ALBERTA INNOVATES

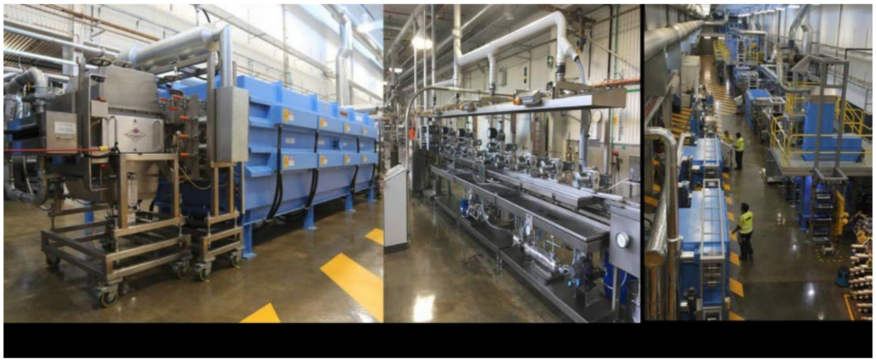
CLEAN ENERGY

ADVANCED HYDROCARBONS

BITUMEN ADVANCED MATERIALS

Modification of Alberta Oilsand Asphaltene (AOA) for Development of Low-cost Carbon Fibres

This project aims to address the solubility challenges of asphaltene to facilitate its effective integration into cost-efficient carbon fibre (CF) production. Our recent investigations have demonstrated the feasibility of CF fabrication from asphaltene; however, its poor solubility and incompatibility with common solvents remain significant obstacles. This project will explore various chemical and thermal modification strategies to enhance asphaltene solubility in solvents, utilizing multiple commercial sources. Optimized treatments will be applied to produce precursor fibres, subsequently processed into CF and composites using Carbon Nexus unique facility at Deakin. This research will establish critical process-structure-property relationships, advancing the development of low-cost CF.



FUNDING DETAILS

RECIPIENT:
Deakin University – Prof. Minoo Naebe

PARTNERS:
Mahindra, Quickstep

TOTAL BUDGET:
$1,915,514

AI FUNDING:
$957,711

PROJECT DATES:
MAR 2025 – APR 2027

PROJECT TRL:
Start: 3
End: 5

APPLICATION

This project has significant applications in advancing cost-effective carbon fibre (CF) production for automotive, unmanned vehicles, and infrastructure sectors. By optimizing asphaltene solubility and integrating it into precursor fibres, the aim to reduce reliance on expensive polyacrylonitrile (PAN) while maintaining application-tailored properties. The findings will support sustainable material development, expand CF use in cost-sensitive applications, and position Alberta as a key player in the growing CF market through the utilization of oil sands-derived asphaltene.

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PROJECT GOALS

The goal of this project is to develop a cost-effective pathway for carbon fibre (CF) production by optimizing the solubility of asphaltene, a promising alternative carbon source derived from Alberta oil sands (AOA). While CFs have revolutionized lightweight, high-strength materials, their conventional reliance on costly polyacrylonitrile (PAN) limits broader applications. Our recent studies have demonstrated the feasibility of incorporating a high weight fraction of asphaltene into PAN-based systems to reduce CF costs. However, poor solubility and solvent incompatibility remain key challenges. This project will investigate chemical and thermal modifications to enhance asphaltene solubility in common solvents. By establishing process-structure-property relationships, this research aims to enable the large-scale production of low-cost CF and strengthen Alberta's position in the growing CF market.

BENEFITS TO ALBERTA

This project offers substantial benefits to Alberta by leveraging its abundant oil sands-derived asphaltene as a cost-effective feedstock for carbon fibre (CF) production. By enhancing the solubility and processability of asphaltene, the research supports the diversification of Alberta's resource-based economy, creating new opportunities in advanced materials manufacturing. The development of low-cost CF can drive growth in key industries such as automotive, and infrastructure, fostering local innovation and job creation. Additionally, this project strengthens Alberta's position in the global CF market, reducing dependence on imported raw materials and increasing the value-added utilization of its natural resources. By integrating asphaltene into CF production, Alberta can establish itself as a leader in sustainable and economically viable advanced materials, supporting long-term industrial and economic development.

2 Publications

4 Students Trained

1 Patent

3 New Products/Services

CURRENT STATUS

JUN 2025

The project has made a solid start, with key foundational activities progressing as planned. Initial activities have centered on literature review, sourcing and characterizing the asphaltene feedstock, and establishing baseline solubility data in conventional solvents. Preliminary experiments on chemical modification approaches are underway, with promising early indications of improved solubility. The team is on track to achieve the next project milestone, which involves identifying the most effective modification strategy for enhancing solubility and compatibility with PAN systems.