Solar Energy Materials 17 (1988) 425–431
North-Holland, Amsterdam

ELECTRICAL AND OPTICAL PROPERTIES OF CHEMICALLY DEPOSITED SnO_2:I COATINGS

A.K. ABASS, H. BAKR, S.A. JASSIM

Department of Physics, College of Science, University of Basrah, Basrah, Iraq

and

T.A. FAHAD

Department of Chemistry, College of Education, University of Basrah, Basrah, Iraq

Received 24 October 1987; in revised form 9 May 1988

Thin coatings of SnO_2 and SnO_2:I are prepared using the spray pyrolysis technique. The effect of iodine doping on the electrical and optical properties of SnO_2 are studied and compared with other types of doping. The electrical sheet resistance is minimum (30 Ω/□) and optical transmission at solar maximum is 95% for an SnO_2 coating doped with 0.3 wt% iodine. The absorption coefficient data versus photon energy for SnO_2 coatings doped with 0.3 wt% iodine are analyzed and interpreted in terms of direct and indirect allowed transitions.

1. Introduction

A transparent–conductive semiconductor possesses the unique properties of good electrical conductivity and high optical transparency in the visible spectrum [1–8]. The optical and electrical properties of SnO_2 coatings are improved by doping with fluorine, chlorine, and antimony [9–14,7]. The investigations of SnO_2 coatings are interesting because of their wide range of applications: (i) as a heat mirror suitable for application in solar photo–thermal conversion [6], (ii) heterojunctions of transparent–conductive oxides on bulk semiconductors show considerable promise for use in inexpensive solar cells [2,15], (iii) the refractive index of SnO_2 is in the right range so as to form an antireflection coating on silicon and GaAs [4]. In the present work SnO_2 coatings doped with iodine were prepared using the spray pyrolysis technique. The electrical and optical properties were studied with various iodine doping concentrations.

2. Experimental

The coatings were chemically deposited using the spray pyrolysis technique onto heated borosilicate glass substrates. Spraying solutions containing 30 g $SnCl_4$, 37 ml H_2O, 30 ml CH_3CH_3OH and HCl were used for preparing SnO_2 coatings. HCl was