Advanced Anode Materials for Proton Exchange Membrane Water Electrolysis (PEMWE)

For: MSc or PhD Students; 12 months

Program supported: Materials for Clean Fuels

Academic Collaborator	NRC Principal Investigator	Associated NRC Research Centre
Carleton University	Khalid Fatih (Researchgate)	Energy, Mining and Environment Research Centre

Project Description:

The world-wide hydrogen production market is estimated to reach a size of USD 199.1 billion by 2023. The estimated growth is attributed to the growing demand for hydrogen in oil and gas refineries and increasing demand for fuel cells in transportation and power generation. Ultimately, PEMWE is the only industrial technology to produce pure hydrogen without carbon footprint during the process particularly if the electricity source is clean and renewable.

However, PEMWE technology still suffers from performance, cost and stability of the stack components specifically the anode catalyst for the oxygen evolution reaction where the main energy loses and cost occur. The proposed project aims at developing new anode catalyst materials and support using a flame-based combustion process, which allows alloys/oxides compositions flexibility and particles sizes control. The anode catalyst/support materials will be produced at Carleton University and tested at NRC-EME-Vancouver.

The proposed topic aligns well with the Materials for Clean Fuel Challenge program as it explores a scalable solution for nanoparticle (electrocatalyst) fabrication with unique morphology and properties. It contributes to addressing material discovery-development challenges that has been retarding the industrialization of this critical technology. The project aligns with an existing project under the MCF program in collaboration with University of British Columbia and will use capabilities developed under this program to conduct materials' performance evaluation. The project has the potential to generate IP in materials composition as well as some aspect of the methodology.

Student Profile:

Candidates must have completed an undergraduate degree (exceptional undergraduate students are also considered) in Material, Mechanical or Chemical engineering, Physics, Chemistry or in a closely related field. The candidate should have demonstrated experience in the following areas:

*Demonstrated experience with the design, fabrication and assembly of mechanical parts using commercial software SolidWorks, and/or AutoCAD

*Experience from the construction of experimental equipment and related infrastructure

*Experience with Thermal Gravimetric Analysis (TGA), Differential Scanning Calorimetry (DSC) and X-ray powder diffraction (XRD) and Nitrogen Adsorption (BET) analysis is an asset

*Work independently, self-motivated, with a strong work ethic and collaborative skills

*Applicants must be proficient in both written and oral English and possess excellent communication and interpersonal skills.