Study on effect of dual-layer polyvinylidene fluoride nanofiber membrane towards quasi-solid state dye-sensitized solar cell's characteristics

Wan Nur Ainna Amirah Wan Zulkifli[1], Nik Fatin Qistina Amran[1], Alyaa Afiqah Fauzi[1], Faiz Arith[2] and Ahmad Syahiman Mohd Shah[1]

[1]Department of Electrical Engineering, College of Engineering, Universiti Malaysia Pahang, Lebuhraya Tun Razak, 26300 Kuantan, Pahang

[2]Faculty of Electronic and Computer Engineering, Universiti Teknikal Malaysia Melaka, Hang Tuah Jaya, 76100 DurianTunggal, Malaysia

asyahiman@ump.edu.my

ABSTRACT

Dye-sensitized solar cell (DSSC) is one instance of third-generation photovoltaic cell that is capable to be manufactured without sophisticated machineries. Adaptation of polymer-based electrolytes in dye-sensitized solar cells' fabrication have contributed benefits in enhancing the DSSCs' performance. Polymer nanofiber membrane-based material was utilized in the fabrication of DSSCs to function as quasi-solid electrolyte. The impact of Polyvinylidene Fluoride (PVDF) membranes with varied pore sizes and layers of DSSCs' structures and their photovoltaic characteristics are investigated in this paper. The implementation of 0.45µm/0.1µm-pore sized dual-layer PVDF nanofiber membrane as quasi-solid electrolyte in DSSC's structure has shown good improvement in enhancing short circuit current density, fill factor and efficiency with the values of 3.0716µA/cm2, 56.84% and 0.000539%, compared to the 0.1µm-pore sized single layer PVDF nanofiber membrane' structure with 2.0957µA/cm2, 46.18% and 0.000337%, respectively.

KEYWORDS

Dye-Sensitized Solar Cell, Quasi-Solid Electrolyte, Nanofiber Membrane

ACKNOWLEDGEMENT

The authors would like to acknowledge Universiti Malaysia Pahang under Fundamental Research Grant (RDU) RDU20 0348 and Master Research Scheme (MRS) for financially supporting the project.