

Photosensitization of nanocrystalline TiO₂ films by a polymer with two carboxylic groups, poly (3-thiophenemalonic acid)

G.K.R. Senadeera^{a,*}, T. Kitamura^b, Y. Wada^b, S. Yanagida^{c,*}

^a*Institute of Fundamental Studies, Hantane Road, Kandy, Sri Lanka*

^b*Materials and Life Science, Graduate School of Engineering, Osaka University, Suita,
Osaka 565-0871, Japan*

^c*Center for Advance Science and Innovation, Osaka University, Osaka, Japan*

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Abstract

Photovoltaic devices were assembled using a conducting polymer; poly (3-thiophenemalonic acid) sensitized TiO₂ electrodes and an electrolyte containing I₃⁻/I⁻ redox couple. This cell exhibited a short-circuit photocurrent (J_{sc}) of $\sim 6.65 \text{ mA cm}^{-2}$, an open circuit voltage (V_{oc}) of $\sim 355 \text{ mV}$ and an efficiency of 1.5% under the illumination of 100 mW cm^{-2} (AM 1.5). Addition of an ionic liquid, 1-methyl 3-n-hexylimidazolium iodide, into the electrolyte led to an improvement in the cell performances, achieving an overall efficiency of 1.8% under the same illumination. The average cell characteristics of the later devices are $J_{sc} = \sim 7.6 \text{ mA cm}^{-2}$, $V_{oc} = 365 \text{ mV}$ with a fill factor of 0.65.

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