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Microwave-assisted synthesis of cobalt doped WO3 nanostructure as an electrode material for supercapacitor

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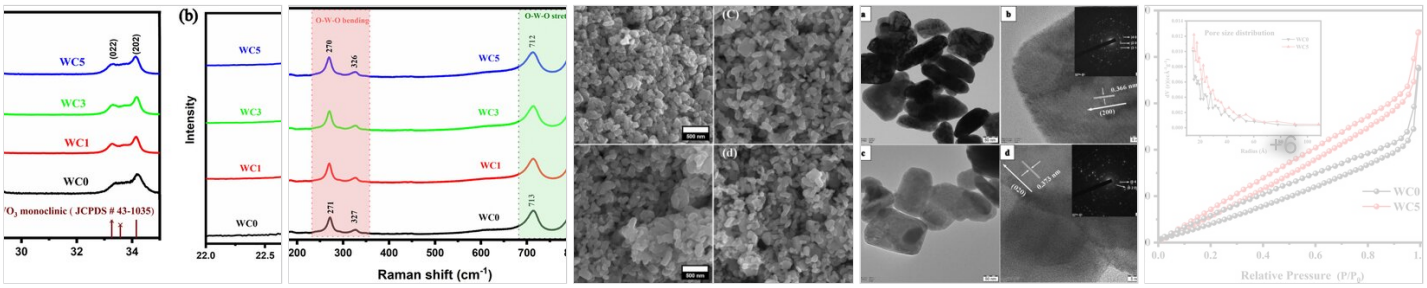
The present work demonstrates the improvement in the pseudocapacitive performance of Cobalt (1, 3, and 5 wt%) doped Tungsten oxide (WO3) nanoparticles synthesized by the microwave irradiation method. X-ray diffraction and Raman spectra analysis indicate the successful doping of Co in the WO3 crystal matrix. Meanwhile, Co doping influences the surface morphology of pure WO3 by forming more smaller particles with elongation in the long axis. The specific surface area of WO3 (125.32m² g^{-1}) is increased by two times after doping of Co in WO3 (232.1 m^2 g^{-1}). Moreover, the electrochemical performance of 5 wt% Co doped WO3 is improved by five times higher than pristine WO3, ascribed to its high surface area and porosity. Also, it achieves the highest specific capacitance (517 F g^{-1}) and energy density (14.55 Wh kg^{-1}) at 1 A g^{-1} current density. The synergetic effect of the change in surface area and increased porosity due to doping of Co shows the enhancement in the electrochemical performance of WO3.



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Microwave-assisted synthesis of cobalt doped WO_3 nanostructure as an electrode material for supercapacitor

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ABSTRACT

The present work demonstrates the improvement in the pseudocapacitive performance of Cobalt (1, 3, and 5 wt%) doped Tungsten oxide (WO_3) nanoparticles synthesized by the microwave irradiation method. X-ray diffraction and Raman spectra analysis indicate the successful doping of Co in the WO_3 crystal matrix. Meanwhile, Co doping influences the surface morphology of pure WO_3 by forming more smaller particles with elongation in the long axis. The specific surface area of WO_3 (125.32m^2 g^{-1}) is increased by *two* times after doping of Co in WO_3 (232.1 m^2 g^{-1}). Moreover, the electrochemical performance of 5 wt% Co doped WO_3 is improved by *five* times higher than pristine WO_3, ascribed to its high surface area and porosity. Also, it achieves the highest specific capacitance (517 F g^{-1}) and energy density (14.55 Wh kg^{-1}) at 1 A g^{-1} current density. The synergetic effect of the change in surface area and increased porosity due to doping of Co shows the enhancement in the electrochemical performance of WO_3.

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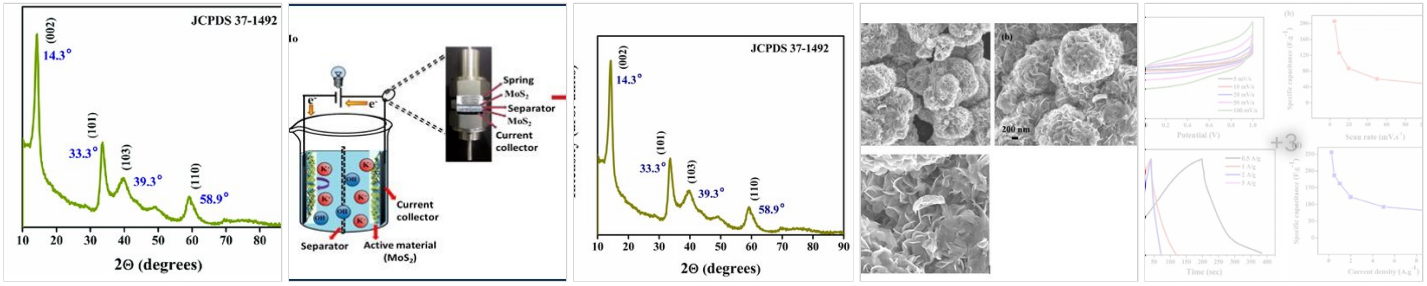

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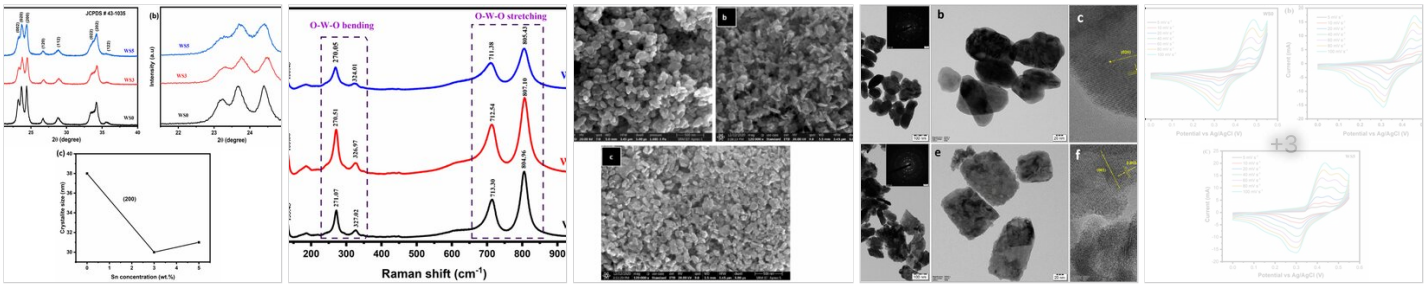

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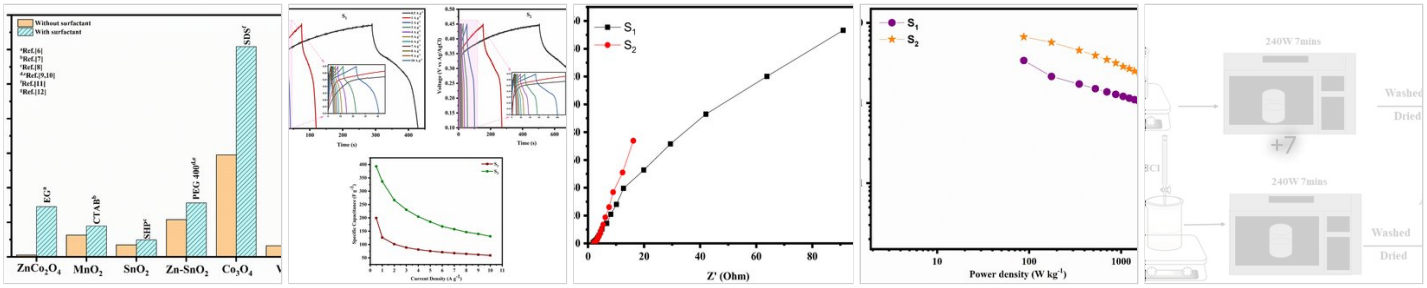

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Journal of Materials Science: Materials in Electronics

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Tungsten oxide (WO3) nanoparticles were synthesized by microwave irradiation method in the presence of cetyltrimethylammonium bromide (CTAB) as a surfactant. The structural, morphological, optical and porous properties were studied. The X-ray diffraction pattern and Raman spectroscopy show that both the sample crystallizes in stable monoclinic structure with nanoplates morphology which is inferred from the ima...

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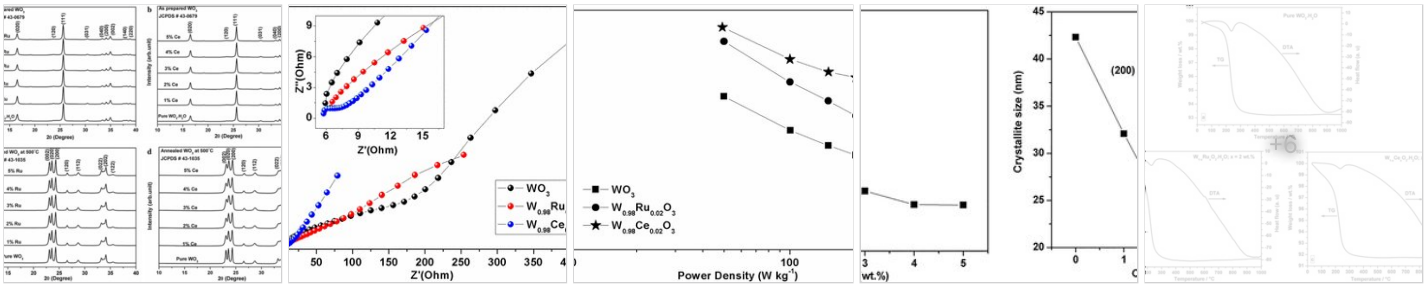

Microwave-assisted synthesis of Ru and Ce doped tungsten oxide for supercapacitor electrodes

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Paulraj .s · R. Jayavel

Ruthenium (Ru) and cerium (Ce) doped tungsten oxide (WO3) were successfully synthesized at various concentration (1–5 wt.%) by microwave irradiation method without adding any surfactant and studied as a supercapacitor electrode material for the first time. The effect of Ru and Ce on structural and morphological properties were studied systematically by using powder X-ray diffraction (XRD), thermogravimetry (TG)-...

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