

April 04, 2022

Post Doctoral Fellowship Opportunity at the University of Victoria – *Investigation of membrane separation technologies for hydrogen-blended natural gas*

We are pleased to announce an opening for a NSERC grant-funded Post-Doctoral Fellow (PDF) position with the Department of Mechanical Engineering at the Faculty of Engineering starting immediately (please contact me if you wish to adjust the starting date). This letter constitutes the contract for your term of appointment at the university and is conditional upon you obtaining approval from government agencies responsible for immigration and work permits.

The PDF will be performing research on sensing and membrane separation technologies for natural gas applications and will be provided with workspace for that purpose. Specifically, the research project will be focused on the separation of hydrogen (H₂) from gas stream of hydrogen-enriched natural gas (HENG, from 5-20% (v/v) H₂) using commercial membranes for downstream use by appliances incompatible with HENG. A project summary is provided below:

The H₂ separation unit will use a conventional polymeric membrane with an area sufficient for the slip stream flow. Under a pressure-controlled mode, a portion of the HENG will flow to a hollow-fiber membrane module to test its effectiveness in producing H₂ free natural gas. The membrane module's separation efficiency will be validated using the gas composition analysis unit along with the sensor developed in Subproject 4.

Task 7.1: Separation performance of single-stage membrane units. The ability of a single-stage membrane unit to produce ultra-pure natural gas (free of H₂) at various feed operating pressures is studied. The emphasis is on recovery of hydrocarbons during the separation process, as the associated hydrocarbons loss could be significant due to membrane's imperfection. The tests will be conducted considering various H₂ contents in the feed gas, and various operating pressures at the membrane's permeate side. An in-house simulation module, MemCal in Hysys (developed in Phase 1), will be used to determine optimum membrane configuration for separation.

Task 7.2: Effect of other components on separation performance. The setup will investigate the effect of the presence of hydrocarbons heavier than CH₄, and non-hydrocarbons (e.g. water, N₂, CO₂) on the membrane's performance. The experiments will be conducted using gas mixtures provided by FEI, or mixtures of similar composition obtained from a commercial supplier.

Deliverables: Two major outcomes are expected: (1) we will perform more detailed analysis based on actual natural gas compositions and gas capacities and determine optimal inlet/outlet conditions for ultra-pure natural gas extraction from HENG, and (2) we will obtain details from membrane supplier's regarding unit's performance, footprint, and cost.

Risk mitigation: The performance parameters of the market available H₂ separation membranes will be determined using the thermodynamic simulator Aspen HYSYS model with a MemCal extension developed in Phase 1 to model the membrane separation process. The model studied the performance of single- and two-stage units at various feed/products specs.

Success indicators: Establishing the performance of commercial membranes utilized in single-stage designs for recovery of H₂ by 95% volume and 100% purity from mixtures of hydrocarbons and non-hydrocarbons, respectively.

As part of your duties, you are expected to assist with project-related tasks and contribute to the management of the project by communicating with outside collaborators, exchanging information and materials as necessary. You will also contribute to the existing research group and participate in research meetings. You may also have the opportunity to co-supervise graduate students, contribute to industry sponsored research, initiate new research and contribute to the writing of grant proposals. Laboratory costs are covered by the research grant but you are expected to ensure the funds are spent effectively. You will be eligible for additional pay (up to \$7,000 Canadian) if the assigned duty (e.g., lecturer assignment) falls outside the scope of this position.

You will be a co-author on any publications arising from your work on this project with first, second or other authorship depending on the relative contributions. Typically, the principal investigator will be the senior and corresponding author. If any intellectual property (IP) is developed from your work on the project, you will work with the principal investigator and the university's Research Partnerships and Knowledge Mobilization Unit (RPKM) to develop and protect the IP. IP sharing will be assessed on a case-by-case basis in consultation with RPKM.

The initial appointment will be for 1 year on the campus of the University of Victoria under the supervision of Dr. Mina Hoorfar at the Microfluidics and Nanotechnology (MiNa) Laboratory. Full-time hours are 7.5/day and minimum 15 days/year vacation with flexibility on location at UVIC (ELW B120). The salary for this position is \$55,000 Canadian per year. This position may be renewed for a further year subject to satisfactory performance and the availability of funding. During the term as a PDF at the university, you will be subject to the policies of the university including, but not limited to, the *Post Doctoral Fellows policy HR6310* and *Procedures for the Appointment of Post Doctoral Fellows* found at [http://www.uvic.ca/shared/shared_usesec/docs/policies/HR6310_7010 .pdf](http://www.uvic.ca/shared/shared_usesec/docs/policies/HR6310_7010.pdf).

Unless otherwise specifically stated in writing, conditions of your employment will be in accordance with the requirements set out in the B.C. Employment Standards Act and Regulations. You may wish to consult the terms of the Act and Regulations found at www.labour.gov.bc.ca/esb/igm/igm-toc.htm.

Through the grant funding I will provide the employer share of the following voluntary benefits: Medical Services Plan, Extended Health Plan, Dental Plan, Basic Life Insurance and Optional Group Life Insurance. You will be eligible for the Dental Plan, Basic Life Insurance and Optional Group Life Insurance after one year employment. Eligibility, employee share costs, and employer share costs are detailed in the university's policy on Employment Under Externally Funded Grants And Contracts HR 6305 – **see weblink** [https://www.uvic.ca/universitysecretary/assets/docs/policies/HR6305_1470 .pdf](https://www.uvic.ca/universitysecretary/assets/docs/policies/HR6305_1470.pdf).

If medical services benefits are not offered as part of your employment conditions, you are required to have medical insurance through the BC Medical Services Plan (or another plan if you are not eligible) before you commence your position.

As a Post Doctoral Fellow at the University of Victoria you are eligible:

- a) to hold University identity cards that provide access to library facilities;
- b) for information systems access similar to that of a faculty member;

- c) to apply for, and upon payment of the required fees, use University athletic facilities on campus;
- d) to apply for, and upon payment of the required fees, have access to University parking;
- e) to receive career advice and job placement services offered by the Student Employment Centre

Should you have any questions and if you require additional information on Victoria or assistance in finding housing or temporary accommodation, please do not hesitate to contact me.

The Department of Mechanical Engineering, Faculty of Engineering is comprised of a dynamic group of researchers, staff and students currently engaged in an array of projects and activities related to integrated and low-carbon energy systems. You will have opportunities to interact both socially and professionally with this diverse group, and we look forward to having you as a colleague.

Sincerely



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