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## Nanostructured WO<sub>3</sub> thin films by Aqueous Chemical Growth: Structural, Optical and Gas sensing characteristics

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Crystalline thin solid films of WO<sub>3</sub> have been prepared on Corning glass, FTO and Si through the low temperature, wet chemistry method of Aqueous Chemical Growth. SEM images of the thin films produced show that the surface morphology of the films is influenced by the kind of substrate used for the synthesis. While nanoplatelet-containing flower-like structures were consistently obtained on the Corning glass substrates, nanorod-containing urchin-like structures were consistently produced on the F-doped SnO<sub>2</sub>-glass substrates. A review, using SEM, is done here of the different kind of nanostructures that make up the thin films produced on these different substrates. Structural characterization of the different thin films synthesized on all three substrates was carried out using XRD, TEM, HRTEM and SAED. These showed that the films produced were made up of WO<sub>3</sub> in the monoclinic, triclinic, cubic and hexagonal phase depending on what heat-treatment procedures the different substrates were subjected to post-synthesis. The quantum confinement effect is clearly demonstrated in the thin films as the optical band gap calculated for these films is seen to undergo a blue shift from the theoretical values of 2.7 eV in the bulk to values of 3.18 eV, 3.93 eV and 4.12 eV at the nano/microscale. This can be explained as being a consequence of the reduction of the grain size in these films to values in the nano-range, values as small as 9 nm. By varying the time of synthesis for these films, a growth mechanism for the nanostructures produced is proposed. A comparative study of the hydrogen sensing properties of the WO<sub>3</sub> thin films produced on all three substrates is carried out. This is compared to hydrogen sensing carried out on WO<sub>3</sub> thin films prepared on Corning Glass, FTO and Si via the method of electrospinning. The structure-property relationship for gas sensing is thus assessed.

**Level (Hons, MSc, PhD, other)?**

Phd

**Consider for a student award (Yes / No)?**

Yes

**Would you like to submit a short paper for the Conference Proceedings (Yes / No)?**

Yes

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