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Extracts of Cola acuminata, Lupinus arboreus and Bougainvillea spectabilis as Natural Photosensitizers for Dye-Sensitized Solar Cells

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Abstract : Organic dyes from Cola acuminata (C. acuminata), Lupinus arboreus (L. arboreus) and Bougainvillea spectabilis (B. spectabilis) leaves and their mixtures were used as sensitizers to manufacture dye-sensitized solar cells (DSSC). Photoelectric measurements of C. acuminata showed a short circuit current (J_{sc}) of 0.027 mA/ cm², 0.026 mA/ cm² and 0.018 mA/ cm² with a mixture of mercury chloride and iodine (Hgcl₂+ I); potassium bromide and iodine (KBr + I); and potassium chloride and iodine (KCl + I) respectively. The open circuit voltage (V_{oc}) was 24 mV, 25 mV and 20 mV for the three dyes respectively. L. arboreus had J_{sc} of 0.034 mA/ cm², 0.021 mA/ cm² and 0.013 mA/ cm²; and corresponding V_{oc}of 28 mV, 14.2 mV and 15 mV for the three electrolytes respectively. B. spectabilis recorded J_{sc} 0.023 mA/ cm², 0.026 mA/ cm² and 0.015 mA/ cm²; and corresponding V_{oc} values of 6.2 mV, 14.3 mV and 4.0 mV for the three electrolytes respectively. It was observed that the fill factor (FF) was 0.140 for C. acuminata, 0.3198 for L. arboreus and 0.1138 for B. spectabilis. Internal conversions of 0.096%, 0.056% and 0.063% were recorded for three dyes when combined with (KBr + I) electrolyte. The internal efficiency of C. acuminata DSSC was highest in value.

Keywords : dye-sensitized solar cells, organic dye, C. acuminate, L. arboreus, B. spectabilis, dye mixture
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