Wavelength Dependence of Light-Activated Transformation of Carbon Dioxide at Copper Oxide Electrodes

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Purpose: The purpose of this project was to focus on different wavelengths of light and determine the effect they have on the efficiency of current flowing through the electrodes and creation of methanol. Procedure: Copper electrodes were first smoothed and polished, then immersed in an ammonium peroxide/hydrogen peroxide solution. Next, a copper (I) oxide coating was applied to the surface of the electrode. The electrode was then submerged in a sodium sulfate solution that was rich with CO2, and, with a constant voltage running through the circuit, an LED with a specific wavelength was strobed on the electrode. When this was done, the changes in amperage were recorded. These procedures were repeated for five different wavelengths. The above procedures were then repeated for two additional trials, and the results were averaged, graphed and statistical analyses were done. Conclusion: It was hypothesized that a diode placed at the short wavelength end of the spectrum would provide the greatest increase in efficiency for generating methanol. This hypothesis was accepted. It was also hypothesized that different wavelengths would provide significant differences on the current going through the electrodes. This hypothesis was also accepted.