

## NCUR Application

Name of Student: Cheyloh Bluemel

Class: Senior

Name of Advisor: Michael Zehfus

College/School: Black Hills State University

Department/Major:  
Chemistry

Email

Address: [cheyloh.bluemel@yellowjackets.bhsu.edu](mailto:cheyloh.bluemel@yellowjackets.bhsu.edu)

Attach File: <http://>

Title of Presentation:

Examining the Use of Copper Catalysis in Photoredox Reactions

BHSU IRB, IACUC or Biosafety #:

NA

**Abstract:**

Photoredox reactions are chemical reactions that use light for synthesis, similar to how chlorophyll in plants utilizes sunlight to synthesize glucose and oxygen. However, in synthetic photoredox reactions, chlorophyll is replaced with a photoredox catalyst, often a transition metal complex, which, when excited by light, can mediate the transfer of electrons between chemical compounds that otherwise would not react. Most reported photoredox reactions use ruthenium or iridium complexes, but we predicted that copper would be a more viable alternative because it is abundant, inexpensive, less toxic, and certain copper (I) complexes are known to have photophysical properties similar to common photoredox catalyst. The excited copper photoredox catalyst can donate an electron to an alkyl-bromide to form a free radical intermediate that will react to form a new carbon-carbon bond with an aldehyde. We evaluated a wide scope of aldehydes with the use of two catalysts, a chiral catalyst, to selectivity set a new chiral center, and a copper(I) complex as a photoredox catalyst. From these reactions, we determined yield and enantiomeric excess of the resulting product using nuclear magnetic resonance (NMR) and high performance liquid chromatography (HPLC).

I certify that: My project is at or near completion and the abstract accurately represents my findings:

Yes

**Statement of Student Responsibilities:**

If my project is accepted for NCUR and I receive funding, I agree to:

- complete my project before departure
- make a trial presentation to my faculty advisor before departure
- present my paper/project at NCUR and attend other sessions
- all required IRB, IACUC and Biosafety approvals have been received
- give presentation at Black Hills Research Symposium (BHRS)
- Represent BHSU in a professional & responsible manner