Photoelectrochemical reduction of carbon dioxide over copper ferrite - graphene oxide composites

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ABSTRACT:

Recycling of atmospheric CO2, the ultimate by-product of all processes involving oxidation of carbon compounds, for use as fuel is one of the most promising alternatives to combat global warming and energy crisis. Photocatalysis (PC) is a very promising technique for reducing CO2 into hydrocarbon fuels[1].The use of photon energy to mimic the photosynthesis process requires photoresponsive materials that can efficiently interact with light, yielding high-energy photogenerated electrons capable of reducing CO2 to produce fuel. To produce hydrocarbons or oxygenated hydrocarbons from CO2 requires proton coupled multiple electron path ways which suffer from slow kinetics, poor product selectivity, and mechanistic complexity[2]. The electrochemical reduction of CO2 is another important route for the conversion of CO2 to chemicals requiring substantial amount of electrical energy. Photoelectrocatalytic approachintegrates the electrocatalytic and the photocatalytic methods where solar energy can significantly lower the applied voltage, thusdecreasing the electricity consumption[3].Moreover, the bias potential effectively reduces the e-/h+ recombination rate in the photocatalyst leading to higher quantum efficiency.Among photocatalysts, visible light responsive materials are of major interest as it could use solar irradiation as light source. In the present paper, we report the preparationand characterization of graphene oxide (GO) modified CuFe2O4 nanoparticles and their activity towards photoelectrochemical (PEC) reduction of CO2in aqueous solutionunder visible light irradiation