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The future of water purification by electrical discharge plasmas

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The use of electrical discharge plasma for treating contaminated water has been studied for over three decades. During that time, dozens of different reactor configurations have been demonstrated for the degradation of phenols, dyes, pharmaceuticals, pesticides, and warfare agents, among other compounds. However, despite their ability to degrade and in some cases completely mineralize these compounds, very few bench-scale reactors have been upscaled to demonstration levels. One exception is the plasma-based treatment of poly- and perfluoroalkyl substances (PFAS), a notoriously toxic group of chemicals found in water of nearly 200 million Americans, where the field-demonstrated process has been shown to be superior compared to existing electrically driven destructive techniques.

This talk attempts to position the current state of research on plasma-based water treatment in relation to the general needs of the water treatment industry. This is achieved by tying the fundamental processes occurring at plasma-liquid interfaces to the plasma reactor design, and discussing the challenges and advantages of the heterogeneous nature of multiphase plasma systems. The most promising future directions of plasma-based water treatment are also discussed.



Short Bio

Thagard is a professor of chemical engineering at Clarkson University. She received her BS in chemical engineering from the University of Zagreb in Croatia and her Ph.D. in chemical engineering from Florida State University. Before coming to Clarkson, Thagard held post-doctoral appointments at Toyohashi University of Technology in Japan and at Colorado State University. Her research interests lie in experimental investigations of fundamental plasma chemistry in single and multiphase plasma environments and plasma reactor design with applications in environmental remediation. Her work has been funded by the National Science Foundation, US Environmental Protection Agency, US Department of Defense, US Department of Energy, Semiconductor Research Corporation, GlobalFoundries, and US Air Force. Thagard serves on the Editorial Board of Plasma Chemistry and Plasma Processing.

