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Plasma chemistry for suitability and environmental safety

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Medically approved disinfectants and hand washes are used routinely, many of which are not sufficient to disinfect surfaces, and fail to inactivate a substantial percent of the pathogens found within biofilms. Strong biocides such as benzalkonium chloride, chlorhexidinegluconate, and triclosan were unable to completely inactivate pathogens in their planktonic and embedded biofilm (sessile) forms, and thus the reservoirs of hospital-acquired infections are inefficiently controlled. There is a real need for a disinfectant solution that is less toxic, carries less fear of systemic bacterial resistance, simple, and safe for use in all patient populations including children/neonates. It was demonstrated that water have antimicrobial properties after it is treated with room temperature non-thermal plasma. Liquid medical waste originating in hospitals and pharmaceutical companies is one of the main sources of antibiotics release into the environment worldwide. Release of antibiotics into the environment is a form of pollution that kills microorganisms helping to sustain natural balance and may promote the selection of antibiotic resistance contributing to more serious infections in humans and livestock. Normal water treatment facilities are not designed to deal with this type of pollution and advanced oxidation methods, developed over the past few decades, are highly inefficient in terms of their removal efficiency, energy use, and cost. The dependence of plasma-based antibiotic inactivation on a combination of physicochemical properties of the waste material and on the operating conditions of the treatment system with the goal to achieve dramatic improvement in energy required to inactivate antibiotics in waste was investigated. The results of this work may prove useful not only for liquid waste treatment in the developed world, but also to the reduction of pollution in the developing nations.

Biography

Hai-Feng Ji received his PhD degree in chemistry from Chinese Academy of Science, China, in 1996. He is currently an associate professor in the Department of Chemistry at Drexel University. His research interests focus on micro/Nano sensors, MEMS devices, surface modification for sensors, and Nano assembly of organic molecules. He is currently a co-author of more than 120 peer-viewed journal articles and book chapters.

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