Photoelectrocatalytic Reduction of Carbon Dioxide to Methanol Using CuFe2O4 Modified with Graphene Oxide under Visible Light Irradiation

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ABSTRACT

Photoelectrocatalytic reduction of CO2 into valuable products can provide energy in a sustainable way with leveling off of the concentration of CO2 in our environment. In this study, graphene oxide (GO) incorporated with copper ferrite (CuFe2O4) has been employed to enhance photoelectrocatalytic CO2 reduction under visible light. The TEM and XPS characterization indicated a strong interaction between the CuFe2O4 and GO in the hybrid catalyst. The GO incorporation reduced the e−/h+ recombination in the hybrid catalyst by trapping the photoexcited electrons from CuFe2O4 leading to high methanol yield of 28.8 μmol L−1 cm−2 at 20.5% quantum efficiency. The incident photon current efficiency (IPCE) and Faradaic efficiency for methanol formation were observed as 8.02% and 87%, respectively. The results showed that the photoelectrocatalytic activity for CO2 reduction can be improved by incorporating GO with CuFe2O4, and it provides a universal platform to fabricate GO−CuFe2O4 based hybrid photocatalyst with promising applications in CO2 reduction.

KEYWORDS
Photoelectrocatalytic; graphene oxide (GO); copper ferrite (CuFe2O4); CO2 reduction

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