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Optimization of Biosoprene Production from Renewable and Captured Carbon Feedstocks

Abstract.

Scalable technologies are critically needed to capture wind and solar energy as valuable fuels and chemicals. Successful development and patenting of a novel engineered organism, “isoprenogen”, that is capable of converting carbon dioxide to fuel and a value added multi-carbon product has been completed with preliminary funding from the NCESR as well as external funding at the University of Nebraska-Lincoln. Process optimization and scale-up is necessary for translation of this technology to industry. The goal of this proposed project is to **optimize the parameters for industrial scale up of the patented “isoprenogen” organisms to synthesize bioisoprene and renewable methane from inexpensive carbon feedstocks including carbon dioxide (US Patent 10533192B2)**. Bioisoprene and renewable methane yields will be further optimized using CRSIPR/Cas9 (Objective 1), monocultures and synthetic microbial consortia (Objective 2), and fermentation strategies (Objective 3). The project will result in innovative research, intellectual property, and bioprocess data essential for additional DOE funding and partnering with US National Laboratories (eg. NREL) to develop the isoprenogen technology from a technology readiness level of 3/4 (bench demonstration) to 5/6 (pilot scale). If successful, the project will result in scalable technology to capture abundant wind and solar energy by converting carbon dioxide emissions to drop-in fuels and chemicals while generating a market for carbon dioxide emissions.