ALBERTA INNOVATES

AGRICULTURE AND ENVIRONMENT

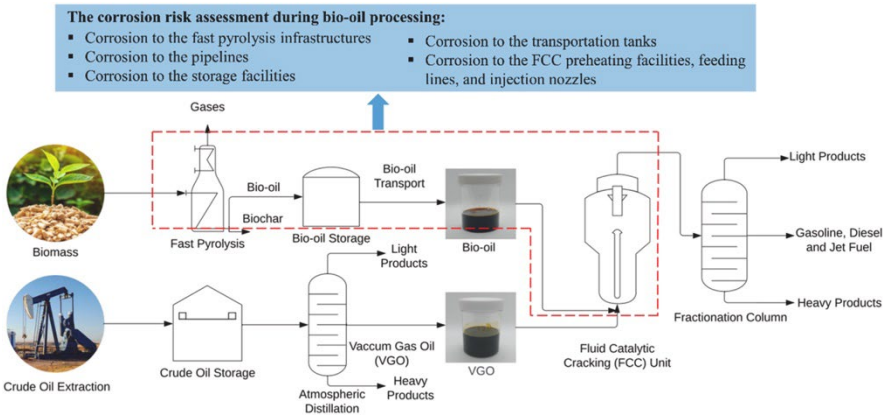
BIOINDUSTRIAL AND CIRCULAR INNOVATION

BIOENERGY

FUNDING DETAILS

Revolutionizing Low-Carbon Fuels with Advanced Electrochemical Analysis

Our research team at the University of Alberta (UofA) is advancing co-processing technologies that upgrade low-quality biocrudes—such as vegetable oils, animal fats, waste cooking oils, and biomass-derived oils—alongside petroleum intermediates within existing refinery infrastructure. This project focuses on developing a novel electrochemical dummy cell with a Faraday shield to enable accurate corrosion measurements in low-conductivity oil environments, addressing limitations of traditional immersion testing. The successful prototyping and testing of the corrosion measurement tool would lead to a commercial prototype (TRL 6), providing industry with a faster, more reliable method for assessing corrosion during biocrude co-processing. Validation against traditional techniques will ensure accuracy and reliability, supporting the integration of low-carbon biofuels into refinery operations and helping overcome key commercialization challenges for co-processing technologies.



RECIPIENT:

University of Alberta

Jing Liu

Nobuo Maeda

PARTNERS:

Imperial Oil

Arbios Biotech

TOTAL BUDGET:

AI FUNDING:

$200,000

PROJECT DATES:

Jan 2025 - Dec 2026

PROJECT TRL:

Start: 4

End:6

APPLICATION

UofA's advanced electrochemical measurement system addresses a critical challenge in co-processing low-quality biocrudes with petroleum intermediates within existing refinery infrastructure. By enabling real-time, accurate corrosion analysis in low-conductivity bio-oil environments, the system facilitates safer and more efficient integration of renewable bio-feedstocks into conventional refining operations. The successful development and deployment of this portable electrochemical tool would significantly enhance operational reliability, reduce unplanned downtimes, and lower maintenance costs for refineries adopting bio-based processing, contributing to the environmental, economic, and social sustainability goals of Alberta's energy sector.

Classification: Protected A

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PROJECT GOALS

- Validate the performance of the novel electrochemical system for accurate, real-time corrosion assessment in low-conductivity biocrude and petroleum environments.
- Demonstrate that the advanced electrochemical measurement system can reduce the time and the costs associated with traditional corrosion testing methods by at least 50%, enabling faster and more reliable decision-making at refineries.
- Validate the system's ability to support the integration of biocrudes into existing refinery operations by reducing unplanned downtime and equipment failure risks, supporting GHG emissions reduction goals tied to lower fossil fuel reliance.
- Develop and validate new equivalent circuit models to improve corrosion rate interpretation, enabling proactive corrosion management strategies in biofuel and petrochemical industries.

BENEFITS TO ALBERTA

- Adoption of the corrosion monitoring tool will enhance the safe co-processing of bio-based feedstocks, accelerating Alberta's transition toward lower-carbon fuel production.
- Successful development and manufacturing of the tool in Alberta will foster local innovation, create high-skill jobs in electrochemical technology development, and strengthen Alberta's position as a leader in clean energy technologies.
- Improved refinery efficiency and asset lifespan will reduce the capital and the operational costs for Alberta's energy sector, enhancing competitiveness in a global market increasingly driven by sustainability metrics.
- By supporting integration of renewable feedstocks, the project directly contributes to Alberta's Clean Fuel Standards and broader environmental and economic diversification goals, attracting further investment in clean technologies.

1 New Products/Services

1-5 Project Jobs

6-50 Future Jobs

1 Patent

Indirect Project GHGs

100-1000 kT/yr Future GHGs Reduced

CURRENT STATUS

MAY 2025 – In progress

The UofA research team has completed the design and laboratory validation of a novel four-electrode electrochemical system, enabling accurate corrosion measurements in low-conductivity biocrude environments. An initial prototype has been successfully bench-tested, demonstrating proof-of-concept for real-time corrosion assessment. The team is now advancing toward system manufacturing and optimization, to deliver a field-ready prototype. Field validation trials with industrial partners are planned for summer 2026.

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