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Fish bladder-based activated carbon/Co3O4/TiO2 composite electrodes for supercapacitors

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## Abstract

Cobalt oxide/titanium dioxide/activated carbon (Co3O4/TiO2/Ac) composite was synthesized using simple sol-gel method before annealing at 300 °C. Fish bladder derived porous carbon used for the composite was synthesized by pyrolysis followed by chemical activation. Both scanning electron microscopy (SEM) and X-ray diffraction displayed Co3O4 and TiO2 phases well embedded onto the carbon matrices. Cyclic voltammetry in 6 M KOH electrolyte demonstrated that the composite has an excellent specific capacity of 946 Fg-1 for Co3O4/TiO2/Ac as compared to Co3O4/Ac, TiO2/Ac, and Ac with specific capacitances of 845, 340, and 308 F g-1, respectively at 5 mVs-1. Impedance spectroscopy reveals that the composite has good capacitive behavior with a series resistance of 0.6  $\Omega$ . Besides, Co3O4/TiO2/Ac maintains 89.7% of the initial capacitance after 2000 cycles. This study shows that the synergistic effect of the metal oxides and the carbon in the composite can enhance capacitance for practical supercapacitor applications.

## **Keywords**

Fish bladder activated carbon; Supercapacitor; Specific capacitance; Cobalt oxide; Titanium dioxide