

Investigation into the Effectiveness of CuBiW_2O_8 in Photocatalytic Degradation of an Herbicide

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SYNerg-E Lab: Materials and Processes for Energy & Printed Electronics (formerly known as NanoEnergy Lab)

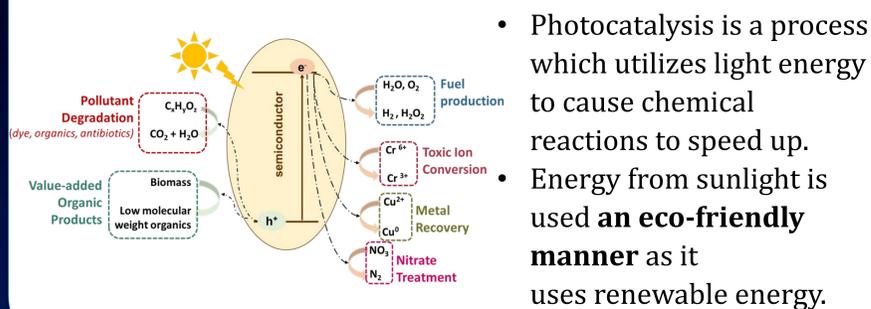


Motivation for Project

- 2,4-Dichlorophenoxyacetic acid (2,4-D) is an herbicide that is used in many products to eliminate weeds on land and in water. This product negatively affects water quality by **contaminating surface waters, resulting in adverse effects on human and animal life.**¹
- This study is to investigate the effectiveness of removing this herbicide from water using a photocatalytic process.

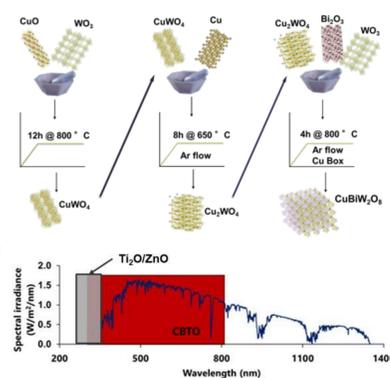


What is Photocatalysis?



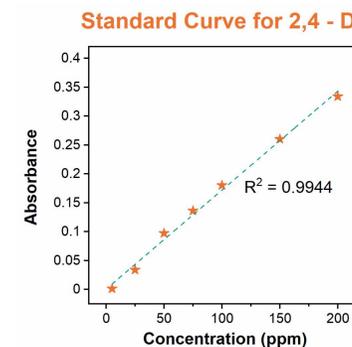
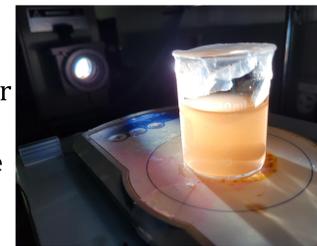
The Photocatalyst

- CuBiW_2O_8 (CBTO) is a semiconductor that serves as a photocatalyst.
- It is created through a **multi-step solid state synthesis**.
- It is a favorable photocatalyst as it has a strong energy absorption in the whole visible light range.

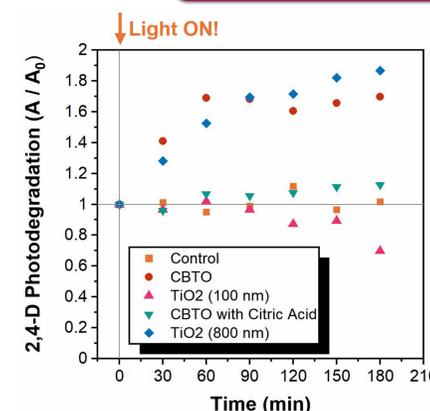


The Investigation

- Previous studies have shown that CBTO could degrade a form of the element Chromium (Cr^{6+}), a mutagenic and carcinogenic water contaminant, into a form much less harmful.²
- Using photocatalysts such as TiO_2 and CBTO, a photoreduction study was completed to **investigate if a similar degradation of 2,4-D would occur.**
- The samples were subjected to simulated sunlight for three hours after being stirred in the dark.
- A standard curve of absorbance for the pesticide was created as a reference to compare the testing results.
- Absorption of light was measured using a spectrophotometer and plotted against time.



Data Analysis



- Multiple trials were conducted with different concentrations of the photocatalysts.
- Measurements of this technique revealed the smaller particles of the photocatalysts did begin to break down the pesticide.
- The larger particle photocatalysts did not degrade the pesticide as expected.



6 CLEAN WATER AND SANITATION



The aim of this project is to use clean energy for the purpose of breaking down a pesticide, a water contaminant. Therefore, two of the United Nations Sustainable Goals are targeted.

7 AFFORDABLE AND CLEAN ENERGY



Final Thoughts

- Results indicate the photocatalyst did not respond to the 2,4-D as readily as Cr^{6+} .
- The measurement procedure was not effective for measuring larger particles of the photocatalyst, as the light appeared to scatter through the nontransparent samples.
- A test which more directly measures the herbicide absorbance is recommended.**
- Repeated testing under different conditions such the pH of the water, concentration of herbicide, size of the particles of the photocatalyst, and concentration of photocatalyst is also recommended.



In The Classroom

- Research a city that is in a climate change crisis to understand human impact on Earth.
- Inform and encourage the use of renewable energy sources to limit pollution on land and in water** in own community through a public service announcement.
- Create a water filtration prototype by following the **Engineering Design Process**.
- Write a letter to local stakeholders in school and community to fund a green energy initiative.



SCAN ME



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Thank you

References

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