Development of Electrochemical Sensors for the Detection of Trace Contaminants

Quang Lam

Ashish Aphale

Duy Pham

Development of Electrochemical Sensors for the Detection of Trace Contaminants

Quang Lam[1], Duy Pham[1], and Ashish Aphale[1*]

[1] Department of Mechanical Engineering, Kennesaw State University, Marietta, GA

Abstract

Several industrial processes, such as stainless steel fabrication and textiles, produce heavy metal byproducts such as chromium. These heavy metals have detrimental effects on the surrounding environments and humans. Recently, electrochemical-driven sensors have been studied and show great potential in miniaturization while still providing measurements at a low cost. In addition, atomically thin allotropes of carbon, graphene, and graphene oxide have shown remarkable results in producing a highly responsive and selective sensor platform. These results are due to their excellent electrical conductivity, high surface area for utility, and physicochemical stability. The existing challenge for electrochemical-driven sensors is understanding the molecular level's relationship between microstructures and chemical affinities. In this work, the research efforts are to understand the relation structure-property-function to comprehend reaction kinetics better and identify the rate-limiting steps. Experimental results from interdigitated micro-comb chips deposited with nanocomposite electrodes will be presented under different electrolytes and varying concentrations. In addition, we will display governing mechanisms of charge transfer relating to sensor performance.