Abstract No: 759 ***Natural Sciences***

EFFECT OF BATH TEMPERATURE AND NH_3 CONCENTRATION ON CBD CdS THIN FILMS

W.G.C. Kumarage[1, 2], K.I.H. Senevirathne[2], V.A. Seneviratne[2], C.P. Jayalath[2] and B.S. Dassanayake[2]*

[1]Postgraduate Institute of Science, University of Peradeniya, Sri Lanka
[2]Department of Physics, Faculty of Science, University of Peradeniya, Sri Lanka
**buddhid@gmail.com*

Fossil fuel, coal, oil and natural gasses are created several millions of years before by decaying plants and animals. These fuels are being consumed much rapidly than they are being created. So, these fuels are called as non-renewable energy. They provide around 66% of the world's electrical power and 95% of the world's total energy demand. With the end of the fossil fuel era, arriving faster than mankind thought, the civilization is now forced to invent alternative energy sources to meet their energy demand. Alongside that, with ever increasing concerns about environmental protection, extracting energy from renewable green sources has become a key interest. Among various different solar cell technologies, thin film solar cells stand out due to their promising efficiencies in the range of 16-18% so far. One of the promising material systems for solar cell mass production is the p-CdTe/n-CdS/TCO/glass structure. As CdTe has a near optimal band gap (1.45 eV) for solar absorption. The n-CdS (2.42 eV) forms one side of the electrical junction and acts as the window layer. The calculated theoretical efficiency for CdS/CdTe solar cell has been estimated at around 29% but in practicality the conversion efficiency of 16% was achieved with the application of a post deposition $CdCl_2$ treatment of the CdTe layers. In this research work CdS thin films were fabricated using Chemical Bath Deposition (CBD), which is a low cost technique, to be applied as the window layer of inorganic CdS/CdTe solar cells.

CdS was grown using 0.1 M cadmium sulfate, 0.2 M thiourea, 25% w/w ammonia and 0.5 M ammonium hydroxide on fluorine doped tin oxide (FTO) glasses. Properties of the films were optimized by varying the solution parameters such as chemical concentrations (NH_3) and bath temperature. Bath temperature of the reaction solution was varied from 40 to 80 ºC to study its effect on optical and electrical properties of the samples. Transmittance in the range 300 – 800 nm was found to be decreasing with the increasing NH_3 volume. The fabricated films at bath temperatures from 40 to 80 ºC revealed that the optical band gaps increase when moving away from the bath temperature range of 50 – 60 ºC, potentially due to different CdS deposition mechanisms at higher and lower temperatures. The best transmission as well as the film quality was obtained when deposited in a bath of 80 ºC with 0.2 ml of 25% w/w NH_3 solution for 1 hr.

Financial assistance given by the National Science Foundation (RG/2012 BS/03) of Sri Lanka is acknowledged.