

**Environmental Engineering**

**and Earth Sciences**

**EEES Department Seminar**

**Stabilization of Source-separated Urine Using Electrochemically Synthesized Hydrogen Peroxide**

**Dr. Sudeep Popat**

Department of Environmental Engineering and Earth Sciences

Clemson University

Separate urine collection and treatment is an attractive alternative to current wastewater treatment strategies, though urea hydrolysis presents challenges for collection and storage. Urea also represents an important resource, which if recovered could offset some of the environmental burden of fertilizer production. In this presentation, I will present the proof-of-concept for a method to stabilize source-separated urine with electrochemically synthesized hydrogen peroxide (H2O2). In this study, samples of synthetic urine were stored following electrochemical treatment and monitored for changes in total ammonia nitrogen (TAN), H2O2, and pH. TAN formation from urea hydrolysis was inhibited by the deactivation of the urease enzyme by H2O2 in all experiments. We evaluated the effects of current density, treatment time, and final pH of the synthetic urine. Higher current densities and longer treatment times resulted in slightly lower final concentrations of TAN, while pH had no observable effect on final TAN concentrations. A neutral pH resulted in a slower degradation of H2O2 within treated samples compared to alkaline samples. Direct urea measurements showed that as much as 78.9% of the initial urea was preserved after 140 days of storage at room temperature. These results confirm that electrochemically synthesized H2O2 is an effective method for source-separated urine stabilization and present a basis for investigating this process beyond bench-scale experiments.

**Bio:** Dr. Sudeep Popat is an Assistant Professor in the Department of Environmental Engineering and Earth Sciences at Clemson University. Dr. Popat has a Ph.D. in Chemical and Environmental Engineering from the University of California, Riverside, in 2010, following which he spent six years at the Biodesign Institute at Arizona State University, prior to joining Clemson.

Dr. Popat’s primary research interests lie in the field of environmental biotechnology and electrochemistry. One of the technologies Dr. Popat’s group works on is the microbial electrochemical cell platform, which is a focus of an ongoing NASA EPSCoR project. Another area of active interest is anaerobic digestion of waste with high fat content.  Dr. Popat’s prior work also includes research in the areas of reductive dehalogenation of chlorinated ethenes, anaerobic digestion of municipal sludge, and gas-phase bioreactors for waste gas treatment and air pollution control.

Dr. Popat’s research has resulted in >35 peer-reviewed publications, including in reputed journals such as Environmental Science & Technology, Chemical Engineering Journal, Water Research, Journal of Power Sources, Bioresource Technology, and ChemSusChem.

**2:30 PM**

**Friday, September 24, 2021**

**Rich Lab Auditorium**

**Also available online via Zoom:**

<https://clemson.zoom.us/j/5783910968>

***Attendance is mandatory for graduate students enrolled in EES 8610, EES 9610, and GEOL 8510.***