Enhanced light-induced hydrogen evolution reaction by supramolecular systems of cobalt(II) and copper(II) octaethylporphyrins on glassy carbon electrodes

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Chemically modified glassy carbon electrodes formed by ?-stacking of commercial cobalt (II) and copper (II) porphyrins have been used as stable and efficient electrocatalytic system for the hydrogen evolution reaction at pH 7.0, as reported in a previous work. In this work, it has been found that when these systems are irradiated with light of different wavelengths, their electrocatalytic responses change in terms of overpotential and photocurrent. Thus, the electroactivity of these systems towards hydrogen evolution reaction can be enhanced by irradiation at certain wavelength with no requirement of a photosensitizer. Interestingly, the largest enhancement of this reaction is observed at wavelengths corresponding to specific arrangement of porphyrins on the electrode. Cyclic voltammetry, photoelectrochemical impedance spectroscopy and UV?visible spectroscopy studies were done in order to corroborate and discuss this effect. Finally, XRD experiments allowed us to confirm the existence of highly ordered arrangement in each supramolecular system and that this is a determinant factor in the photoelectrochemical responses. © 2017 Elsevier Ltd

Hydrogen evolution reaction

Metalloporphyrins

Modified electrodes

Photoelectrocatalysis

Supramolecular system

Cobalt

Copper

Cyclic voltammetry

Electrochemistry

Glass

Glass membrane electrodes

Hydrogen

Photosensitizers

Porphyrins

Supramolecular chemistry

Ultraviolet visible spectroscopy

Hydrogen evolution reactions

Metallo-porphyrins

Modified electrodes

Photo-electrocatalysis

Supramolecular systems

Electrodes