Proceedings of the 12th World Congress on New Technologies (NewTech 2026)
August 20- 22, 2026 – London, United Kingdom
DOI: 10.11159/icepr26.002

IMPACT: Innovative (Nano) Materials and Processes for Advanced Catalytic Technologies to Sense and Degrade PFAS

Omowunmi (Wunmi) Sadik
Department of Chemistry and Environmental Sciences, New Jersey Institutes of Technology
University Heights, Newark, NJ 07102

Abstract

Per- and polyfluoroalkyl substances (PFAS) are a group of emerging anthropogenic, fluorinated organic contaminants that are becoming a silent threat in water due to their extreme persistence, high mobility, and bioaccumulation. Due to their excellent physical and thermal stability ascribed to the strong C-F bond, these are ubiquitously present globally and difficult to remediate. (~546 kJ/mol), they are ubiquitously present globally and difficult to remediate1-5. Extensive toxicological and epidemiological studies have confirmed the adverse health effects of PFAS. With the increasing literature on the environmental impact of PFAS, the regulations and research have also expanded. Over 5,000 Chemical Abstract Service (CAS) numbers exist for PFAS classification, but most of them remain unknown. The Organization for Economic Cooperation and Development (OECD) global database reveals that more than 4,700 PFAS-related 33 CAS numbers are identified, having manifold physicochemical properties. The United States Environmental Protection Agency (EPA) has set limits for perfluorooctanoic acid (PFOA) and perfluorooctanesulfonic acid (PFOS) to not exceed beyond 70 parts per trillion, while the European Union introduced drinking water regulations at parts per billion levels. Even though some of the environmental agencies have set up the limits, the problem of PFAS is across the globe and is still not considered as a major issue worldwide. Many methods have been developed for PFAS sensing, removal, and destruction. Amongst these methods, nanotechnology has emerged as a sustainable and affordable solution due to its tunable surface properties, high sorption capacities, and excellent reactivities. This presentation will focus on the development of a novel electrochemical method to sense and degrade perfluorooctanoic acid (C7F15COOH, PFOA) and other PFAS. IMPACT uses flavonoid-sequestered Pd-Ru nanomaterials, allowing the development of specialized electrochemical reactors with tunable properties to sequentially degrade classes of PFAS into a sustainable byproduct via an indirect electrochemical method. Electron transfers at RuOxHy species stabilize the Pd component of the nano-catalysts, enabling the degradation process via PFOA deprotonation, chain shortening, decarboxylation, hydrolysis, fluoride elimination, and CF2 flake-off mechanism. IMPACT design, characterization and applications in different media will be demonstrated for Perfluorosulfonic Acid, Perfluorobutanoic Acid and ammonium salt of hexafluoropropylene oxide dimer acid (HFPO-DA) fluoride or Gen-X.