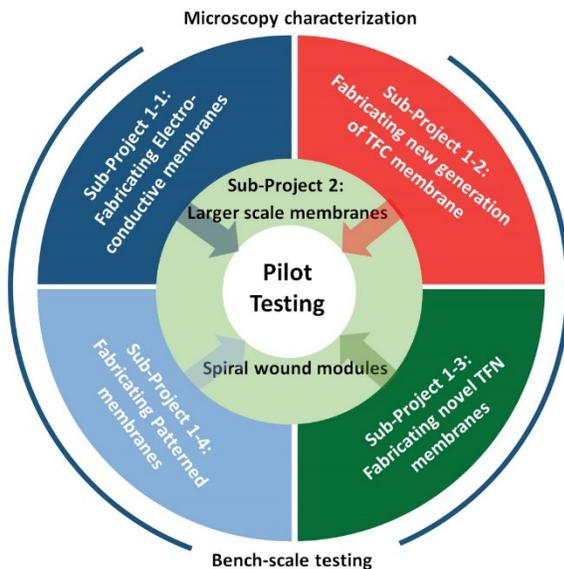


Manufacturing gravity-driven membrane elements for high-quality water production for rural, Indigenous, and remote communities

Microfiltration and ultrafiltration technologies are viable solutions to produce potable water, free of viruses, bacteria, and organic matter, for remote communities. However, a major challenge for the sustainable operation of these membrane systems in remote areas is the need for electrical power and management of fouling. This project's scope will be to develop a roll-to-roll membrane manufacturing process to produce large-scale, gravity driven, porous membranes using lignin, carbon nitride, and metalorganic frameworks. Manufacturing these membrane modules offers some advantages over conventional membranes regarding biodegradability, lower fabrication costs and reduced fouling.



RECIPIENT:
University of
Alberta



PARTNERS:
NSERC, COSIA,
CRIN



TOTAL BUDGET:
\$1,349,000



AI FUNDING:
\$650,000



PROJECT DATES:
APR 2023 – MAR
2026



PROJECT TRL:
Start: 4
End: 7

APPLICATION

The initial market for the project technology is water treatment in rural, remote and Indigenous communities that can take advantage of the gravity driven aspect of the membrane. The membrane has broader potential application for treatment of wastewater produced in many industrial processes such as petroleum refining, food processing, and pulp and paper.

PROJECT GOALS

This project aims to develop an energy-efficient membrane system to produce clean and safe drinking water for rural, Indigenous, and remote communities. Specific objectives include:

- O1: Manufacturing large-scale nanocomposite MF/UF flat sheet membranes utilizing lignin, MOFs, and C3N5, enabling them to operate at very low pressure
- O2: Manufacturing spiral wound membrane modules equipped with these nanocomposite membranes.
- O3: Implementing a grid-independent water treatment system

BENEFITS TO ALBERTA

While remote and Indigenous communities are the early adaptors of the proposed technology, the market within Alberta could be wastewater treatment in three sectors: residential, agricultural, and industrial. Hence, Alberta's municipalities, agricultural water treatment systems, mining, and pulp and paper industries, as well as water treatment EPC companies, can benefit from the results of this project. Our modification method using advanced nanomaterials and biopolymer increases the membrane's longevity and performance and thus produces higher-quality water for long-term operation. This will strike immediately, directly, and forcefully at contributing to economic diversification and growth in Alberta.



32 Publications



**8 Students
Trained**



2 Patents



2 Project Jobs



12 Future Jobs



**2 New
Products/Services**



**1 Spinoff
Companies**

CURRENT STATUS

JUNE 2025

The goal of this project is to develop an innovative energy-efficient water treatment system. The novel gravity-driven membranes are to be intricately tailored to the conditions in urban and rural communities. The project focused on the following activities during the recent reporting period: (1) Fabrication of lab-scale pyrolytic carbon and lignin composite membrane, (2) Performance evaluation of fabricated membranes, (3) Fabrication of roll-to-roll carbon-based composite membranes, (4) Characterization of spiral wound modules, (5) Long-term performance and antifouling properties of membranes.