



UNIVERSITY
OF ALBERTA

FACULTY OF ENGINEERING

Advanced Heat Transfer &
Surface Technologies
(AHTST) Laboratory



AHTST Laboratory

RESEARCH TOPICS

The current research program focuses on the development of next-generation coatings and multi-functional surfaces. For the last decade, the Laboratory has developed surface solutions built on:

- High-strength metal matrix composite wear-resistant coatings.
- Photocatalytic bactericidal coatings.
- Coatings deposited on temperature-sensitive polymeric materials.
- Functional coatings-based heating elements for extreme low-temperature environments.
- Smart hybrid coating-membrane systems for liquid purification and reclamation.



ON-GOING RESEARCH ACTIVITIES

- Ultra-high strength and light coatings from high entropy alloys (HEA).
- In-service health monitoring sensors.
- Predictive performance modelling.
- Autonomous fabrication of repair coatings using integrated artificial intelligence (AI) and machine learning (ML) techniques.
- Thermally sprayed coatings for protection against hydrogen embrittlement.

APPLICATIONS

- Aerospace and Defence
- Energy Generation
- Natural Resources and Agriculture

EMERGING RESEARCH PRIORITIES

- Critical Minerals
- Hydrogen Economy
- Low-carbon Energy Generation

PRINCIPAL INVESTIGATOR



André McDonald, PhD, BS Law, PEng, CEng, PE, FASM, FIMMM, FIMechE, is currently a Professor of Mechanical Engineering at the University of Alberta. He is a world-renowned expert in thermal spray, heat transfer, and surface modifications and engineering. Dr. McDonald currently leads the Experiential Learning in Innovation, Technology, and Entrepreneurship (ELITE) Program for Black Youth (www.eliteprogram.ca).

PARTNERS



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