

Preparation of WO₃ nanowires and metal nanoparticle-WO₃ nanocomposites

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Nanotechnology and nanostructured materials have been in the center of the attention in the past few decades. Nanotechnology is „the design, characterization, production, and application of structures, devices, and systems by controlled manipulation of size and shape at the nanometer scale (atomic, molecular, and macromolecular scale) that produces structures, devices, and systems with at least one novel/superior characteristic or property”¹. The properties of these new materials are different from the properties of the bulk matter and that is the reason why they can be used widely.

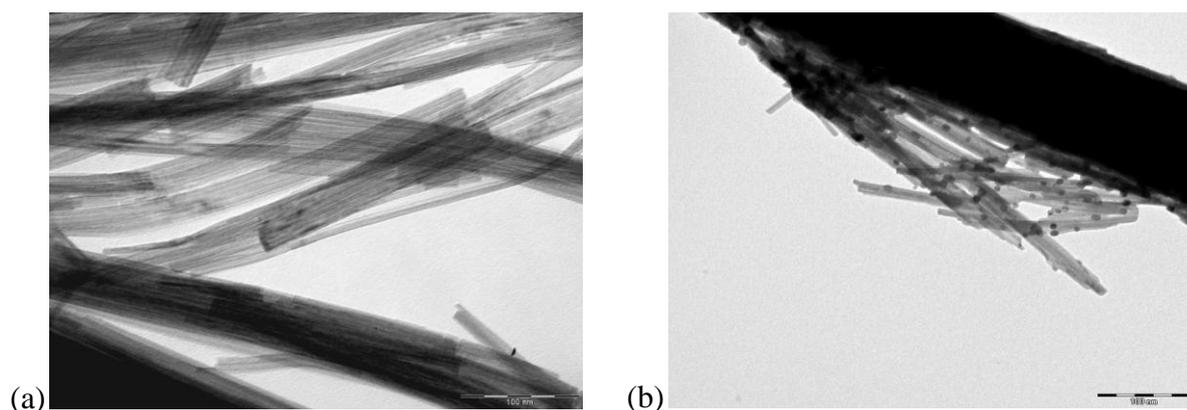
Recently, much effort has been devoted to the synthesis of semiconductor nanowires, nanorods and nanobelts. Among metal oxides, WO₃ is a wide band gap semiconductor therefore it can be used in many applications like semiconductor gas devices, electrochromic devices or photocatalysis.

WO₃ nanowires can be synthesized for example by heating a tungsten foil in argon gas² or by electrochemically etching a tungsten tip³.

In this work the hydrothermal method was used for preparing WO₃ nanowires. We used sodium-tungstate as precursor, sodium-sulphate as structure directing agent and hydrochloric acid to set the pH of the solution. The mixture was transferred into a Teflon lined stainless steel autoclave and it was kept at 180 °C for 48 h.

The nanowires were decorated with metal nanoparticles by wet impregnation.

The as-prepared sample was investigated by XRD, TEM, SEM and AFM.



TEM images of (a) the WO₃ nanowires and (b) the Pd decorated nanowires

¹ Raj Bawa, MS, T S.R. Bawa, MSc, Stephen B. Maebius, Ted Flynn, Chiming Wei, *Nanomedicine: nanotechnology, Biology, and Medicine* **1** (2005) p. 150

² Y.Q. Zhu, W. Hu, W.K. Hsu, M. Terrones, N. Grobert, J.P. Hare, H.W. Kroto, D.R.M. Walton and H. Terrones, *Chem. Phys. Lett.* **309** (1999), p. 327

³ G. Gu, B. Zheng, W.Q. Han, S. Roth and J. Liu, *Nano Lett.* **2** (2002), p. 849