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Simulation of plasma discharge in liquids: A detailed two-phase fluid approach ALI CHARCHI AGHDAM, TANVIR FAROUK, University of South Carolina, REACTING SYSTEMS AND ADVANCED ENERGY RESEARCH LABORATORY TEAM — Plasma discharge in liquids has gained great attention recently due to its applications in biomedical engineering, fuel processing, and water treatment and so on. Despite the tremendous interest, a comprehensive understanding of the underlying physics still remains limited. In the current work, an attempt is made to present a mathematical multi-physics model to describe the discharge of plasma in liquids. An in-house modeling platform is developed for simulating plasma formation in multiphase fluids. The model resolves a detailed two-phase fluid including viscous effects, surface tension, gravitational forces and electrical body force. All the governing equations are solved for gas and liquid phases. Electric field and charged species equations along with the plasma reaction kinetics are solved to get the charge distribution in the different phases as well as at the gas-liquid interface to obtain the electric body force acting at the interface. By coupling the above sub-models, a comprehensive multi-physics model for plasma discharge in liquids is constructed which is able to capture several physical aspects of the phenomena especially the role of the bubble, its motion and distortion on plasma characteristics.

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