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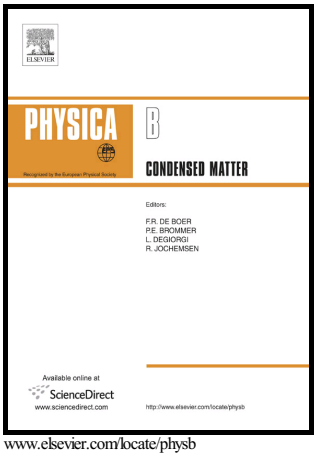

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Electrical and gas sensing investigations on the sprayed ZnO:Cu thin films

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Abstract:

The electrical and gas sensing properties of the sprayed Cu doped ZnO thin layers were investigated. The main study is an analysis of the conduction mechanism based on the measurement results of the frequency dispersion of the conductivity at different temperatures performed by impedance spectroscopy. It emerges from this study that the transport mechanism of charge carriers in such thin films is a thermally activated hopping mechanism. This process is confirmed by the obtained values of the maximum barrier height W_m deduced from the study of the frequency power law of the ac conductivity. Otherwise, we have studied the response evolution of ZnO: Cu sensors ethanol versus time, working temperature and relative doping. From the measurement results of gas sensing properties of ZnO :Cu thin film, we find that a good stability and response was observed for a doping of 2%.

Keywords: Cu doped ZnO; Impedance spectroscopy; ac conductivity; dielectric properties; ethanol gas sensing.

1- Introduction

The zinc oxide ZnO thin film has good prospects as an oxide transparent conductor when it is doped with transition metals. Indeed, this doping can act effectively in improving the transport properties of the ZnO material, particularly a significant reduction of material resistivity. Likewise, in addition to its chemical and mechanical stabilities, the values of its band gap Eg, of about 3.1 - 3.4 eV are quite favorable for optoelectronic applications and photovoltaic