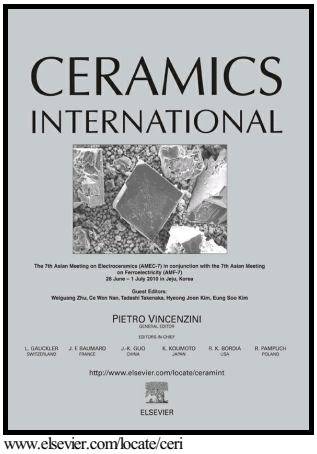

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Annealing impact on the structural and optical properties of electrospun SnO_2 nanofibers for TCOs

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Abstract:

Tin oxide (SnO_2) nanofibers were fabricated by electrospinning technique and subsequent annealed at different temperatures. The structure, morphology and optical properties of the annealed samples were characterized by X-ray diffraction (XRD), Raman, scanning electron microscopy/energy dispersive spectroscopy (SEM/EDS), TEM transmission electron microscopy (TEM), Fourier transformed infrared (FTIR),and optical absorption techniques. The phase of SnO_2 of all samples is rutile (tetragonal), and at higher annealing temperatures, good crystanality and lower absorption were obtained. Annealing of the samples at 600^{o}C caused the lower absorption and higher optical band gap, and the decrease of the absorption was probably because the fiber structure changed from solid to hollow structure. From PL spectra, it was observed that the SnO_2 hollow nanofibers annealed at 600^{o}C revealed green emission at 530 nm.

Keywords: Nanofibers, electrospinning, Tin oxide, annealing, TCOs

Introduction:

Transparent conducting oxide (TCO) materials have been used in a wide range of applications in different fields, due to their good transmission in the visible region and high electrical conductivity. Among the available TCOs, tin oxide (SnO_2) is an oxide material, which exhibits sensitivity towards oxidizing by variation of its electrical properties and has high transparency in the near-visible and infrared regimes. Moreover, SnO_2 has a band gap energy nearly 3.6 eV, good conductivity, and good environmental stability [1], so it is a very useful material with numerous different applications such as transparent electronics, gas sensors, and photovoltaics [2-4].

Nanostructured SnO_2 materials have been synthesized by various methods such as chemical vapor deposition [5], sol-gel [6],spray pyrolysis [7],thermal evaporation [8],