Applicant: Visolis, Inc.
Principal Investigator: Brian Lee, Ph.D.
Participants: University of California, Davis and Argonne National Laboratory
Project Title: Integrated Biorefinery for Chemicals and Fuels Production from Waste Biomass

Relevance: Organic waste streams including agricultural residues, food waste, and municipal solid waste are predicted to significantly increase in the coming decades due to rapid urbanization. One promising technology to reduce and reuse organic waste is anaerobic digestion, whereby a community of microbes breaks down complex organic molecules into biogas. Biogas, however, is of limited valued, which prevents anaerobic digestion from being widely deployed, especially in small municipalities and rural areas that cannot benefit from economies of scale.

Objective: Visolis aims to develop a novel hybrid biological/chemical process to produce chemicals and fuels from organic wastes. The process involves rewiring anaerobic digestion to produce liquid intermediates instead of biogas. These intermediates can then be upgraded into a range of high-value bioproducts and renewable fuels. The process is designed to use renewable electricity to increase the conversion of waste biomass into the intermediates and to reduce residual bio-solids in municipal solid wastes. This new technology will reduce the cost of waste disposal while producing high-value stable intermediates, thereby establishing anaerobic digestion as a viable waste management option for small communities.

Description: The key technology that will be developed under this grant is an efficient electrodeionization-coupled process to convert organic wastes into stable intermediates that can serve as feedstocks for the production of high-value chemicals and renewable fuels using Visolis' proprietary engineered microbes and catalytic processes. This technology would prevent organic wastes from reaching landfills and would allow anaerobic digestion to become economically viable at small scales while simultaneously producing sustainable green alternatives to petrochemicals and fossil fuels at cost-competitive prices. With full development, our process would produce a portfolio of high-value chemicals as well as inexpensive 2nd generation biofuels that meet American and European transportation standards, thus decreasing US dependence on foreign fossil fuel imports and increasing America's energy security and sustainability.