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The synthesis and characterization of tin oxide SnO2 nanorods

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<p>In 2003, photoluminescence emission in tin dioxide nanoribbons was reported and it was later demonstrated that the absorption of nitrogen dioxide by these structures quenches the intensity of visible light emission in SnO2 nanobelts which suggested he possibility of developing a new class of contactless devices based on gas sensitive optical devices. The motivation behind this project is to clarify the fundamental aspects of light emission mechanisms of nanorods instead of nanoribbons and to characterise their response to gas species in view of their possible applications. The benefits of this project may include enhancing the sensitivity of conductometric gas sensors through the design and synthesis of porous three-dimensional tin oxide nanostructures. Several methods have been used to prepare SnO2 nanorods including thermal evaporation, thermal decomposition, solution phase growth and hydrothermal methods. Amongst these, the thermal evaporation approach has been used to synthesize a wide variety of 1-D materials. This often has involved the use of a catalyst in which nanowire growth proceeds by vapour-liquid-solid (VLS) mechanism. However metal catalysts can serve as impurities and contaminate the nanowires, possibly forming defect states that limit their applications in devices.

The experiental procedure that will be used to deposit the tin dioxide (SnO2) nanorods is called pulsed laser deposition (PLD). These structures were characterized using X-ray powder diffraction, scanning electron microscope, transmission electron microscope and photoluminescence spectroscopy. The XRD patterns of the SnO2 nanorods showed peaks with 2θ values of 26.97 °, 34.34 °, 38.26 °, 52.01 °, 54.90 °, 71.28 °, and 78.40 °, corresponding to SnO2 tetragonal rutile crystal planes of (110), (101), (200), (211), (220), (202) and (321) respectively. Raman spectra taken at room temperature for Sno2 nanorods which shows bands at 576 and 359 cm-1 in addition to the Ag1 vibrational mode at 635 cm-1. TEM image of the SnO2 nanorods indicates a relatively uniform rod-like morphology. These rods are of 15-20nm in length and 2.5-5nm in diameter. The room temperature photoluminescence spectra for SnO2 nanorods showed a red emission at 580nm was observed from the SnO2 nanorods using the He-Cd laser (325nm) as the excitation source.

Level (Hons, MSc,
   PhD, other)?

MSc

Consider for a student
   award (Yes / No)?

No

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

No

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