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Study and elaboration of Fe - doped SnO_2 thin films for the capture of Li ions

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1- Abstract

In this study, tin oxide (SnO_2) films were deposited on 480°C heated glass by spray pyrolysis with moving nozzle (SPMN). Tin chloride ($SnCl_2$, $2H_2O$) was used as precursor solution, iron chloride ($FeCl_3$) and lithium chloride ($LiCl_2$) were used as doping sources. Effect of high/low Fe and Li doping concentration on structural, morphological, optical, and electrical properties of SnO_2 thin films. The transmittance of all Fe-doped SnO_2 thin films was more than 78% in the visible region. The optical gap was found to be in 3.64-3.58 eV. The existence of functional groups and the chemical bonding is confirmed by Fourier-transform infrared spectroscopy (FTIR) spectra. X-ray diffraction study showed that elaborated thin films have a polycrystalline structure with tetragonal crystal. The preferential orientation shift from (*211*) toward (*110*) plane for 1, 2 and 4 wt.% Fe/Sn only, whereas crystalline size was ranged in 57-36 nm. An increase in electrical resistivity increases from 1.2×10^{-4} to 3.4×10^{-3} Ω cm. The Hall effect measurements have shown n-type for non-doped SnO_2 thereafter the type conductivity changes to p-type for more than 2wt.% Fe-doped SnO_2 thin films.

2- Key words: SnO_2 films, Fe-doped SnO_2, XRD, FTIR, spray pyrolysis

3- Thesis plan

• Bibliography study on the tin oxide of SnO_2 and its elaboration.

• Elaboration of SnO_2 thin films by spray pyrolysis.

• The optical characterization (UV-Vis and IR) of the material deposited before and after doping.

• Electrical characterization of the thin films before and after iron/lithium doping.

• Structural characterization of the elaborate before and after iron/lithium doping.

• Application of SnO_2 in capturing lithium ions or in gas detection (if possible).

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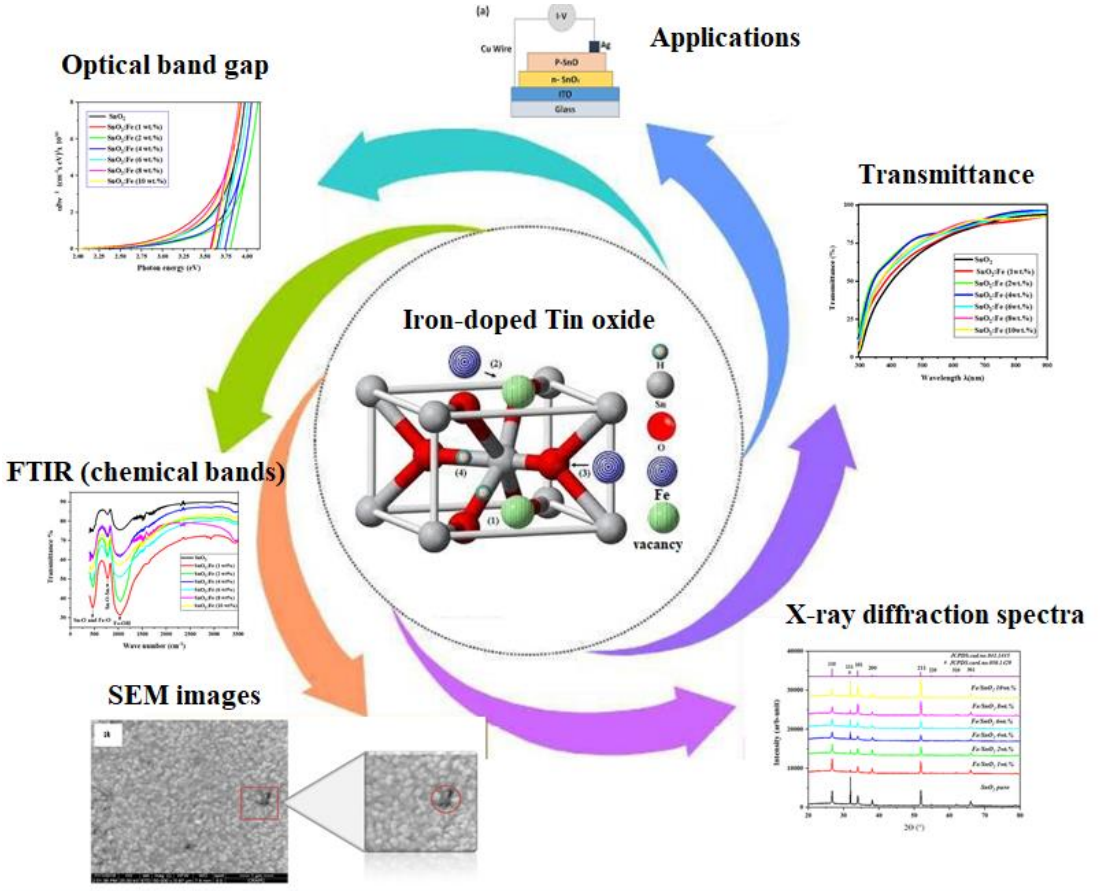
4- Obstacles

- MEB, PL, Thermoelectric effect not available.
- Lack of chemicals and work material.
- Weakness in characterization analysis.

5- Abstract Graphic



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