

ABSTRACT NO.: 563

TITLE: Dye-Synthesized Solar Cells

AUTHOR: Sharaaz Jadoo (807004089)

SUPERVISORS: Dr. K. De Souza
Dr. R. Andrews

For the past two decades, electrical energy has been solely dependent on the use of fossil-fuels. However because of the rapid increase of the use of electrical energy in this modern civilization these energy sources can be used up and life as we know it would be significantly disturbed.

Due to this alternative and renewable sources of energy have been the primary focus of study. However solar energy apart from the others forms of energy have emerged as the most appropriate alternative to fossil-fuel based energy sources. Since solar cells are a broad area of study this report will be focus on the principles and operation of dye-synthesized solar cells and its efficiencies.

Apart from the conventional silicon based solar cells which assume the task of both light absorption and charge carrier transport these two functions are separated in the dye-synthesized solar cells. At the heart of the dye-synthesized solar cell is a mesoporous oxide layer sintered together so that electronic conduction can take place. The most appropriate oxide layer used is anatase (TiO_2).

A monolayer of the charge-transfer dye is attached to this oxide layer and when this dye is photoexcited, an electron is injected into the conduction band of the oxide layer. The original state of the dye is consequently restored by the donation if an electron from the electrolyte used typically iodide/triiodide. The transport of the electron across the oxide layer involves trapping and detrapping mechanism which is basically diffusion.

Several dyes where compared, however the N3 dye seemed to be the best candidate to date with an overall conversion efficiency of about 11% for the dye-synthesized solar cell.