Solvothermally prepared $ZnWO_4$ nanoparticles based supercapacitor

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Abstract: The energy demand of the world is growing at an immense pace, which in turn increases the need for sophisticated energy source for our daily life which will withstand the cause of time with high performance. Among the energy storage sources, the supercapacitors play a vital role which overcomes the drawbacks of the batteries[1]. The energy is stored in a supercapacitor as a static charge. Unlike batteries, there is no chemical reaction involved in the charging or discharging of a supercapacitor, so the charging process will be very quick. Which also means that, the charge-discharge cycle of a supercapacitor is almost unlimited. The supercapacitors have very high power density (2 to 5kWh/kg) than the Lithium ion batteries (120 to 200Wh/kg)[2].

Because of wide range of chemical and physical properties, the metal tungstate Zinc Tungstate ($ZnWO_4$) is considered to be a novel material for electrode to the supercapacitor application[3]. Herein, we prepared $ZnWO_4$ by Solvothermal method and its properties were studied for the application of supercapacitor.

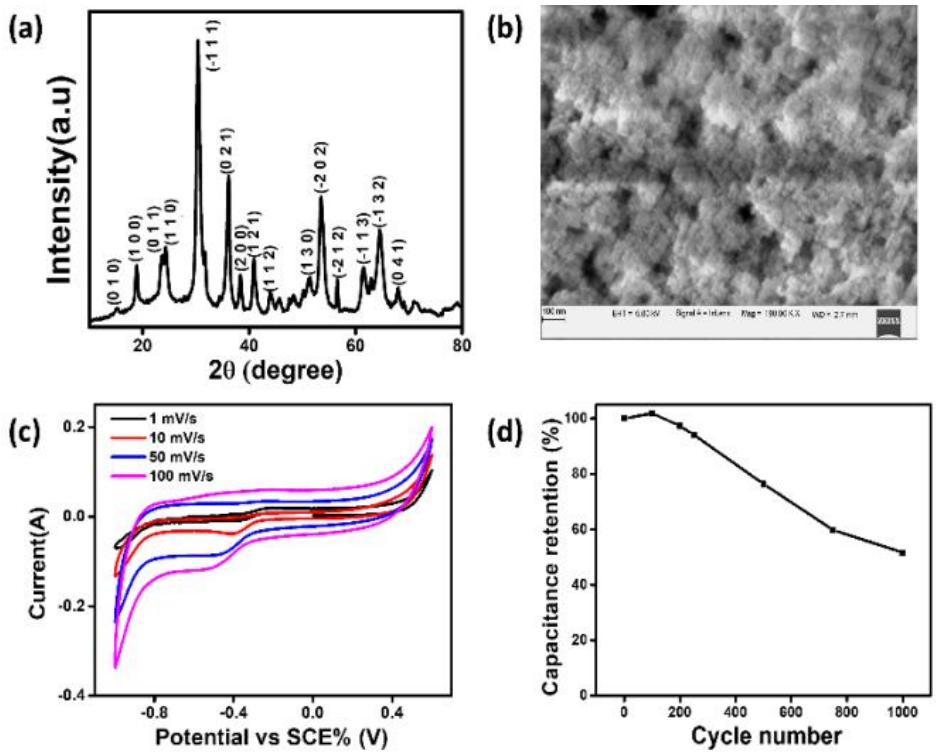

Figure 1: (a) XRD pattern of $ZnWO_4$ nanoparticle. (b) FESEM image shows agglomerated nanospherical structure. (c) Cyclic Voltammetry of the sample at various scan rates. (d) Capacitance retention as a function of cycle number for 1000 cycles.

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$ZnWO_4$ nanoparticle was synthesized by solvothermal method. The monoclinic wolframite structure of $ZnWO_4$ is determined by powder X-ray diffraction. The morphology of the sample was investigated using Field Emission Scanning Electron Microscope (FESEM) and found to be agglomerated nanosphere structure. The samples were tested as an electrode material for the supercapacitor using electrochemical techniques like cyclic Voltammetry (CV), Galvanostatic Charge-Discharge (GCD) and Electrochemical Impedance Spectroscopy (EIS). From the Cyclic Voltammetry we obtained 20.6F/g specific capacitance at 1mV/s scan rate. $ZnWO_4$ retains 50.1% of its capacitance after 1000 cycles

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