

UNIVERSITI TEKNOLOGI MARA

**CHARACTERIZATION OF TMED-COPPER
(I) IODIDE (CuI) THIN FILM AND
PERFORMANCE FOR SOLID STATE DYE
SENSITIZED SOLAR CELL
APPLICATIONS**

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Thesis submitted in fulfillment
of the requirements for the degree of
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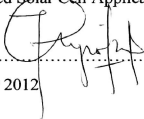
October 2012

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ABSTRACT

This thesis investigates the use of eco-friendly copper (I) iodide or cuprous iodide (CuI), a p-type semiconductor material, with the incorporation of a chelating agent or organic ligand, called tetramethylethylenediamine (TMED@TMEDA) in the preparation for solid-state dye-sensitized solar cells (DSSC). The CuI solution incorporated with the ligand was dispersed in acetonitrile solvent and deposited on glass and indium-doped tin oxide (ITO) substrates. The thin film is characterized to study its suitability for applications in dye sensitized solar cell (DSSC), a low cost solar cell but having high energy conversion efficiency. From the characterization, compared to that of pure CuI film, its optical properties show improved band-gap energy, while its electrical properties show improved conductivity. An efficient solid-state dye-sensitized solar cell (n-TiO₂/dye/p-CuI) with improved stability was fabricated. The TMED-capped CuI crystals not only controls pore-filling of the dyed TiO₂ layer but also improves the electrical contacts between the TiO₂ particles, which in general improves the efficiency of the DSSCs. Current-voltage characteristics of the cell showed a larger energy conversion, achieving higher energy conversion efficiency and improved stability.

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