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**The competition between reduction and oxidation reactions in plasma electrolysis**[1] HERNAN E. DELGADO, PAUL RUMBACH, DAVID M. BARTELS, DAVID B. GO, University of Notre Dame — One of the more common configurations for plasma electrochemistry consists of an electrolytic cell where the cathode or the anode is replaced by a direct current (DC) plasma in contact with the solution. By generating highly reactive species such as the hydroxyl radical (OH) and the solvated electron ($e^-_{aq}$), the plasma can initiate the oxidation and/or reduction of reactants in the liquid. This system has been used to study several applications including chemical synthesis, nanoparticle synthesis, and wastewater treatment. However, the competition between oxidizing and reducing reactions, as well as the creation of long-lived species that may continue to react even after the plasma is terminated, is not completely understood. Here, an electrolytic cell consisting of a DC low-temperature, atmospheric-pressure argon plasma and a submerged platinum counter electrode was used to study these chemical paths with ferricyanide, chloroacetate, and methylene blue model chemical systems. An analysis of competing reactions between reducing and oxidizing species and the effect of plasma polarity and pH, as well as the effects of transport limitation on the overall efficiency of the system are discussed.

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