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Band gap engineering in PbO nanostructured thin films by Mn doping

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Abstract: Thin films of PbO and manganese doped PbO with different Mn doping levels (0.5, 1, 3, 5, and 10 mol%) were deposited on glass substrate using ultrasonic spray pyrolysis technique. The structural and morphological properties of the films has been investigated by X-ray diffraction (XRD) and scanning electron microscopy (SEM). XRD study reveals that the deposited PbO and Mn doped PbO films are polycrystalline in nature. The crystallinity of PbO thin films is gradually deteriorated with increasing the Mn concentration. As a result of Mn incorporation in PbO lattice, strong morphological and structural variations are observed. The band gap for undoped PbO thin film is 2.59 eV. The optical band gap of PbO films varies from 2.72 to 1.66 eV with increasing the Mn concentration. The wavelength dependent oscillatory behavior is observed for the refractive index and dielectric constants of Mn doped PbO thin films. The correlation between the structural modifications and the resultant optical properties are reported.

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