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Detection of solvated electrons at a plasma-liquid interface DAVID B. GO, PAUL RUMBACH, DAVID BARTELS, University of Notre Dame, R. MOHAN SANKARAN, Case Western Reserve University — We have recently shown that charge can be transferred from a DC microplasma jet into an aqueous solution to promote electrolytic reduction reactions [1,2]. However, the precise nature of these charge transfer reactions remains poorly understood—in particular, it is not known if plasma electrons solvate and solvated electrons are responsible for the reduction of solution species. To address these questions, we have designed and built an optical absorption spectroscopy system to directly detect solvated electrons at a plasma-liquid interface, which only have a lifetime of ~ 1 μs. Our preliminary results reveal that plasma electrons do indeed solvate, and survive up to depths of approximately 0.5 nm beneath the plasma-liquid interface. Adding electron scavengers such as nitrite and nitrate salts to the solution causes a decrease in optical absorption, indicating a decrease in the average lifetime of the solvated electrons, further confirming their existence. Measuring optical absorption as a function of scavenger concentration, we extrapolate rate constants that agree well with prior radiolysis experiments. These preliminary findings are consistent with the hypothesis that free electrons from atmospheric pressure plasmas solvate in aqueous solutions, and open potential applications of plasmas for solvated electron chemistry.

[1] M. Witzke, P. Rumbach, D. B. Go, and R. M. Sankaran, *J. Phys. D: Appl. Phys.* **45**, 442001 (2012).
[2] P. Rumbach, M. Witzke, R. M. Sankaran and D. B. Go, *J. Amer. Chem. Soc.* **135**, 16264-16267 (2013).

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