Low-cost $FeNi_3$@C for DSSC counter electrodes

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Abstract

To reduce the cost of a dye-sensitized solar cell (DSSC), noble metal platinum (Pt) on the counter-electrode has been replaced with relatively cheap metals, i.e., photo-activity-designable bimetal core-shell nanoparticles. In present work, nickel and iron encapsulated within carbon-shell ($FeNi_3$@C) nanoparticles were prepared by carbonization of Ni^{2+} and Fe^{3+}-β-cyclodextrin at 673 K for the DSSC counter-electrode. By component fitted X-ray absorption near-edge structure (XANES) spectroscopy, metallic nickel (Ni) and iron (Fe (73%) and Fe_3O_4 (27%)) are observed in the $FeNi_3$@C. The $FeNi_3$@C nanoparticles are deposited on a conductivity glass recovered from thin film transistor (TFT) liquid crystal display wastes for the counter-electrode of a DSSC. The DSSC having the $FeNi_3$@C nanoparticles coated counter-electrode has the conversion efficiencies of 3.1%. In addition, the cost of the DSSC using the reccycled conducing glass and cheaper nanostructured $FeNi_3$@C electrode can be reduced by at least 38%.

Keywords: *Dye-sensitized solar cells, FeNi3@C, DSSC counter-electrode.*

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