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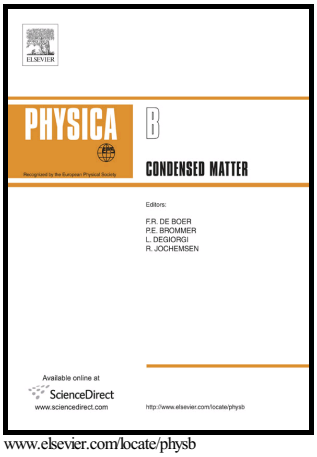

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Effect of pH on the electrical properties and Conducting mechanism of SnO_2 nanoparticles

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Abstract

Semiconductor nanoparticles have attracted more interests because of their size-dependent optical and electrical properties.SnO_2 is an oxygen-deficient n-type semiconductor with a wide band gap of 3.6 eV(300K). It has many remarkable applications as sensors, catalysts, transparent conducting electrodes, anode material for rechargeable Li- ion batteries and optoelectronic devices. In the present work, the role of pH in determining the electrical and dielectric properties of SnO_2 nanoparticles has been studied as a function of temperature ranging from Room temperature (RT) to 114°C in the frequency range of 7MHz to 50 mHz using impedance spectroscopic technique. The non linear behavior observed in the thermal dependence of the conductance of SnO_2 nanoparticles is explained by means of the surface property of SnO_2 nanoparticles where proton hopping mechanism is dealt with. Jonscher's power law has been fitted for the conductance spectra and the frequency exponent ("s" value) gives an insight about the ac conducting mechanism. The temperature dependence of electrical relaxation phenomenon in the material has been observed. The complex electric modulus analysis indicates the possibility of hopping conduction mechanism in the system with non-exponential type of conductivity relaxation.

Keywords: Tin oxide nanoparticles, Sol-Gel method, pH value, impedance spectroscopy, conducting mechanism.

I. Introduction

Studying the surface property and the conducting nature of semiconductors is essential to go for their potential applications. Intensive research is going on for finding the suitable material as energy storing device.