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Spatial Distribution of Reduction Potential near the Plasma-Liquid Interface[1] TREY OLDHAM, ELIJAH THIMSEN, Washington University, St. Louis — Systems comprised of aqueous media in contact with nonthermal atmospheric pressure plasma jets (APPJs) have attracted interest for biomedical, agricultural, and nanomaterial synthesis applications. The emerging field of plasma electrochemistry uses atmospheric pressure plasma, generated using noble gases, as a means to drive redox reactions. Free electrons from the noble gas plasma become solvated in solution, creating a chemically reducing environment. Many important fundamental questions about the plasma-liquid interface remain unanswered. For example, if a reduction reaction occurs in the liquid beneath the plasma jet, where does the complementary oxidation half-reaction occur that is required to maintain charge neutrality in the solution? In this work, the spatial distribution of the reduction potential for a solution in contact with a radiofrequency APPJ is presented. Treating the plasma-liquid interface as a boundary condition that constrains the reduction potential, a parametric study will be presented relating process parameters to the spatial distribution of the reduction potential. More specifically, the influence of applied power, gas flow rate, and jet standoff distance on the location and magnitude of the reducing and oxidizing zones in the liquid will be presented. The knowledge of how process parameters affect the spatial distribution of reduction potential in solution can be used to design electrodeless electrochemical reactions using the plasma-liquid interface.

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