

Fabrication and Photovoltaic Characterization of Bio-Sensitized Solar Cells
Using Myoglobin-Based Sensitizers

Chang, Chih-Wei; Chang, Chin-Hao; Lu, Hsueh-Pei; Wu, Tung-Kung; Diao,
Eric Wei-Guang

Abstract

Myoglobin (Mb), reconstituted zinc protoporphyrin-apomyoglobin (ZnMb), and eosin-modified ZnMb (EoZnMb) were used as photosensitizers to functionalize TiO₂ nanocrystalline films for biosensitized solar-cell (BSSC) applications. For the Mb-sensitized SC, the poor cell performance was due to a reduction Fe(III) → Fe(II) that produces a photocurrent density of the device smaller than its unsensitized counterpart. The efficiencies of power conversion of both ZnMb and EoZnMb-sensitized SC were enhanced about ten times due to superior charge separation between TiO₂ and the protein, and due to smaller current leakage between TiO₂ and the electrolyte. The cell performances of the BSSC devices are discussed in terms of an equivalent-circuit model.