

Electrochemical Technologies for Water Sustainability



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ABSTRACT: Sustainability of water is key for social and economic development. Water sustainability in a holistic context implies resiliency, efficiency, and quality. Electrochemical technologies are an excellent platform to contribute towards water sustainability. For example, inorganic and organic nitrogen containing compounds play an important role in the chemical industry. However, these chemicals can also be seen as an environmental challenge.

Ammonia emissions into air (ambient ammonia) and water represent an environmental challenge. Ambient ammonia not only contributes to inorganic PM_{2.5} (particulate matter with an aerodynamic diameter of less than 2.5 μm) directly but also plays an important role in secondary organic aerosol formation by interacting with gaseous phase organic acids and forming condensable salts. Various industries and other operations are considered ammonia emitters. These are fertilizer manufacture industry, livestock management, coke manufacture industry, fossil fuel combustion, and refrigeration methods. In addition, ammonia emissions in water are associated with environmental problems such as algae bloom. To circumvent these problems, Dr. Botte and members of her research group have been working on different projects related to the electrocatalysis of nitrogen containing compounds for the production of hydrogen, wastewater treatment, synthesis of ammonia, recovery of energy from waste, and sensors. In this talk, I will present examples of electrochemical technologies that we are developing at the Chemical and Electrochemical Technology Innovation Laboratory at Texas Tech University towards water sustainability, including ammonia and nitrate removal, electrochemical conversion of sludge, and microbial sensors.