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Photocatalytic reduction of CO₂ by employing ZnO/Ag_{1-x}Cu_x/CdS and related heterostructures

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Abstract

In view of the great importance of finding ways to reduce CO₂ by using solar energy, we have examined the advantage of employing heterostructures containing bimetallic alloys for the purpose. This choice is based on the knowledge that metals such as Pt reduce CO₂, although the activity may not be considerable. Our studies on the reduction of CO₂ by ZnO/M/CdS (M = Ag, Au, Ag_{1-x}Au_x, Ag_{1-x}Cu_x) heterostructures in liquid phase have shown good results specially in the case of ZnO/Ag_{1-x}Cu_x/CdS, reaching a CO production activity of 327.4 μmol h⁻¹g⁻¹. The heterostructures also reduce CO₂ in the gas-phase although the production activity is not high. Some of the heterostructures exhibit reduction of CO₂ even in the absence of a sacrificial reagent.

1. Introduction

Drastic reduction of CO₂ in the atmosphere has become imperative to save the environment. One way of accomplishing this objective is to use solar energy for the conversion of CO₂ to useful chemicals. Photocatalytic reduction of CO₂ on suspended semiconductor-powders was reported some years ago by Fujishima et al.^[1] TiO₂, ZnO, CdS and SiC have been employed as

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