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Optical and electrical characterization of ZnO thin films deposited by RF sputtering in Ar-H₂ plasmasGloria Gottardi¹, Rajesh Pandiyan², Victor Micheli¹, Ruben Bartali¹, Nadhira Laidani¹¹Fondazione Bruno Kessler, Trento - Povo, Italy ²University of Trento, Physics Department, Trento - Povo, Italy

ggottard@fbk.eu

Among transparent conductive oxides, ZnO has gained increasing attention in the last years because of its several attractive properties and - above all - its higher abundance compared to other TCO materials. The wide prospective use of ZnO in technological domains like photovoltaics, flat panel displays, smart windows, etc. has been stimulating research aimed especially at understanding the factors controlling the conductive and optical properties of this material and at identifying their dependence on the film structure and growth process conditions.

In this respect, the present work aims to look into the optical and conductive properties of ZnO thin films deposited on n-type Si (100) and glass substrates by RF sputtering using Ar-H₂ gas mixtures at various concentrations (0 - 50%). The optical properties (absorption, optical gap and refractive index) were obtained by UV-Vis transmittance and reflectance spectroscopy. Electrical conductivity and carrier density were determined by means of van der Pauw and Hall effect measurements.

The addition of hydrogen in the sputtering gas appears to strongly affect the chemical structure of ZnO films. Besides, hydrogen was found to greatly improve conductivity while maintaining a good transparency level which was reflected in an optical gap slightly varying with hydrogen concentration in the gas.

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