

The project goal is to develop a synergistic approach combining dark fermentation and electrochemical oxidation using boron-doped diamond-like electrodes for efficient hydrogen production from food waste.

Food waste presents a significant environmental challenge, contributing to greenhouse gas emissions and resource depletion. Dark fermentation offers a promising solution for converting food waste into valuable products, such as hydrogen. However, the presence of different substances, like organic acids and ammonia can inhibit the growth of microorganisms and reduce hydrogen production.

The project aims to enhance the efficiency of dark fermentation by using diamond-like electrodes for electrochemical oxidation of its contaminants and increase the biodegradable fraction of food waste. Diamond electrodes, with their distinctive characteristics, enable their application in the challenging environment of food waste while retaining the ability to break down a diverse array of chemically resistant compounds. Consequently, such chemicals that pose challenges for bacteria to break down can be decomposed, so enhancing the overall effectiveness of the dark fermentation process.

The project expects to:

- **Increase hydrogen production efficiency:** By electrochemically degrading the inhibitors of the dark fermentation process and increasing the bacterially biodegradable fraction of food waste, leading to an increase in the amount of hydrogen generated.
- **Improve control over the biological process:** Electrochemical oxidation can be used to selectively remove inhibitory compounds that can hinder bacterial respiration, allowing for better control over the fermentation process.
- **Unveil the material-process relation:** The project aims to develop new customized electrodes for optimizing the oxidation/production of selected compounds, by focusing on synthesizing customized diamond-based electrodes.