

Natural Leaf Inspired Z-scheme Photocatalytic Carbon Dioxide Reduction by 3-Dimensional Bismuth Vanadate/Carbon coated Copper oxide Nanowire Arrays

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Drastic climate change and energy crisis poses a threat to our future. So the photocatalytic conversion of CO₂ into valuable chemicals is one of the most attractive research topic. However, photocatalysts developed thus far suffer from quite low photoconversion efficiency due to many drawbacks. In this study, we present Z-scheme photocatalyst for CO₂ reduction by 3-D bismuth vanadate/carbon coated copper oxide nanowire array which is inspired from natural leaf. High redox potential with significantly decreased electron-hole recombination can be obtained by Z-schematic electron flow between elements by ultrathin carbon layer. At the same time, protecting effect of carbon layer induced outstanding photostability of copper oxide that is retention of 98% activity after 20 hours of reaction. The optimized sample achieved ~3micomole/gram/hour CO formation rate in visible light irradiation that is 9.4 and 4.7times higher than those of Cu₂O mesh and Cu₂O nanowire arrays, respectively. It also shows methane production that is higher hydrocarbon.