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# Synthesis and Characterization of Nanorods and Nanobelts of α-$MoO_3$ and $MoS_2$

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The aim of the present study is concerned about the synthesis and characterization of nanostructures of α-$MoO_3$ and $MoS_2$, and their use as catalysts in the hydrodesulfuriztion (HDS) of dibenzothiophene (DBT). The materials were characterized by X-ray diffraction (XRD), scanning and transmission electron microscopy (SEM and TEM).

The synthesis of α-$MoO_3$ was performed following the method reported by Wen Lou [1]. First, a saturated solution of ammonium heptamolybdate was prepared and acidified using a solution 2.2 M of $HNO_3$ to a final pH of 5, and then kept hermetically sealed by 30 days or more. In order to obtain nanostructures, 5-10 mL of the aged solution were mixed with 0-15 mL of ionized water and further acidified with 5-10 mL of nitric acid solution. The resultant solution was transferred to a Teflon-lined stainless steel autoclave and heated at 140-200 °C for 5-65 h. The material obtained was dried at 60 °C for 5 h and then sulfided under a flow of $H_2S/H_2$ at 500 °C for 5 h in a tubular furnace, similarly to the procedure used by Q. Li [2]. The catalytic activity was evaluated in the HDS of DBT, showing a good performance (a reaction rate coefficient of 3.4 $x10^{-7}$ mol $L^{-1}s^{-1}$ and a DBT conversion of 20.04 % in 5 h).

Figure 1 shows rods and belts of α-$MoO_3$. Furthermore, bright and dark field images of α-$MoO_3$ were also taken, Figs. 2a and 2c. In addition, Figs. 2b and 2d show amplified zones of these nanostructures, while Fig. 2e presents an electron diffraction pattern of a α-$MoO_3$ nanobelt, exhibiting the growing direction [200]. Finally, dark and bright field images were taken by STEM and are shown in Fig. 3 The average diameter of the nanostructures is about 300 nm.

**Acknowledgements**

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References

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[2] Q. Li et al., Nano Letters, (2004), Vol. 4, No. 2, 277-281

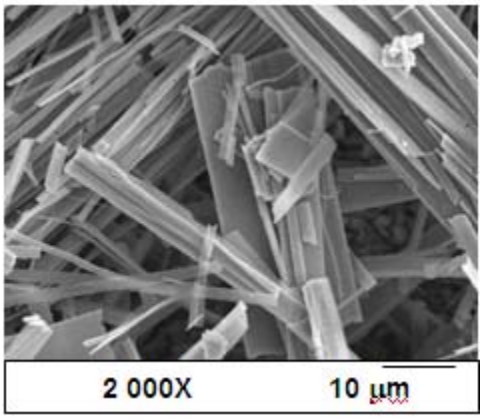


Figure 1. Image obtained by SEM showing rods and bets of α-$MoO_3$.

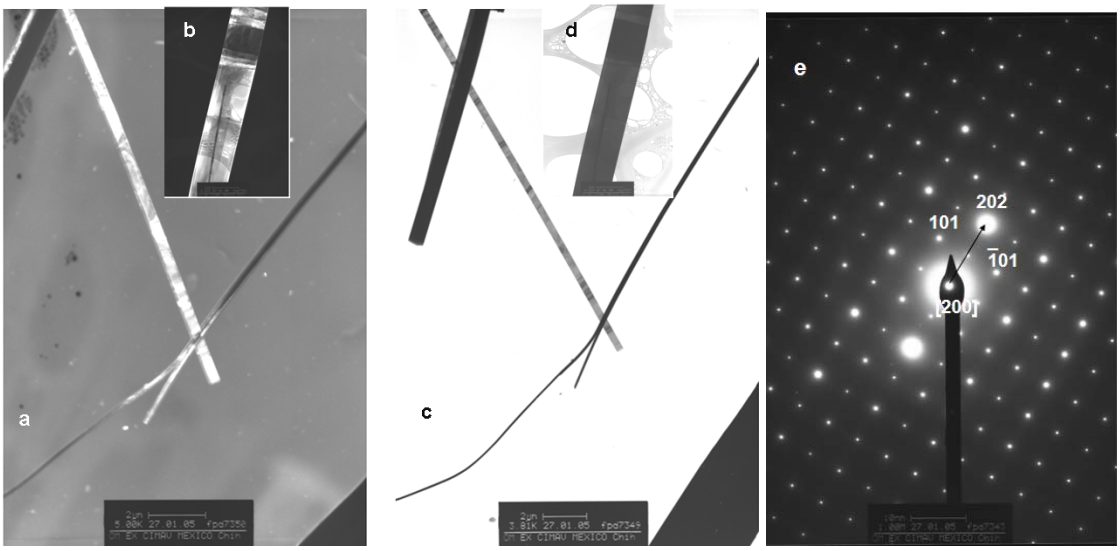


Figure 2. Bright and dark field micrograph (a,c) obtained by TEM and their amplifications (b,d). Image (e) shows electron diffraction pattern of a nanobelt of α-$MoO_3$.

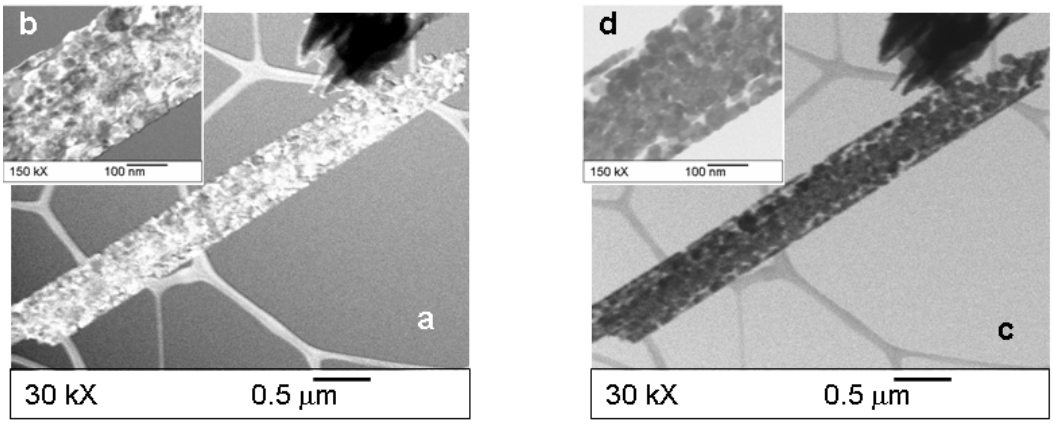


Figure 3. STEM images, bright and dark field (a,c) and amplified zones (b,d) corresponding to $MoS_2$.

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