EFFECT OF NITROGEN DOPING IN AMORPHOUS CARBON THIN FILMS GROWN BY THERMAL CHEMICAL VAPOR DEPOSITION (CVD) METHOD

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ABSTRACT

This paper is to investigate the effect of Nitrogen doping on amorphous carbon thin films at different Nitrogen flow rates and different deposition temperature by thermal chemical vapor deposition (CVD) technique. Camphor oil was used as the precursor while argon and nitrogen were used as carrier gas. The electrical, optical and structural properties were characterized by using Bukoh Keiki (CEP2000) Solar Simulator system at room temperature, Perkin Elmer (LAMBDA 750) UV/Vis spectroscope, Raman spectroscope and Atomic ForceAtomic XE-100 PARK SYSTEM Microscope (AFM) respectively. There are significant changes in conductivity (dark and illumination), optical bandgap and structural properties when Nitrogen doping was introduced and the flow rate was varied .Nitrogen flow rate of 30 bubbles per minute sample gives the highest value of conductivity, absorption coefficient and intensity and have a narrow band gap.For varied deposition time, the 30 minute gives the highest value of conductivity, highest absorption coefficient, highest Raman intensity ratio and lowest bandgap.

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CHAPTER 1

INTRODUCTION

1.1 BACKGROUND RESEARCH

Solar cells are semiconductor devices that convert sunlight directly into electricity, either directly through the photovoltaic effect, or indirectly by first converting the solar energy to heat or chemical energy. With the increase in world population there is an growing demand of energy. But, the commercially available solar cells are still expensive and the efficiencies of them are not high enough yet [5]. The amorphous carbon solar cells were fabricated to develop a low-price solar cell. The photon absorption in the emitter of a heterojunction solar cell leads to a considerable current loss due to the high recombination in this layer. So, it is necessary to suppress light absorption in the window layer or to reduce the recombination in order to improve the efficiency of the solar cell. One direct attempt is to widen the optical band gap by adding carbon in the emitter [1].Carbon is often considered to replace the silicon in the future because of the unique properties resulting from the variety of possible structural forms such as graphite, diamond, nanotubes and fullerenes [2]. Carbon is also occurs in amorphous form like soot, carbon fibers and evaporated carbon, and it is also believed that many more forms of carbon are yet to be discovered [3]. Amorphous carbon (*a*-C) is an interesting material with mechanical and electronic properties close to those of diamond. a-C thin film also cheap and environmentally benign material with outstanding properties such as chemical inertness, high hardness, high electrical resistivity and tunable band gap by adjusting sp^2 and sp^3 carbon bonding ratio for semiconductor technology [4].Optical properties of amorphous carbon can results in the tunable band gap tailored over wide band gap from that of the semimetallic/ soft graphite (~0.0eV) to that of insulating/hard diamond (5.5eV) [5, 6].