Carleton UNIVERSITY
Canada's Capital University

Mechanical and Aerospace Engineering
1125 Colonel By Drive
Ottawa ON Canada K1S 5B6
Tel: 613-520-5684

Position: PhD Candidate

Title:

Design of a solar thermal driven thermochemical energy storage system for building heating applications in Canada's remote communities

Supervisor: Professors Jean Duquette and Ron Miller

Start date: September 2020 (or January 2021)

Duration: 4 years

Stipend:

Domestic PhD students: Qualified students receive a minimum guaranteed funding package of $35,000/year for four years (including RA, TA, and scholarships). Additional top-ups will be provided for those awarded external scholarships (NSERC, OGS, etc…).

International PhD students:
Note: Effective Fall 2020, incoming international PhD students will be eligible for a bursary that will account fully for the tuition difference between their international PhD tuition and the tuition paid by domestic students in the same program. Qualified students are also eligible for RA, TA and scholarship amounts depending on student record and budget availability.

Description:

A number of technologies are currently being considered for use in northern remote communities for reducing energy system related CO_2 emissions. Solar thermal collectors are one such technology that have the potential to capture heat from the sun for use in residential heating applications. However, as these locations receive minimal sunlight during the winter months when heating demands are the greatest, these collectors must be coupled with a seasonal storage device in order to store heat during the summer for delivery during the winter. Thermal energy storage via physical adsorption processes (*e.g.* using adsorbent materials such as Zeolite 13X) has been demonstrated as a more compact mode of thermal energy storage than other technologies based on sensible or latent heat. Heat is stored in the zeolite material by using hot dry air to drive off the adsorbed water vapour (and the process is reversed to release this stored heat). In the current project, the PhD candidate will design a solar thermal driven thermochemical energy storage system for space and domestic hot water heating applications in buildings located in Canada's northern remote communities. The system will be modeled numerically using an appropriate tool (*e.g.* Matlab/Simulink, TRNSYS) and various system configurations and control scenarios will be explored. Experimental work will also be conducted to properly scale the adsorption system's thermal response for any given system size. Potential impacts will mainly be evaluated via techno-economic, and environmental assessment methods. In addition to the project aspects of the work, the candidate will be expected to attend conferences, and publish their work in peer-reviewed journals.

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Eligibility:

Candidates should have a

- A strong background in heat transfer, fluid mechanics, and thermodynamics;
- Considerable knowledge/experience in the areas of building science and building HVAC systems;
- and possess advanced numerical modeling and/or experimental skills.

In addition, candidates should be highly motivated and self-directed, and demonstrate strong oral/written communication skills in the English language (preference will be given to those having already published in peer-reviewed literature).

Contact:

Please email your cover letter, resume, transcript(s) and a writing sample in a single pdf file to Jean Duquette at: jean.duquette@carleton.ca.

In the body of the email, please include your name, desired start date, and whether you are a domestic or an international student.