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# ENHANCING THE PERFORMANCE OF GEL POLYMER ELECTROLYTE FOR DYE-SENSITIZED SOLAR CELLS

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## Abstract

Dye – sensitized solar cells (DSSCs) are promising cost-efficient devices in the solar energy conversion process. This type of solar cell combines the optical absorption and charge separation processes by the association of a sensitizer as photon absorbing material with a wide band gap semiconductor such as $TiO_2$. The power conversion efficiency of a solar cell depends on the efficiency of light absorption, charge separation and charge collection processes. Usually, liquid electrolytes are used in dye-sensitized solar cells. Liquid electrolytes give high performance to solar cells. However, there are many problems including leakage, evaporation of the solvent and photodegradation. In order to overcome these limitations, quasi-solid-state electrolytes are used. But, the efficiencies of the DSSCs with quasi-solid-state electrolytes are lower than those of DSSCs with liquid electrolytes. However, gel polymer electrolytes become feasible alternatives to the liquid electrolytes having improved properties. Polyvinylpyrrolidone (PVP) based quasi solid-state electrolytes have been synthesized and studied with N719 dye-sensitized solar cells. In order to enhance the ionic conductivity of the gel electrolyte, $TiO_2$ nanofillers were incorporated and suitable amount of the nanofiller for efficient electrolyte has been optimized by current – voltage characterization of the fabricated DSSCs. Gel electrolyte with 0.3% of nanofiller shows a better efficiency of 2.54% while controlled cell shows an efficiency of 1.43% under the same condition. Overall performance of the electrolyte has been enhanced by $TiO_2$ nanofillers.

**Keywords:** *polyvinylpyrrolidone (PVP), dye-sensitized solar cell, gel polymer electrolyte, nanofiller*