13

Suppression of recombinations in a dye-sensitized photoelectrochemical cell made from a film of tin IV oxide crystallites coated with a thin layer of aluminium oxide

G R R A Kumara[1], K Tennakone[2,3], V P S Perera[2], A Konno[1], S Kaneko[1] and M Okuya[1]

[1] Department of Material Science, Shizuoka University, Hamamatsu 432-8561, Japan
[2] Institute of Fundamental Studies, Hantana Road, Kandy, Sri Lanka

E-mail: tenna@ifs.ac.lk

Received 5 September 2000, in final form 5 December 2000

Abstract

A dye-sensitized photoelectrochemical cell consisting of a film of SnO_2 crystallites coated with ultrafine particles of Al_2O_3 generates an exceptionally high open-circuit voltage as compared to a cell made only from SnO_2. Al_2O_3 coating on SnO_2 improves the efficiency and the fill factor while delivering reasonably high photocurrents. Photoexcited dye molecules on Al_2O_3 injects electrons into the conduction band of SnO_2 via tunnelling through the Al_2O_3 barrier. Suppression of recombinations of electrons with the dye cations and the acceptors at the electrolytic interface build up the quasi-Fermi level in SnO_2 with an impressive increase of the open-circuit voltage.