

# BACK CONTACT CHARACTERIZATION STUDIES OF CdS/CdTe THIN FILM SOLAR CELLS

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Thin-film cadmium telluride (CdTe) solar cells are one of the most promising candidates of photovoltaic energy conversion. One of the critical issues associated with the fabrication of thin film CdTe solar cells is the formation of a stable, low-resistance back contact. The principal problems are its high work function and the difficulty associated with reliably obtaining high p-type doping concentrations. One of the most common approaches to contact formation is to heavily dope the semiconductor region adjacent to the contact to promote quantum mechanical tunneling. In this paper we report that the processing conditions are optimized for methods that use Copper Telluride ( $\text{Cu}_2\text{Te}$ ) as the contact material.

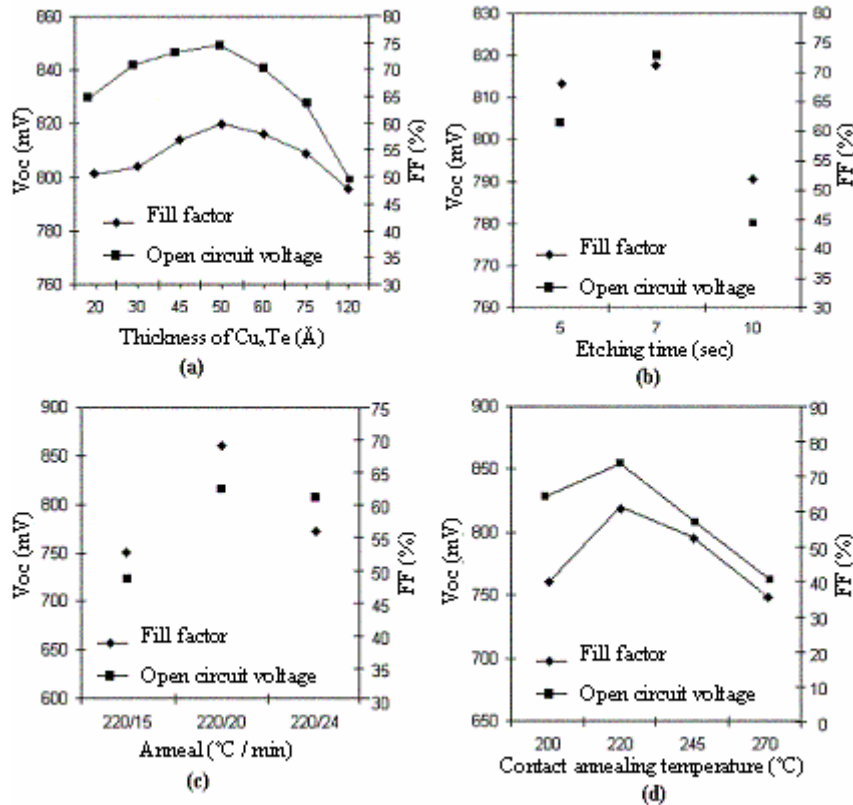


Fig. 1 (a) Effect of the  $\text{Cu}_2\text{Te}$  thickness on Voc and FF. (b) Effect of etching time on Voc and FF. (c) Effect of contact annealing time on Voc and FF. (d) Effect of contact annealing on Voc and FF.

CdTe solar cell was fabricated on high purity corning 7059 glass used as substrates, followed by the deposition of the front contact which is the transparent conducting oxide (TCO). Cadmium sulfide (CdS) was deposited as n-type window layer for the CdTe absorber layer. Then the method using copper telluride as contact material to thin film CdTe solar cells was investigated. An extensive set of experiments including the effect of etch time on CdTe surface,  $\text{Cu}_2\text{Te}$  thickness, post deposition heat treatment and molybdenum deposition were performed to determine the optimum processing conditions. RF sputtering technique was employed to deposit all the contact layers. Fig. 1 shows the result of the processing conditions we propose. An optimum cell performance was obtained for  $\text{Cu}_2\text{Te}$  deposited at 250°C to a thickness of 50Å, followed by the deposition of 1µm molybdenum at 2mTorr (not shown in Fig. 1) and then annealed at 220°C for 20min. The open circuit voltage was 820mV, and the fill factor was 72%.

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- 2) T. A. Gessert et al., J. of Elect. Mat., Vol 24, No 10, pp 1443-1449 (1995).
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**TOPICS+KEYWORDS:** Back Contact, RF Sputtering, Cadmium Telluride, Copper Telluride.