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# THE DOCTORAL RESEARCH ABSTRACTS

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Name :
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Title :
**Fabrication of $TiO_2$/DYE/CuI Solid-State Solar Cell Using Mist-Atomized CuI Nanostructures**

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This study is carried out to investigate the properties of copper (I) iodide (CuI) thin films deposited by using a novel-mist atomization method. The properties of CuI thin films studied in this research are structural, morphological, electrical and optical properties. The new deposition method of CuI thin films which is by using mist-atomization technique is carried out in order to find the suitability of CuI thin films as a p-type hole conductor for the fabrication of solid-state dye sensitized solar cells (ss-DSSCs). The CuI solution was prepared by dissolving the CuI powder in acetonitrile and deposited onto the conducting glass substrate. Several parameters investigated which are deposition flow rate and frequency, spraying method, substrate temperature, molar concentration and doping concentration to get an optimized film. All of the investigated parameters were carried out by using mist-atomization technique. The nanostructured CuI exhibit a 2-dimensional and quantum confinement effects that lead to improved properties. Further investigations reveal that the 0.05 M of CuI concentration sample was the most conductive sample of 3.93 $Scm^{-1}$ with the highest crystallinity, which then becomes the set of parameters to be applied in the fabrication of solid-state dye sensitized solar cells (ss-DSSCs). Then, the two set of parameters of molar concentration and doping concentrations were carried out to the next part of the research which is the fabrication of ss-DSSCs ($TiO_2$/dye/CuI). In this part, the CuI thin films were fabricated on top of dye-anchored $TiO_2$ layer using a novel mist-atomization method. Therefore, in order to understand the photovoltage behavior, four different parametric studies are conducted. The solar cells efficiencies show same relations with the results obtained in the thin film properties section. It is observed that 0.05M of CuI solution concentration gives the best device efficiency of 1.05% as compared to other parameters. While low device efficiency for cells fabricated with doped CuI thin films was observed when compared to the undoped CuI thin films. From the results, it can be concluded that the nano sized of CuI particles which matched to the porous structures of $TiO_2$ layer and electrical conductivity are the main properties contributed to the ss-DSSCs device efficiency.