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Characterization of composite films made from Tin (IV) Oxide and Magnesium Oxide with impedance spectroscopy

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Impedance spectroscopy (IS) subsumes the small signal measurement of the linear electrical response of a material of interest including electrode effects and the subsequent analysis of the response to yield useful information about physicochemical properties of the systems. In the majority of cases, the nano-structured films are better represented by a more complicated network of resistances and capacitances, so-called equivalent circuit. IS analysis generally makes a considerable use of these equivalent circuits.

Impedance of composite porous films has been taken into consideration and the behaviour of composite films made from homogenous mixtures of SnO_2 and MgO were analyzed using IS to describe the mechanism of charge carrier transportation. Analysing the Nyquist plots, the sheet resistance of the CTO glass was found to be around 610.47 Ω. But the parallel resistance of the film varied dramatically while altering the composition (Figure 1). 10% addition of MgO to the composite showed a high impedance which was of two orders of magnitude higher than pure MgO. The charge transport mechanisms at different levels of MgO in the composite films are being discussed in this study. Various compositions of MgO in the SnO_2/MgO composite films can be found in different applications of devices such as solar cells, capacitors and thin film transistors.

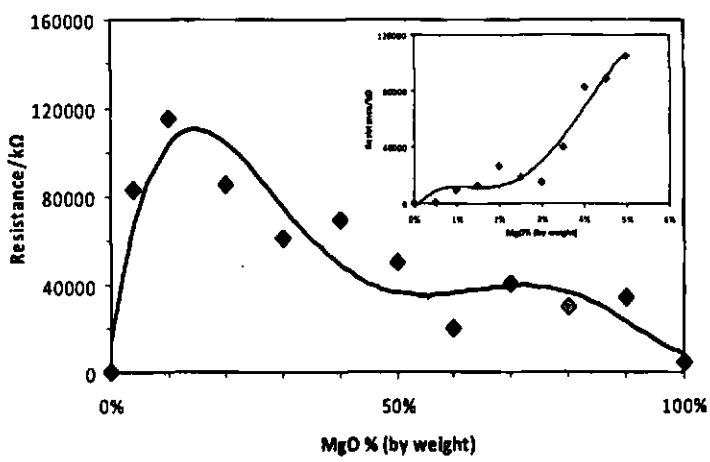

Figure 1: Resistance vs MgO % by weight of MgO/SnO_2 composite films

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