# Missouri S&T Chemistry Seminar


## Adam Willett, PhD Candidate

## Department of Chemistry, Missouri S&T


**Monday, 17 November 2025**

**4:00 pm in 126 Schrenk Hall**

# Organic Molecules as Cathodic Corrosion Inhibitors for Steel Substrates in Saline Media

Adam Willett is a fourth-year graduate student in the Chemistry Department at Missouri S&T, working in the Schuman group on the development of environmentally friendly coatings for steel substrates. Adam joined the Schuman group in the Spring of 2020 through the FYRE program and continued to do undergraduate research through the OURE program. He completed his Bachelor of Science in Chemistry from Missouri S&T in 2022.


**Abstract**: Corrosion, the natural degradation of metallic materials through electrochemical oxidation, results in chronic financial drain and severe safety issues. Economically, the global cost of corrosion is estimated to be $2.5 trillion, equating to approximately 3.4% of the global GDP. Furthermore, corrosion has directly led to catastrophic material failures in airplanes, bridges, sewer systems, and other critical infrastructure that resulted in the loss of human life. While a spontaneous process, the rate of corrosion is accelerated through the nature of the surrounding environment and is especially escalated in saline environments. Corrosion inhibitors are used to prevent corrosion by forming a barrier layer between the metal substrate and the corrosive environment. Most corrosion inhibitors are inorganic salts, but heteroatomic organic molecules with polar functional groups and conjugated π-electrons can be used as corrosion inhibitors through their adsorption onto the metal surface. With this, we have developed organic corrosion inhibitors containing nitrogen, oxygen, and/or sulfur heteroatoms to use used in the corrosion prevention of 1008 cold-rolled carbon steel in saline media. We hypothesize that the polarizability of a functional group directly affects the corrosion inhibition ability of an organic molecule, and we aim to prove this through both electrochemical and computational methods. The synthesis, characterization, and corrosion inhibition of these molecules along with implications for future research will be discussed.