

Electron transport studies of dye-sensitizer solar cells based on natural sensitizer extracted from rengas (*Gluta spp.*) and Mengkulang (*Heritiera elata*) wood

ABSTRACT

Dyes extracted from rengas (*Gluta spp.*) and mengkulang (*Heritiera elata*) wood were investigated as sensitizers in dye-sensitized solar cells (DSSCs). Three types of sensitizers, including individual sensitizer, mixture sensitizer, and co-sensitizer, exhibited different patterns of absorption properties under UV-Vis spectroscopy. The incident photon-to-current efficiency (IPCE) was analyzed via spectral response to examine the generation of photocurrent. Because mixture sensitized DSSCs obtained broader absorption spectra, they were expected to achieve good light harvesting and hence, enhanced photocurrent and conversion efficiency. The photovoltaic performance was further examined by electrochemical impedance spectroscopy (EIS). The mixture sensitized DSSCs exhibited good conversion efficiency (0.21% and 0.30%) compared with individual sensitized DSSCs (0.16% and 0.11%). The co-sensitized DSSCs also showed increased conversion efficiency with ruthenium (N719) dye as a co-sensitizer. The parameters calculated from EIS analysis were used to determine suitable conditions for the dye to be implemented in DSSC. The behavior of electron transport was determined to be efficient due to the increase of electron diffusion coefficient, electron lifetime, and low recombination rate as achieved by the mixture sensitized DSSCs.

Keyword: DSSC; Natural dye; Hardwood waste; Impedance; Electron transport