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#### **ACCEPTED MANUSCRIPT**

#### Substrate free synthesis of wide area stannic oxide nano-structured sheets

#### via a sol-gel method using gelatin

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#### Abstract

Stannic oxide nanostructured sheets (SnO<sub>2</sub>-NS) were synthesized via a simple sol-gel method. Stannous chloride (SnCl<sub>2</sub>) was used as a starting material and gelatin as a stabilizer. The structures of the prepared samples were characterized by X-ray diffraction (XRD) analysis and Raman spectroscopy. The results showed that the SnO<sub>2</sub>-NS were crystallized in tetragonal structure. Field emission electron microscopy (FESEM) observation showed that the SnO<sub>2</sub>-NS, with thickness of 175 nm, were grown by SnO<sub>2</sub> nano-grains ( $\approx$ 80±20) also, it was seen that the SnO<sub>2</sub>-NS are formed only in present of gelatin. The minimum wavelength of transmission window was obtained to be 344 nm due to SnO<sub>2</sub>-NS optical band gap (E<sub>g</sub>=3.6 eV) from UV-vis spectrum.

Keywords: Nanocrystalline; Sol-gel preparation; particle, nanosize; Thin film

#### 1. Introduction

Tetragonal stannic oxide,  $SnO_2$  with rutile-like structure, is an n-type semiconductor metal oxide with a wide band gap of  $E_g$ =3.6 eV at room temperature. Also,  $SnO_2$  is a good electron acceptor due to its small band edge about 0.5 V. Therefore, it is one of the most strategic materials used in a broad range of applications such as dye-sensitized solar cells [1], photoconductors [2], gas sensors [3, 4], batteries [5-7] super capacitors [8], and optical sensors [9], especially in nanostructured form. For these propose, various physical and chemical methods have been developed to prepare the  $SnO_2$  nanostructures such as: nanoparticles, nanowires, and nanobelts [7, 10-14]. Among of these nanostructures,  $SnO_2$  thin films are widely used as a conductor layer for electronic applications due to its good conductivity. Pulsed laser deposition (PLD), pulsed plasma deposition (PPD), sol-gel, and spray paralysis methods Download English Version:

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