

Characterisation of ITO sputtered coatings on glass and plastic substrates prepared at room temperature

V. Teixeira^{*}, H-Ning Cui, J. O. Carneiro, A. Portinha, R. Newton, H. Fonseca, L. J. Meng¹

University of Minho, Physics Department, GRF Group, Azurém Campus, 4800-058, Guimarães, Portugal

¹ Instituto Superior de Engenharia do Porto, Physics Department, Rua Dr. António Bernardino de Almeida 431, 4200-072 Porto, Portugal

*Corresponding author. tel.: +351-253510477/65; fax: +351-253510401; *e-mail address*: vasco@fisica.uminho.pt

Abstract

Indium tin oxide (ITO) thin films onto glass substrates are widely used as transparent and conductive electrodes for various displays and photovoltaic devices.

The replacement to flexible polymer substrates is gaining a great interest because it can give advantages such as lighter weight, higher shock resistance and scalable roll-to-roll deposition processes. Generally a high optical transmission and a lower sheet resistance characterise the high-quality film of Indium-tin-oxide (ITO). Especially a high transmission as first and then a sheet resistance as small as possible are very important for a smart (electrochromic) window application.

In this work, ITO thin films were prepared by d.c. magnetron sputtering at room temperature on glass and plastic substrates using different Ar/O₂ ratio and deposition time. It was obtained some improvements on the film properties, microstructure and other physical characteristics for different conditions. Amorphous and polycrystalline films can be obtained for different deposition conditions. The films exhibited suitable optical transmittance and conductivity for electrochromic applications. The thickness, microstructure, surface roughness, refractive index and energy band gap of the ITO films were investigated by the transmission, absorption, specular and diffuse reflection spectra in some ranges of UV-Vis-NIR. The sheet resistance, atomic force microscopy, SEM and spectra data calculation were studied.

Keywords: magnetron sputtering, polycarbonate, plastics, smart coating, ITO, TCO, transparent oxide conductors, electrochromism