ALBERTA INNOVATES

AGRICULTURE AND ENVIRONMENT

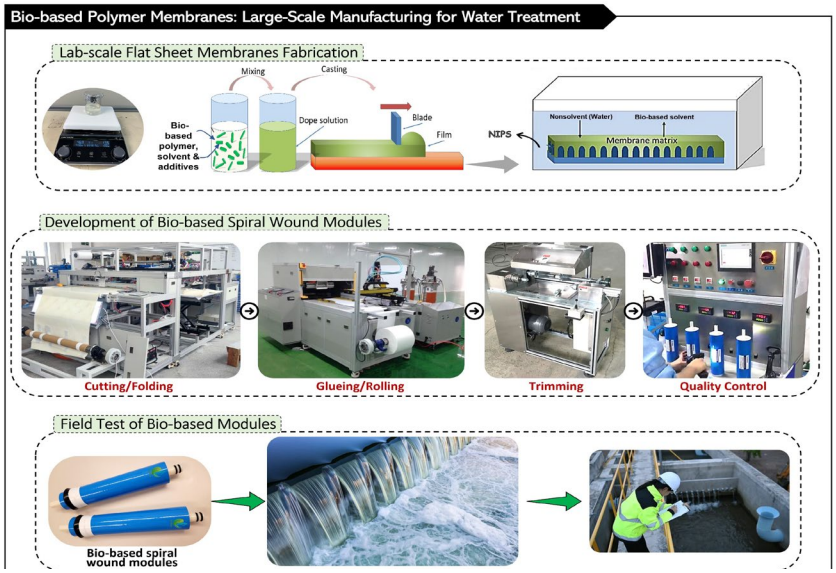
BIOINDUSTRIAL AND CIRCULAR INNOVATION

CIRCULAR ECONOMY

FUNDING DETAILS

Bio-based Polymer Membranes: Large-Scale Manufacturing for Water Treatment

Conventional petroleum-based membranes are non-biodegradable, prone to fouling, and costly to maintain. This project addresses these issues by developing scalable, bio-based membranes using renewable materials like poly(lactic acid) and eco-friendly solvents. These membranes reduce cleaning needs by up to 40%, lower environmental impact, and cut long-term costs. Building on prior Alberta Innovates–funded work, the project will optimize formulations, scale production, and validate performance in applications such as brewery wastewater and potable water treatment. Partnering with GreEnvi, it aims to localize manufacturing, reduce imports, and position Alberta as a leader in sustainable membrane technology.



RECIPIENT:
GreEnvi Corp.

PARTNERS:
Flexcim Manufacturing Services Inc.

TOTAL BUDGET:
$500,000

AI FUNDING:
$250,000

PROJECT DATES:
MAR 2025 – APR 2027

PROJECT TRL:
Start: 3
End: 5

APPLICATION

The bio-based membranes will be used for potable water purification, industrial wastewater treatment, and food and beverage applications, including brewery wastewater management. Their high permeability, antifouling properties, and biodegradability make them a cost-effective and sustainable alternative to conventional membranes. The project will integrate membranes into spiral wound modules, allowing for commercial adoption in municipal, industrial, and agricultural water treatment systems.

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PROJECT GOALS

This project aims to develop, scale, and commercialize bio-based polymer membranes as a sustainable alternative to conventional petroleum-based membranes. The key objectives are optimizing membrane formulations using bio-polymers, bio-additives, and green solvents, refining roll-to-roll manufacturing processes for large-scale production, and integrating membranes into spiral wound modules for real-world applications. Performance validation will focus on enhanced permeability, fouling resistance, and biodegradability, reducing chemical cleaning requirements by up to 40% and minimizing plastic waste. The project will support potable water purification, industrial wastewater treatment, reducing Alberta's reliance on imported membranes

BENEFITS TO ALBERTA

This project will drive economic, environmental, and social benefits for Alberta by establishing local production of bio-based membranes, reducing dependence on imported filtration technologies. By replacing petroleum-based membranes with biodegradable alternatives, it will lower plastic waste, chemical use, and operational costs for water treatment facilities. The project is expected to create 50 direct jobs in manufacturing, R&D, and commercialization, along with 100 indirect jobs in supply chain and logistics. Alberta could capture 5–10% of the North American bio-based membrane market, generating $25–50 million in annual revenue within a decade. Additionally, by reducing the use of petroleum-based polymers and hazardous solvents, the project is expected to cut CO_2 emissions by up to 1,000 metric tons annually, supporting Alberta's climate action targets and promoting sustainable industrial practices.

2 Publications

2 Students Trained

1 Patents

2 Project Jobs

1 New Products/Services

4 Future Jobs

CURRENT STATUS

MAY 2025 — In progress

Our team demonstrated the viability of bio-based polymer membranes for water treatment. Electrospun membranes made from sulfonated kraft lignin and polycaprolactone showed high hydrophilicity, permeability, and fouling resistance. Solvent-free polyelectrolyte complex membranes exhibited strong mechanical integrity and selectivity. Testing revealed flux rates of 400–700 LMH at 5–10 psi with over 90% impurity rejection. Even with BSA fouling, permeability dropped by less than 20%.