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Nanoparticles based on copper deposited on carbonspheres. Preparation, characterization and application for CO₂ photo-electrochemical reduction

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Abstract

In this study, we have examined the performance of copper nanoparticles deposited on carbon spheres with a mass weight of 10 wt.% (labeled 10Cu-CSs) via photo-electrochemical reduction of carbon dioxide (CO₂). The carbon spheres (CSs) were prepared by a chemical vapor deposition method and 10Cu-CSs was made via a homogeneous deposition precipitation method. The materials were characterized by different physico-chemical techniques such as X-ray diffraction (XRD), Raman, Fourier transform infrared (FTIR) and diffuse reflectance (DR) spectroscopy, electrical conductivity and photo-electrochemical studies. The 10Cu-CSs material was studied for the photo-electrochemical reduction of CO₂ under visible light illumination. The synthesized material exhibited a single phase monoclinic structure of CuO deposited on CSs as confirmed by XRD, Raman and FTIR spectroscopies results. The semi-conductor property was established by electrical conductivity, and the activation energy obtained was *ca.* 0.04 eV. The UV-visible absorption spectrum showed a direct band gap transition with gap energy of 1.22 eV. The material synthesized was a cathode

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