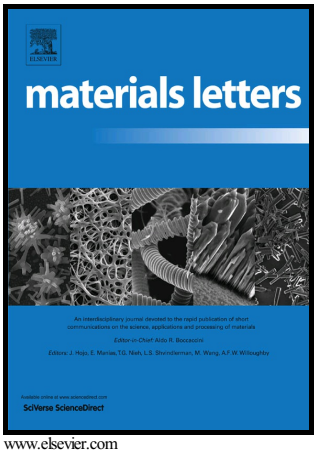

On optical properties of phosphate glass thin films

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PII: S0167-577X(16)31050-3
DOI: http://dx.doi.org/10.1016/j.matlet.2016.06.094
Reference: MLBLUE21095

To appear in: *Materials Letters*
Revised date: 3 June 2016
Accepted date: 22

Cite this article as: M. Hammi and A. Maaroufi, On optical properties o phosphate glass thin films, *Materials Letters* http://dx.doi.org/10.1016/j.matlet.2016.06.094

On optical properties of phosphate glass thin films

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ABSTRACT

The present work is focused on obtaining sol-gel thin films belonging to $ZnO-P_2O_5$ system by using zinc acetate dehydrate; diethanol amine and orthophosphoric acid .It was confirmed by scanning electron microscopy that $ZnO-P_2O_5$ thin films are homogeneous. The X-ray diffraction patterns indicated that the binary structure system is amorphous. FTIR (Fourier transform infrared spectroscopy) aimed at investigating the structural features of zinc phosphate network; and the synthesized films exhibited the UV transmittance at around 85%with the estimated direct band gap energy of 3.5eV.

Keywords: $ZnO-P_2O_5$ thin films, UV transmittance, X-ray diffraction, FTIR, scanning electron microscopy (SEM), band gap energy.

1 INTRODUCTION

The optical transparency, chemical durability and manufacturability of glass make it a possible material for solar energy. Also these materials are attracting much attention because of their potential applications in clean-energy areas such as fuel cells, batteries, sensors, and electrolysis [1, 2]. Binary glasses based on $ZnO-P_2O_5$ is one of solid materials that must be useful in solar energy, since both $P_2O_5$and ZnO are abundant, non-toxic, and low cost. Moreover ZnO is well known by it potential applications in solar cells, it is much less expensive than indium oxide and would be an alternative to replace ITO, also, it can be combined with many other oxides such as Cu_2O [3, 4].In this study we focus more particularly on the front window of solar cell which is supposed to be of a good optical transparency thus we have choosed to develop $ZnO-P_2O_5$ glass thin film. Non crystalline layers are common transparent materials in the visible and cannot conduct electrical current, it is then called insulator. This material has a high gap value,but there are some discrepancies in the literature regarding the energy gap [5]. Nevertheless, H.Hosono has demonstrated the possibility of a high mobility in the amorphous TCO. Martins and Fortunado have then deposited TCO amorphous films on paper substrate and created transistors based on transparent and conductive materials [6]. From this discovery we have picked up the idea that the deposition of $ZnO-P_2O_5$ thin films at low temperature would be possible without crystallization. This research is focused on investigating the structural and optical features of thin films prepared by sol-gel route .Structural units that compose the amorphous network were put in evidence by FTIR