GEC20-2020-000080

Abstract for an Invited Paper
for the GEC20 Meeting of
the American Physical Society

Electromechanical coupling at plasma-liquid interfaces[1]

MOHAMMAD HASAN, University of Liverpool

In recent years, a variety of atmospheric pressure low temperature plasma sources were developed to chemically activate liquids for a range of applications including bacterial disinfection, seed germination, and plant growth enhancement (Trends Food Sci. Technol. 77 (2018) 21). In many of these sources, there is a direct contact between the plasma and the treated liquid at an interface. Such contact introduces electromechanical coupling at the interface, where the electric field induces a flow of the background gas and the treated liquid through the Electrohydrodynamic (EHD) forces and field-induced stresses at the interface (Nat. Phys. 4 (2008) 149) , while the flow of the liquid influences the electric field by changing the curvature of the interface and the deposited surface charge density (Sci. Rep. 8 (2018) 12037). In this work, an experimentally validated two-dimensional computational model describing a pin-plate discharge configuration, operating in air for treating water, is developed to analyze the electromechanical coupling at the plasma-water interface. Preliminary results indicate that increasing the water's conductivity over a certain range decreases the lifetime of the high electric field penetrating the water close to the interface. As a result, the time averaged EHD forces and the water's flow velocity close to the interface are affected. These findings have important implications for chemical species transport and reactions in the interfacial region of the discharge.

[1]The author want to thank EPSRC for their support under grant number EP/T000104/1