Morphology, XRD and EDX study of screen-printed thick films based on SnO_2 / Te nanocomposites

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Te / SnO_2 nanocomposites have been synthesized by solvothermal recrystallization of polycrystalline tellurium powder, followed by Te reduction in the presence of a solution of tin chloride. The thick solid films (~ 15 μm) based on these composites were manufactured via screen printing technique but the paper served as a substrate (Fig.1).

Fig.1. The image of tellurium / tin dioxide nanocomposites printed on the paper substrate

It has been established that composites consist of fluffy structures of small agglomerates of irregular blocks of dimensions 100 - 200 nm (Fig. 2).

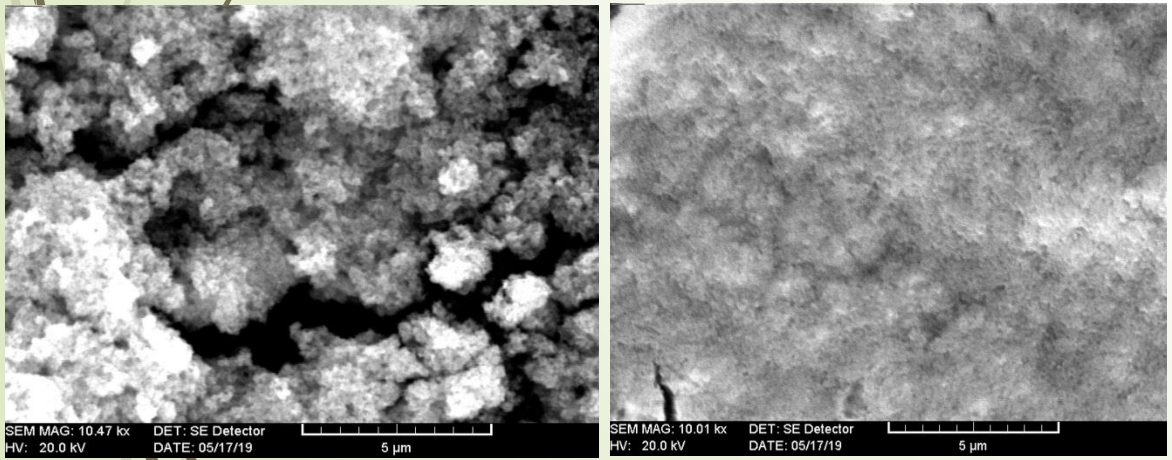

Fig.2. SEM micrographs of Te / SnO_2 thick and thin films.

The surface morphology of the films was investigated using the scanning electron microscope (SEM VEGA TESCAN TS 5130 MM) coupled with energy-dispersive X-ray spectroscope (EDX, INCA OXFORD instruments) but XRD has been applied for their structural characterization.

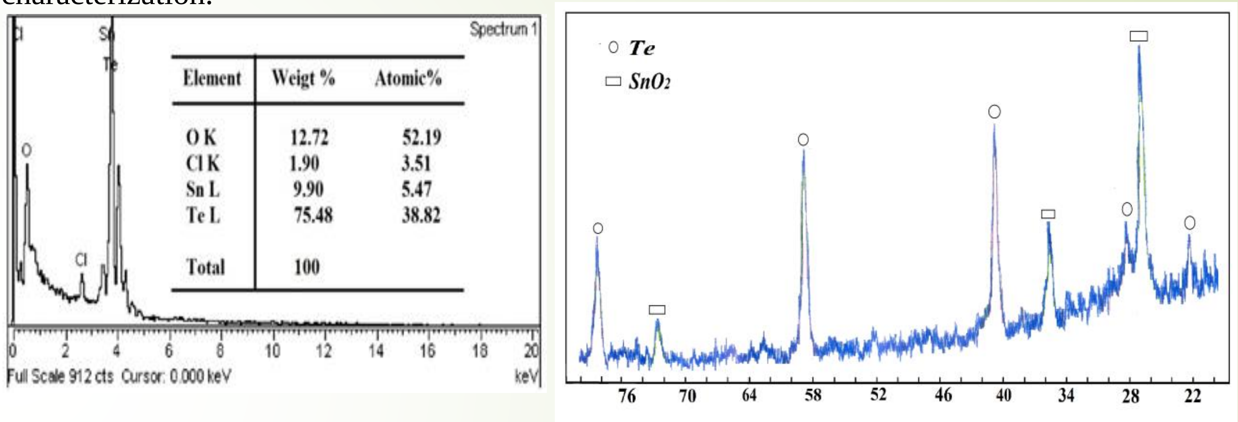

Fig.3. EDX and XRD diffraction pattern of SnO_2 / Te thick films

Figure 3 illustrates the results of EDX that shows the elemental composition of synthetized solid films based on Te / SnO_2 nanocomposites that comprisis approximately 39 at.% Te and 6.0 at.% Sn . Compositional and phase analysis of the fabricated nanocomposite thin films examined by XRD appeared to be entirely consistent with EDX analysis. All of the diffraction peaks in XRD pattern have been readily indexed to the hexagonal phase of tellurium with lattice constants of a = 4.46 Å and c = 5.94 Å [1] along with polycrystalline tin dioxide with predominant orientation of the crystals (110) [2].

Conclusion:

It is expected that the synthesized in this work SnO_2 / Te nanocomposites will be of interest to be used in elaboration of the chemical transducers.

1. F. Liang, H. Qian. Synthesis of tellurium nanowires and their transport property, Materials Chemistry and Physics. 2009. V. 113. p. 523 – 526.

2. JCPDS 36-1452 (Te); 41-1445 (SnO_2).