REFERENCES

1. Angström, A., 1924. Solar and terrestrial radiation. Q.J.R. Meteorol. Soc. 50, 121–125.
2. Allen, R., 1995. Evaluation of procedures of estimating mean monthly solar radiation from air temperature. FAO, Rome.
3. Allen, R., 1997. Self-calibrating method for estimating solar radiation from air temperature. J. Hydrol. Eng. 2, pp. 56–67.
4. Community Survey 2016, Statistical release P0301/Statistics South Africa (http://www.statssa.gov.za) accessed 12 March 2017.
5. Duffie, J.A. and Beckman, W.A. Solar engineering of thermal processing, 1991, 2nd ed. Madison: John Wiley and Sons, Inc.
6. Hanaor A.D, *et al.*, 2012. Ab Initio Study of Phase Stability in Doped TiO2. Comp. Mech., 2, pp. 185-194.
7. Kominami H,et al 2000. Synthesis of brookite-type titanium oxide nano-crystals in organic media. J. Mater. Chem., 10, pp. 1151.
8. Munzhedzi, R., *et al.*, 2009. Redrawing the solar map of South Africa for photovoltaic applications, Renewable Energy, 34, pp. 165-169.
9. State of Renewable Energy in South Africa 2015 published by the Department of Energy.
10. http://www.brandsouthafrica.com/tourism-south-africa/geography/limpopo (accessed 13 March 2017).
11. http://www.observer.co.za/limpopos-third-solar-plant-in-operation (accessed 13 March 2017).

Chapter 13

Fabrication of CdS/CdTe Thin Film Solar Cells via the Technique of Electrodeposition

H.Y.R. Atapattu[1], D.S.M. De Silva[1]*, A.A. Ojo[2] and I.M. Dharmadasa[2]

[1]Department of Chemistry, University of Kelaniya, Kelaniya, Sri Lanka
E-mail: sujeewa@kln.ac.lk
[2]Materials and Engineering Research Institute, Sheffield Hallam University, Sheffield S1 1WB, UK

This study focused on fabrication of CdS/CdTe solar cells using the technique of electrodeposition as it is simple, low cost and scalable method. Initially, CdS and CdTe materials were individually deposited on fluorine doped tin oxide (FTO) glass substrates and optimum growth conditions were obtained by analyzing their structural, compositional, electrical, optical and morphological properties using the techniques of X-ray diffraction, Energy Dispersive X-ray spectroscopy, photo-electrochemical cell study, optical absorption spectroscopy and scanning electron microscopy respectively. Thereafter, final device structure ofglass/FTO/CdS/CdTe/Au was fabricated using the optimum growth conditions obtained for the two materials, CdS and CdTe. Finally the current density-voltage characteristics of the devices were obtained to assess devices. The best device structure exhibited short circuit current density (J_{sc}) of 24.4 mA cm^{-2}, open circuit voltage (V_{oc}) of 681.9 mV, Fill Factor (FF) of 0.32 and conversion efficiency of 5.4 per cent.

Keywords: *Cadmium sulfide, Cadmium telluride, Thin films, Solar energy materials, Electrodeposition, Solar cells.*

* Postal Address: Dr. D. S. M. De Silva, Department of Chemistry, University of Kelaniya, Kelaniya 11600, Sri Lanka; Email: sujeewa@kln.ac.lk; Phone: +94(0) 71 710 7497