

Co-sensitization of natural sensitizers extracted from rengas (*Gluta spp.*) and mengkulang (*Heritiera elata*) wood with ruthenium dye (N719) to enhance the performance of dye-sensitized solar cells

ABSTRACT

In this study, photovoltaic performance was improved when two natural sensitizers, namely, rengas (*Gluta spp.*) and mengkulang (*Heritiera elata*), were mixed with ruthenium (N719) sensitizer. Five different ratios were prepared and their performances were compared with individual sensitizers. The components of the sensitizers were analyzed via ultraviolet–visible spectrophotometry and Fourier transform infrared spectroscopy. The band gap values and the highest occupied molecular orbital–lowest unoccupied molecular orbital (HOMO–LUMO) levels were calculated using data obtained from photoluminescence analysis and cyclic voltammetry. The mengkulang: N719 (80%:20%) sensitizer exhibits the highest conversion efficiency (η), which is 0.58% with an open circuit voltage (V_{oc}) of 0.63 V, a short circuit photocurrent density (J_{sc}) of 2.1 mA/cm², and a fill factor (ff) of 0.44. By contrast, the individual mengkulang sensitizer presents a poor conversion efficiency (η) of 0.16%.

Keyword: Natural sensitizer; Mixed sensitizer; Band gap; HOMO–LUMO level