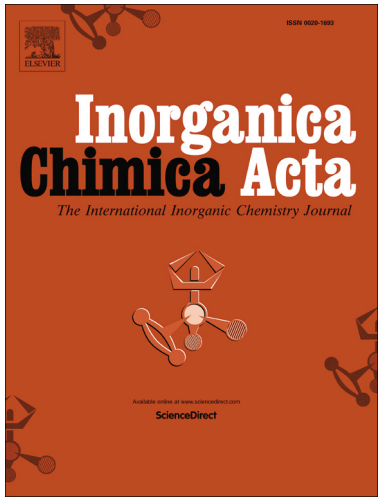

Research paper

Effect of Dimethylaminophenyl and Thienyl donor groups on Zn-Porphyrin for Dye Sensitized Solar Cell (DSSC) Applications

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Effect of Dimethylaminophenyl and Thienyl donor groups on Zn-Porphyrin for Dye Sensitized Solar Cell (DSSC) Applications

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Abstract

We have designed and synthesized two Zn-Porphyrin derivatives Zn[5,15-dimethylaminophenyl-10,20- (4-carboxyphenyl)Porphyrin] **(SKPor-1)** and Zn[5,15-thiophene- 10,20-(4-carboxyphenyl)Porphyrin] **(SKPor-2)** which possess donor modified structures as sensitizer for Dye Sensitized Solar Cells (DSSCs). These molecules contain the porphyrin unit as π-bridge, dimethylaminophenyl and thienyl groups as electron donor group and carboxylic acid group as anchoring group (electron acceptor unit). The **SKPor-1** dye has large red-shift of the absorption maxima due to introduction of the dimethylaminophenyl moiety at the meso position of the porphyrin ring. But the absorption maxima of **SKPor-2 is** a little red-shifted due to the thienyl group attached with the porphyrin unit. The highly conjugated dimethylaminophenyl gorup is efficiently donating the electrons and electronic interaction between the porphyrin and dimethylaminophenyl unit is better compared to thienly unit. The DSSC was made using commercial P25 TiO_2 material as photoanode, Zn-Porphyrin derivatives as sensitizer, I^-/I^{3-} as electrolyte and Platinum (Pt) as counter electrode. The highest power conversion efficiency of the two Zn-Porphyrin derivatives **(SKPor-1)** based on DSSC reached **3.2 %** with open circuit voltage (V_{oc}) of 0.68 V, short circuit photocurrent density (J_{sc}) of 9.62 mA/cm^2 and fill factor (ff) of 0.50, **SKPor-2** based DSSC