

Electrochemical Characteristics of Hybrid Capacitor
하이브리드 커패시터의 전기화학적 특성

Masatoshi Sakairi* · Hideaki Takahashi* · 박수길

충북대학교 공업화학과, *北海道大學校 工學研究科 分子化學專攻

The tantalum oxide or aluminium oxide cathode electrode in an electrolytic capacitor was replaced by a ruthenium oxide(Ru,Mn,CoOx)electrode for improving the energy density. Order-of-magnitude increases in volumetric energy density over electrolytic capacitors have been reported¹. Also in contrast to electrochemical capacitors, where cell voltage is limited to the stable potential window of the electrolyte, the hybrid capacitor cell voltage depends on the breakdown voltage of the anode dielectric, which is orders-of-magnitude higher than that of electrochemical capacitors².

In this work, we have developed hybrid capacitor constructed of aluminium oxide anode MO₂(M= Co, Ru, Mn) cathode.

Mn and Co oxide powders were successfully synthesized by our previous works³. MO₂ powders were mixed with 5 wt% PvdF-HFP(binder) and acetylene black 20 wt% , which was directly smeared over a current collector. These working electrodes were dried for 6h at 60°C and pressed for 30min on Al and Ni mesh or foil to form the composite electrodes. The exposed surface areas of these composite electrodes (1.0 cm²) kept uniform, while the other surface areas of electrode were insulated with double coatings of epoxy resin and PTFE. The electrolytes used to study the capacitive behavior of various composites were degassed with purified nitrogen gas before voltammetric measurements and nitrogen was passed over the solutions during the measurements. The solution temperature was maintained at 25°C. The Al foil which was counter electrode was used after the polarization with etching at some conditions from our lab.(40~100m). All other measurements were done at general electrochemical methods by impedance analysis and SEM ,TEM surface analysis