

Development of Dye Sensitized Solar Window by Physical Parameters Optimization

Authors : Tahsin Shameem, Chowdhury Sadman Jahan, Mohammad Alam

Abstract : Interest about Net Zero Energy Buildings have gained traction in recent years following the need to sustain energy consumption with generations on site and to reduce dependence on grid supplied energy from large plants using fossil fuel. With this end in view, building integrated photovoltaics are being studied attempting to utilize all exterior facades of a building to generate power. In this paper, we have looked at the physical parameters defining a dye sensitized solar cell (DSSC) and discussed their impact on energy harvest. Following our discussion and experimental data obtained from literature, we have attempted to optimize these physical parameters accordingly so as to allow maximum light absorption for a given active layer thickness. We then modified a planer DSSC design with our optimized properties to allow adequate light transmission which demonstrated a high fill factor and an External Quantum Efficiency (EQE) of greater than 9% by computer aided design and simulation. In conclusion, a DSSC based solar window with such high output values even after such high light transmission through it definitely flags a promising future for this technology and our work elicits the need for further study and practical experimentation.

Keywords : net zero energy building, integrated photovoltaics, dye sensitized solar cell, fill factor, External Quantum Efficiency

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