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Photo-operated Glucose-O₂ Biofuel Cell Based on the Visible-light Photosensitization of Chlorophyll Derivatives Adsorbed on Nanocrystalline TiO₂ Film

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A novel type of photo-operated biofuel cell was based on the combination of NAD⁺ reduction with glucose and GDH, with photosensitization of zinc chlorin-e₆ (ZnChl-e₆) as a model of chlorophyll *a* on a nanocrystalline TiO₂ film electrode as the anode, and electrochemical reduction of oxygen to the water on a platinum electrode as the cathode. The short-circuit photocurrent (I_{SC}) and the open-circuit photovoltage (V_{OC}) were 6.8 $\mu\text{A}\cdot\text{cm}^{-2}$ and 444 mV, respectively. The peaks in the photocurrent action spectrum of this cell were observed at 400 and 780 nm, and the IPCE values at 400 and 780 nm were estimated to be approximately 11.0 and 6.2%. This novel type of photo-operated glucose-O₂ biofuel cell depends on the visible and near IR photosensitization of ZnChl-e₆ molecules on nanocrystalline TiO₂ film electrode.

Keywords: [Biofuel cell](#), [Bioresource](#), [Chlorophyll](#), [Titanium oxide](#)

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