# The Synthesis of the Nanoparticles With Double-Hierarchical Structure as Promising Materials for Use in Electrochemistry

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In recent years, rechargeable lithium-ion batteries (LIBs) have emerged as the most attractive power source in portable electric devices, and hybrid electric vehicles (HEVs) or electric vehicles (EVs). A lot of different materials were tested as electrode material in such devices [1]. Layered metal dichalcogenides ($MoS_2$, $MoSe_2$, $WS_2$, $WSe_2$, etc) are a a special class of compounds attracted the researchers by its unique structural and electrical properties, due to the weak van der Waals interactions between the individual layers allow to create the space for $Li^+$ ion diffusion path without significant changes in its structure providing relatively high values of specific capacity. However, there is still an issue of low electronic and ionic conductivity and in some cases the problem of nano-particles aggregation and layers restacking during the repetitive cycling and even the drying process of electrodes [2]. One possible way to solve these problems is to use hybrid nanostructures, where the <host> active materials are embedded into the conductive matrix of <subhost> creating the new double-hierachical structure [3]. We present the simple way to obtain such structure consisted of $MoS_2$ and carbon by hydrothermal method using cetyltrimetyl-ammonium cations. According to XRD (Fig.1), TEM (Fig.2) we have received mostly spherical multilayered nanoparticles, in which $MoS_2$ layers alternating with C (atomic ratio is 1:1). Annealing in Ar at 500°C and 1000°C has not significant impact on morphology and composition of the synthesized material.

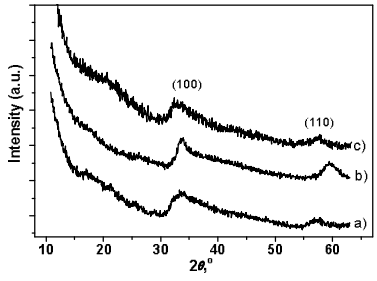


Fig.1. XRD patterns of $MoS_2$/C before (a) and after annealing at 500°C (b) and 1000°C (c)

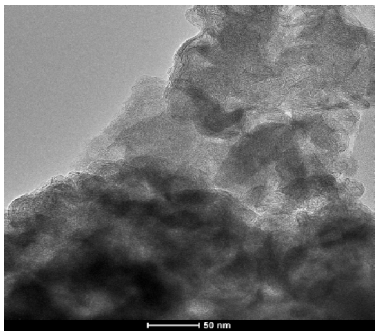

Fig.2. TEM image of $MoS_2$/C

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