

FABRICATION AND CHARACTERIZATION OF THIN FILM SOLAR CELLS USING LIQUID DOPANT BY SPIN COATING METHOD

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In the name of Allah, the Beneficent and the Merciful

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ABSTRACT

FABRICATION AND CHARACTERIZATION OF THIN FILM SOLAR CELLS USING LIQUID DOPANT BY SPIN COATING METHOD

This report presents the fabrication and characterization of thin film solar cells using liquid dopant by spin coating method at different spin speed and annealing temperatures. Silicon is still the most widely used element for solar cell production, due to the improvement of physical properties of silicon structures. Thus the aims of the study are to fabricate and characterize the thin film solar cell using phosphorosilicafilm 3×10^{20} liquid dopant. Phosphorosilica doped p-type silicon thin films were successfully deposited by spin coating in the range of 2000 - 4000 rpm and by using annealing temperature range of 700°C - 900°C in 30 minutes diffusion. The characterized of the film that influence of various spins speed and annealing temperature consist of electrical and physical properties. The properties of thin films solar cell were characterized by using Solar Simulator (Bukoh Keiki CEP-2000) and Field Emission Scanning Electron Microscope (FESEM) to measure current-voltage (I-V), Voc, Isc and fill-factor (FF) to get the efficiency (η) and for structure characterization.

Keywords : Phosphorosilicafilm 3×10^{20} , P-Type Silicon Solar Cells, Spin Coating Method.

CHAPTER 1

INTRODUCTION

1.1 THIN FILM SOLAR CELLS

Faced with an alarming increase of energy consumption on one side, and very limiting amounts of available conventional energy sources on the other, scientists have turned to the most promising, renewable energy sources. Possibilities for the application of solar systems based on photovoltaic conversion of solar energy are very wide, primarily because of their relatively low cost and very important fact that solar energy is most acceptable source of electrical energy from the environmental point of view [1].

Development of Solar Cells involves of three generation. The first generation cells consist of large-area, high quality and single junction devices. Single junction silicon devices are approaching the theoretical limiting efficiency of 33% and achieve cost parity with fossil fuel energy generation. Second generation materials make the use of thin film technology. The most successful second generation materials have been cadmium telluride (CdTe), copper indium gallium selenide (CIGS), amorphous silicon and micro amorphous silicon. These materials are applied in a thin film to a supporting substrate such as glass or ceramics reducing material mass and also the cost. Third generation technologies (Thin Film Solar Cells) aim to enhance poor electrical performance of second generation (thin-film technologies) while targeting conversion efficiencies of 30-60% while retaining low cost materials and manufacturing techniques. Nanotechnology-enhanced, thin-film solar cells are a promising and potentially important emerging technology [2].