Chemical Engineering Master's Defense

Electrochemical Characterization of Anode-respiring *Geobacter sulfurreducens* and *Geoalkalibacter subterraneus*

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abstract

In addition to efforts producing energy from more renewable sources, microbial electrochemical cells (MXCs) can utilize anode respiring bacteria (ARB) to couple the oxidation of an organic substrate to the delivery of electrons to the anode. Although ARB such as *Geobacter* and *Shewanella* have been well-studied in terms of their microbiology and electrochemistry, much is still unknown about the mechanism of electron transfer to the anode. To this end, this thesis seeks to elucidate the complexities of electron transfer existing in *Geobacter sulfurreducens* biofilms by employing Electron Impedance Spectroscopy (EIS) as the tool of choice. Experiments measuring EIS resistances as a function of growth were used to uncover the potential gradients that emerge in biofilms as they grow and become thicker. While a better understanding of this model ARB is sought, electrochemical characterization of a halophile, *Geoalkalibacter subterraneus* (*Glk. subterraneus*), revealed that this organism can function as an ARB and produce seemingly high current densities while consuming different organic substrates, including acetate, butyrate, and glycerol. The importance of identifying and studying novel ARB for broader MXC applications was stressed in this thesis as a potential avenue for tackling some of human energy problems.

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