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Hydrothermal synthesis of MoS_2 for supercapacitor application

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Supercapacitor is new energy storage device, which has many advantages including high power capacity, short charging time, long life cycle and environment-friendly features. Recently two diamensional transition materials have considerable interest in the field of supercapacitor application. Layered structure of molybdenum disulphide has very important role in the field of supercapacitor. The present work is focused on the electrochemical study of MoS_2 prepared by hydrothermal method.

MoS_2 nanoparticle is prepared by simple hydrothermal method. MoO_3 and thiourea are the molybdenum and sulphur source for this preparation respectively. Figure 1 shows the X-ray Diffraction pattern of as prepared MoS_2. The results show the formation of hexagonal structure of MoS_2.

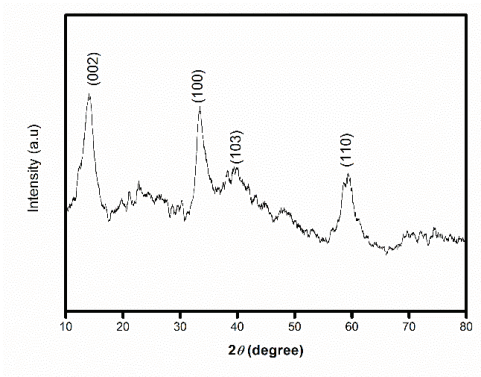

Figure 1: XRD pattern of as prepared MoS_2

The functional group studies are done by Fourier transform infrared spectroscopy. Electrochemical properties of as prepared MoS_2 are measured by cyclic voltammetry and galvanostatic charge discharge technique.

Figure 2 Shows CV curve of MoS_2 based supercapacitor under potential from 0 to 0.6 V at different scan rates. CV curves are similar to rectangular shapes, demonstrated that the sample exhibits typical capacitive character.

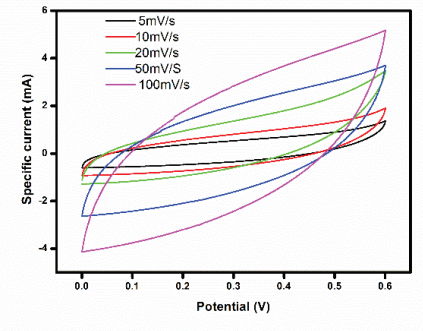

Figure 2: CV curve of as prepared MoS_2

Galvanostatic charge/discharge curves of MoS_2 electrode were recorded with various current densities to further evaluate the electrochemical performance. Typical triangular shape charge/discharge curve exhibits good symmetry and fairly linear slopes at different current densities.

Specific capacitance of as prepared MoS_2 decreases with increase in scan rate. This is because of high scan rate corresponds to high charge/discharge process, which prevents the accessibility and occupation of ions to active sites of electrode material leading to less utilization of electroactive species in the electrode [1]. The specific capacitance of MoS_2 is obtained as 145 F/g and the outstanding electrochemical properties of the MoS_2 nanoparticle may lead to potential applications for high-performance supercapacitors.

Reference

1. K-J – Huang, J-Z-Zhang, G-W-Shi and Y-M-Liu, Electrochim.Acta., 132(2014) 397-403.