. Many groups have reported within the past years on a variety of processes for preparing CIGS films. Up to date, the most successful technique for deposition of CIGS absorber layer for the highest efficiency solar cells has been based on Cu, In, Ga and Se co-evaporated process, so-called 3-stage process, achieving an efficiency of greater than 19%. However 3-stage evaporation process is difficult to scale-up for large area, economic manufacture.

The selenization process has been a promising method for a low cost and large scale production of high quality CIGS film. In conventional selenization process, the sputtered precursor with alloyed or stacked metallic Cu-In-Ga layers is deposited on the substrate and it is followed by selenization process in toxic H2Se ambient gas. However The CIGS films had the poor microstructure when the metal layers were annealed in a Se vapor atmosphere.

In this study, we prepared a precursor which is a mixture of metals and Cu2-xSe selenide compound on Mo-coated soda-lime glass by sputtering. The precursors were selenized to form CIGS film using Se vapor in a vacuum evaporation system without H2Se ambient gas. The microstructure of the CIGS films was investigated with various Cu contents and deposition temperatures. And the CIGS films were applied to the fabrication of solar cell with an Al/n-ZnO/i-ZnO/CdS/CIGS/Mo/glass structure and its photovoltaic properties were characterized. The details will be reported in the meeting.

Keywords: CIGS 태양전지