

Characterization of TiO₂–MnO₂ composite electrodes synthesized using spark plasma sintering technique

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Abstract

Titanium-manganese oxide composites as suitable material for electrode in electrochemical capacitors application was synthesized using spark plasma sintering technique. The feedstock powders were blended at varied compositions in a Turbula mixer through dry mixing with and without the alumina balls. The blended powders were then consolidated at a sintering temperature of 1200 °C with a constant pressure of 25 MPa and holding time of 5 min. The density, phase composition, microstructure, hardness and electrochemical stability of the resulting materials were investigated. Relative densities of 99.33% and 98.49% were obtained for 90TiO₂–10MnO₂ and 80TiO₂–10MnO₂ when ball was incorporated. The 90TiO₂–10MnO₂ powder mixed with balls had its Vickers hardness value increase from 924.4 HV to 998.2 HV. The electrochemical performance of the TiO₂ was improved with the addition of MnO₂.