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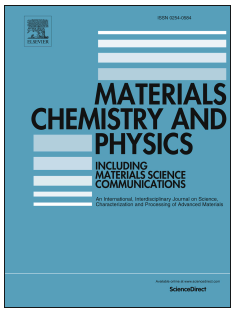

Electrochemical capacitor performance of cobalt compound nanowires electrosynthesized in magnetic fields

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Electrochemical capacitor performance of cobalt compound nanowires electrosynthesized in magnetic fields

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Abstract

Cobalt compound nanowires (CCNWs) were electrochemically deposited on an indium-tin-oxide coated glass plate in magnetic fields (30-90 mT) applied perpendicular or parallel to the substrate by passing 0.50-3.0 C cm^{-2} of electricity, and the capacitor characteristics of the obtained CCNW electrodes were investigated. The CCNW electrodes prepared in a 90 mT magnetic field exhibited the high single electrode specific capacitance of 690 F g^{-1} for the perpendicularly applied magnetic field and 650 F g^{-1} for the parallel applied magnetic field. These values were significantly higher than the capacitance of the CCNW electrode (310 F g^{-1}) prepared without applying a magnetic field. Based on the results of the real surface area measurements and the morphological observations of the CCNW electrodes, it was speculated that the greater capacitances of the former two cases were attributed to the combined effects of the high real surface area and rapid ion transfer, and that these effects were provided by the MHD (magnetohydrodynamic)/micro-MHD fluid flows and by the bundle formation of the CCNWs due to their magnetic dipolar interaction.