

**ADVANCES
IN MATERIALS
ENGINEERING**

Volume 2

**Edited By:
Md Abdul Maleque
Iskandar Idris Yaacob
Zahurin Halim**



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Electrodeposited CdS / CdTe Solar Cells

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Keywords: Electrodeposition, Cadmium Sulfide, Cadmium Telluride, Solar Cells, Single Junction.

Abstract. The formation steps necessary for producing high quality electrodeposited CdS / CdTe solar cells are described. The key step in this process involves the heat treatment of the as-deposited n-type CdTe layers at around 400 °C. The results of studies made on the structural, electrical and optical properties of the electrodeposited CdS, CdTe films are presented. CdS/CdTe hetero-junction solar cells with reasonable efficiency have been demonstrated using electrodeposition techniques

Introduction

CdTe, with its near-ideal band gap and high optical absorption coefficients, is a promising compound semiconductor for low-cost thin film solar cell applications [1]. Polycrystalline thin films of CdTe have been successfully prepared by a variety of techniques such as vacuum evaporation [2, 3], sputtering [4], close-spaced vapor transport (or sublimation) [5, 6], screen printing [7], spraying [8], chemical vapor deposition [9] and electrodeposition [10, 11]. Although all the methods listed above can, under properly monitored growth conditions, produce single-phase CdTe films, so far the best solar cells have been obtained using films prepared by close spaced vapor transport (or sublimation), screen printing, chemical vapor deposition and electrodeposition techniques. These devices were all Cd(Zn)S/p-CdTe-type hetero-junctions and they have demonstrated over 9% conversion efficiency. Recent reviews of thin film CdTe solar [12-14].

Electrodeposition is a very attractive method for thin film solar cell processing. It is a simple technique which lends itself to large-scale production. It does not require specialized expensive equipment. Material utilization in the electrodeposition technique is extremely good since plating takes place only on the substrate. Electrodeposition can produce high purity materials if special attention is paid to the purification of the plating solutions which can be achieved by pre-electrolysis.

In this chapter, we developing the electroplated CdTe thin film solar cells, especially the very promising CdS/CdTe hetero-junction structures. The work include a brief overview of the initial research which resulted in the development of the cathodic electrodeposition technique for CdTe and the demonstration of the first Schottky barrier solar cells made on this material. Also, the electrodeposition technique for CdS, thin films and the contacting