ALBERTA INNOVATES

CLEAN RESOURCES

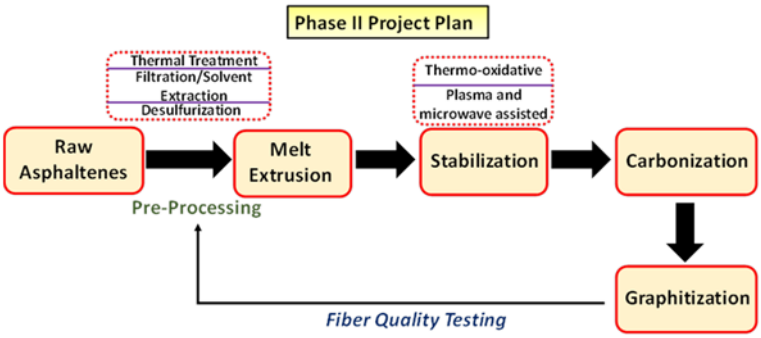
ADVANCED HYDROCARBONS

INNOVATIVE HYDROCARBON PRODUCTS – BITUMEN BEYOND COMBUSTION

Process Development for Transforming Alberta's Asphaltenes into High-value Carbon Fibres

FUNDING DETAILS

The overall objective of this project is to develop an economically and environmentally viable process that would enable valorization of Alberta's asphaltenes into high-value carbon fibres to create low cost alternatives to PAN and pitch-based carbon fibre technologies. In Phase II, this project will pursue pre-processing of asphaltenes for continuous melt-spinning of green fibres followed by energy efficient stabilization, carbonization, and graphitization processes. We aim to produce carbon fibres that would possess the quality and standards needed for commercial applications.



RECIPIENT:
University of Calgary (Dr. Kibria)

PARTNERS:
Rice University

TOTAL BUDGET:
$780,000

AI FUNDING:
$500,000

PROJECT DATES:
AUG 2021 – JAN 2023

PROJECT TRL:
Start: 4
End: 6

APPLICATION

This project has significant potential for profitable collaboration with oil sands and composite industries in Canada and beyond. The success of the proposed project will contribute to supplying inexpensive high-strength carbon fibres to various end users, including automotive, aerospace, construction industries, etc. for multi-functional applications. On the other hand, any low-quality carbon fibres produced from this project would also find commercial applications in other sectors, including energy storage and electrode materials, process plant components (e.g., pressurized vessels, etc.) etc.

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PROJECT GOALS

The key goals of the project are:

- Develop effective pre-processing steps for Alberta oil sands asphaltenes (AOAs) towards improved asphaltene properties (i.e., enhanced mesophase, higher carbon contents and removing impurities).
- Demonstrate continuous melt spinning of pre-treated AOAs.
- Design energy efficient stabilization of green fibres spun from AOAs.
- Demonstrate energy efficient carbonization of stabilized fibres.
- Conduct comparative techno-economic (TEA) and life cycle (LCA) analysis of the AOA-derived carbon fibre production process with the incumbent processes.

BENEFITS TO ALBERTA

Successful implementation of the opportunity would diversify Alberta's downstream economy beyond combustion, create new businesses, long-term and stable employment opportunities, protect Alberta's oil sands industry from potential declines in demand for fossil fuels, mitigate Alberta's GHG emissions, and stimulate investment in Alberta. Shifting our focus to a more diverse array of products from our resources that can reach new markets will lead to sustained growth and prosperity for the province. Also, corporate taxes, jobs, royalties, and other income generated by downstream development would create revenue for governments at all levels.

2 Publications

10 Students/RAs Trained

2 Patents

1 New Product/Service

11-100 Future Jobs

CURRENT STATUS

AUG 2022

We have developed effective pre-processing and post-spinning steps for the as-received asphaltene. Currently, we are producing carbon fibre on a 20-50 grams per day scale with competitive strength and modulus that are suitable for multiple industries. We have recently launched CarboMat Inc., a spin-off company to commercialize our carbon fibre technology for automotive, aerospace, and many other lightweight industries.