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Professor Kelsey Stoerzinger
Assistant Professor
Oregon State University

# Electrocatalytic reduction of nitrate: insight from manipulating adsorbate affinity

**Abstract:** Fertilizer use and fossil-fuel combustion has increased nitrate concentrations in many wastewaters and watersheds to levels that threaten environmental and human health. Consequently, treatment of nitrate-contaminated water is a growing area of energy consumption. Electrocatalytic nitrate reduction offers a distributable treatment solution also capable of producing value-added products (e.g. ammonium), using electrons as a reducing agent at ambient temperatures and pressures. However, nitrate reduction occurs at similar electrochemical potentials to water reduction, reducing the Faradaic efficiency particularly in dilute nitrate concentrations characteristic of wastewater. Here we consider how changing a catalysts' affinity for nitrate (via oxide supports) or its relative affinity for protons (via electronic structure) impact activity and selectivity of the electrocatalytic nitrate reduction reaction in neutral media. We build insight into the reaction mechanism through reaction rate order analysis, microkinetic modeling, and in situ photoelectron spectroscopy.

**Bio:** Dr. Kelsey A. Stoerzinger joined Oregon State University as an Assistant Professor in the School of Chemical, Biological and Environmental Engineering in the Fall of 2018. She holds a joint appointment at Pacific Northwest National Laboratory, where she was a Linus Pauling Distinguished Postdoctoral Fellow. Prof. Stoerzinger completed her doctoral studies in Materials Science and Engineering in 2016 from the Massachusetts Institute of Technology, supported by a National Science Foundation Graduate Research Fellowship. She received an M.Phil. in Physics from the University of Cambridge as a Churchill Scholar and a B.S. from Northwestern University. Prof. Stoerzinger is the recipient of NSF CAREER and DOE Early Career Awards, in addition to recognition for her contributions as a teacher and advisor.