ELSEVIER

Solar Energy Materials & Solar Cells 72 (2002) 223–229

Solar Energy Materials & Solar Cells

www.elsevier.com/locate/solmat

Optical improved structure of polycrystalline silicon-based thin-film solar cell

Elena Budianu[a,*], Munizer Purica[a], Elena Manea[a], Emil Rusu[b], Raluca Gavrila[a], Mihai Danila[a]

[a] *National Institute for Research and Development in Microtechnologies, P.O. Box 38-160, 72225, Bucharest, Romania*

[b] *Institute of Applied Physics, MD-2028, Academiei-Str.5, Chishinev, Moldavia*

Abstract

This paper presents an n-i-p type solar cell structure consisting of polycrystalline silicon thin film as an absorber of incident radiation and a ZnO thin film for optical improvement. The characteristics of Si layers (thickness and doping level) are designed to assure a high value of collection efficiency for photogenerated carriers. The thin films of polycrystalline silicon are obtained by CVD at a temperature of around 620°C. ZnO thin film is prepared by thermal decomposition of Zn-acetylacetonate [$Zn(C_5H_7O_2)^2$] in a vertical reactor. It is used as AR coating and as contact electrode due to its properties of high transparency ($>90\%$) and high conductivity ($3\times10^{-4}\,\Omega\,cm$). Polycrystalline silicon and ZnO films have been investigated in terms of surface morphology and grain size by AFM and XRD.

Keywords: Solar cell; Thin film; Polysilicon; ZnO

1. Introduction

Solar cells based on crystalline thin films represent a promising way for simultaneously achieving good efficiency and low manufacturing cost. An important research activity in the field of good performance and low-cost solar cells is related to the types of thin-film solar cells [1], thin-film silicon growth or deposition techniques [2] and theoretical calculations [3]. The advantage of a thin-film concept is based on the fact that the semiconductor can be deposited directly on low-cost substrates. The

*Corresponding author. Tel.: +40-1-4908412; fax: +40-1-4908-238.

E-mail address: elenab@imt.ro (E. Budianu).

0927-0248/02/$ - see front matter
PII: S0927-0248(01)00169-6