ALBERTA INNOVATES

CLEAN ENERGY

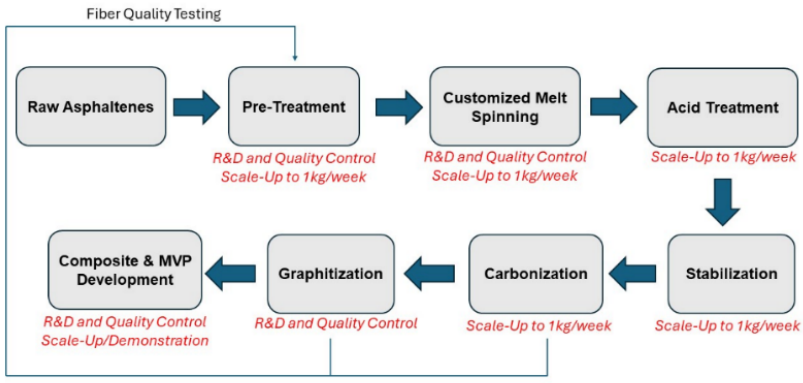
ADVANCED HYDROCARBONS

CARBON FIBRE GRAND CHALLENGE PHASE III

Process Development for Transforming Alberta's Asphaltenes into High-value Carbon Fibers: Performance Improvement, Scale-Up, and Product Development

Over the past few years, CarboMat has demonstrated the technical feasibility and reproducibility of producing high-value carbon fibers from low-value asphaltenes using their prototype units. The team has specifically illustrated the consistency (i.e., uniformity, 7um diameter, etc.) in fiber quality at gram-scale production through multiple iterations and their ability to reinforce composite structures. Furthermore, their detailed techno-economic and life-cycle analysis indicates that their technology offers <USD $10/kg carbon fiber production cost along with a 50% reduction (~10 kg CO2-eq/kg) in GHG emissions, relative to conventional incumbents. Building on these successes, the objectives of this project includes performance enhancement of asphaltene-derived carbon fibers, kg-scale production scale-up, and demonstrate minimum viable product (MVP) development.

CFGC Phase III Project Image



FUNDING DETAILS

RECIPIENT:
CarboMat Inc.

PARTNERS:
CMSI, Haze Automotive, Carbon Upcycling, ZiprPrint, UU/NIACE, CNRL, Suncor, InnoTech Alberta

TOTAL BUDGET:
$5,141,630

AI FUNDING:
$2,522,370

PROJECT DATES:
FEB 2024 – DEC 2026

PROJECT TRL:
Start: 5
End: 7

APPLICATION

The applications of asphaltene-derived carbon fibers would be in various large-volume industries such as automotive, sports, commodities, defense, aerospace, etc. for composite applications. Based on the quality of asphaltene-derived carbon fibers, the go-to-market strategies would be tailored. This project has significant potential for profitable collaboration with oil sands industries in Canada and beyond. The success of the project will contribute to supplying inexpensive high-strength carbon fibers to various structural sectors, including automotive, aerospace, construction, etc.

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PROJECT GOALS

The three goals of this project include:

- Performance improvement of asphaltene-derived carbon fibers through tailoring different individual processes within our end-to-end carbon fiber manufacturing route
- Continuous spinning of multi-filament or carbon fiber tows in kg-scale
- Product development and testing of asphaltene-derived carbon fiber reinforced composite structures to demonstrate a minimal viable product for direct market applications

BENEFITS TO ALBERTA

The successful implementation of this technology or use of the knowledge generated could result in:

- Open up multi-million-dollar non-combustible supply opportunity for oil sands industries
- Reductions in the price and production cost of carbon fibers to penetrate into high-volume markets
- Partnerships between oil sands industries and construction/automotive industries etc.
- Replace carbon intensive products, including steel, construction materials etc.
- Develop a new and sustainable asphaltene-derived carbon fiber and materials industry in Alberta
- Help make automobile and other industries energy efficient and achieve climate benefits towards the race to a net-zero future sooner by 2050

6 Publications

6 Students Trained

2 Patents

9 Project Jobs

1 New Product/Service

10-100 Future Jobs

1000-2000 kt/yr Future GHGs

CURRENT STATUS

JUN 2025

So far, CarboMat has completed two milestones in the project and is expecting the deployment of the kg-scale pilot unit by the end of this year. Our significant innovations so far include the ability to produce anisotropic mesophase domains from asphaltenes with tailored properties and successful impregnation of high-quality additives in small concentrations (<1%) for production of ultra-stiffness premium-grade carbon fibers.