



Photocatalytic Reduction of Carbon Dioxide in Aqueous Phase by UV-LED/TiO₂ Process under Periodic Illumination

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Absreact: The application of periodic illumination with UV-LED for the enhancement of reduction efficiency, photonic efficiency and quantum yield in the process for photocatalytic reduction of CO₂ was investigated. The characterizations of photocatalyst were analyzed by Brunauer-Emmett-Teller surface area measurement (BET), X-ray diffraction (XRD), field emission scanning electron microscope (FESEM), UV-Vis diffuse reflectance spectra (UV-Vis DRS) and zeta potential. For the experiment conducted at continuous illumination, the effect of solution pH, different NiO dosage, initial CO₂ concentration and light intensity on CO₂ reduction were studied in a batch reactor. The effect of periodic illumination, duty cycle and periodic frequency on photocatalytic reduction of CO₂ in the aqueous phase was discussed by UV-LED/TiO₂ process with the operation of periodic illumination. The result showed that the excessive NiO dosage would lead to a decrease in photocatalytic performance. The reduction efficiency, photonic efficiency, quantum yield and yield rate were enhanced when the experiment operated with periodic illumination in the total illumination time 60 minutes. The application of periodic illumination could provide the time for the replenishment of surface coverage and result in a decrease of carrier recombination. The yield rate increased from 807 to 830 $\mu\text{mol gcat}^{-1} \text{ hr}^{-1}$ for the experiments operated at the duty cycle from 1.00 (continuous illumination) to 0.09 (periodic illumination). Moreover, the photocatalytic reduction of CO₂ by UV-LED process under continuous and periodic illumination could be well modeled by the Langmuir-Hinshewood kinetic equation.



Biography: Lin Lo still studied in Taiwan University of Science and Technology in Taiwan as a master student in the age of 24. He is the student of Young Ku, a professor of Taiwan University of Science and Technology. He has investigated in the environmental photocatalysis since he was undergraduated

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