Electrochemical Evaluation of MnO_2/Carbon Composite Electrodes

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Extensive efforts have been done to study the electrochemical behavior of manganese dioxide (MnO_2) as electrodes for various charge carriers. It has several microstructures that show diffenrent physical, electrical and electrochemical properties. A thick MnO_2 electrode was reported to show low capacitance due to the poor electrical conductivity. To enhance electrical conductivity of the electrode, porous carbon substrates were used. They also give a continuous pathway for electrolyte diffusion. Composite materials consisting of carbon, conducting polymers, and transition metal oxides have been widely used as electrode for electrochemical capacitors (ECs). Various carbon forms like powder, CNT and sheets have been used as substrate of metal or metal oxide. The composite electrodes were reported to show a combined effect of the electrochemical double layer capacitance (EDLC) and the pseudocapacitance related to faradaic redox reactions on the metal or metal oxides. Various solid precipitation processes have been developed to prepare metal oxide/carbon composites. In this study, we report on the synthesis of MnO_2 /carbon composite using solid precipitation process assisted by microwave heating. Physical and chemical properties of the composite materials were characterized by transmission electron microscopy (TEM), X-ray diffraction analysis (XRD), N_2 sorption analysis (BET surface area). Their electrochemical activities were evaluated using three electrode system in various solutions by means of cyclic voltammetry (CV), galvanostatic charge/discharge, and electrochemical impedance spectroscopy (EIS). Detailed synthetic procedure, electrochemical and structural properties of MnO_2 /carbon nanocomposite will be presented at the meeting in terms of formation of metal oxide, and specific capacitance of the nanocomposites.

References

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