Summer jobs at ENERSENSE 2019

This summer we are offering the chance to be involved in one of our exciting research projects within ENERSENSE. The ENERSENSE research group focuses on energy storage, energy efficiency, and sensor technology in an interdisciplinary way. There are 7 summer positions available, and the different topics of these are listed and described below. All projects are under the supervision of our Ph.D. candidates and Postdocs. If you have any questions about the projects, please contact the responsible person.

Practical information:

- Five weeks of full-time work, with pay rate 22 (student assistant salary system).
- Open to all students, including bachelor and master students from any university
- Start-up in early June with some flexibility towards the student's availability
- Specific requirements are listed under the positions
- Delivery of a report and poster is required at the end of 5 weeks

How to apply?

If you are interested in one or more of the summer jobs, please send in your motivation letter, CV (including relevant skills and competencies), and a grades-overview. In case you want to apply for multiple positions, send your top three preferred projects.
Please send this information to enersense.ntnu@gmail.com with the email-subject "summer2019_firstname_lastname" before the **deadline on 17.03.2019 at 23:59.**

List of topics

ESS1901 Modeling apartment blocks in IDA-ICE

ESS1902 ASPEN Modelling of a novel technology producing hydrogen from low grade waste heat using Reverse electrodialysis of Ammonium bicarbonate

ESS1903 Experimental studies of a novel technology producing hydrogen from low grade waste heat using Reverse electrodialysis of Ammonium bicarbonate

ESS1904 Conversion of CO2 into hydrocarbon using power ultrasound and electrochemistry *(Two positions are available)*

ESS1905 Characterization of hydroxyl radical formed by ultrasonic irradiation (Dosimetry study)

ESS1906 Nickel materials for anion exchange membrane (AEM) water electrolysis

#ESS1901: Modeling apartment blocks in IDA-ICE
PhD Candidate: Laurina Felius

Goals and tasks: The aim of this summer project is to create a realistic simulation model of a typical Norwegian apartment block from the 70-80s in IDA-ICE. The model will be based on drawings and input data from an existing building, or based on statistical data. The modeling will be supervised by the PhD student, but is mostly independent work. Therefore, it is required that the student has knowledge about the program and can identify and solve errors / strange results. This model will be used afterwards for analyzing the effect of renovation and building automation measures on the energy consumption and indoor climate as part of the PhD. The following tasks are part of the summer project:

- Analyzing and finding correct/realistic input parameters for the model
- Creating a 3D ifc-model of an apartment block based on existing drawings
- From this, create a model in IDA-ICE
- Calibrating and validating the model
- Writing a method-section that explains the modelling and validation process (for future publications)
- If there is time: modeling of renovation scenarios

Desired skills and characteristics:

- The student can use ArchiCAD (or equivalent) to create an ifc-model
- The student can use IDA-ICE for energy simulations
- The student can work independently and in a structured way
- The student is interested in efficient energy use in buildings
- Good writing skills are a bonus, but not required

Important info: It is preferred that the student can start in June (the earlier the better!) and is finished latest mid-July. For questions about the summer job, contact laurina.felius@ntnu.no.

ESS1902: ASPEN Modelling of a novel technology producing hydrogen from low grade waste heat using Reverse electrodialysis (RED) of Ammonium bicarbonate (AmB)
PhD Candidate: Yash Raka

Goals and tasks: The aim of this summer project is to develop an ASPEN/HYSYS model for a AmB RED process for hydrogen production. The following tasks are part of the summer project:

- Evaluation of reactions for AmB decomposition as function of concentration and temperature
- Developing a Gibbs reactor model including reactions
- Testing the robustness for limiting values of concentration and temperature

The goal of the project is to understand how Salinity gradient based energy systems work, understand and develop a process model and conduct simulation.

Desired skills and characteristics:

- Previous experiences in Matlab programming.
- Previous experiences in using analytic approaches.
- Aspen modelling skills are an advantage, but not required.

Important info: A report or poster including a literature study and the model results should be delivered after the five weeks. For questions about the summer job, contact yash.raka@ntnu.no.

ESS1903: Experimental studies of a novel technology producing hydrogen from low grade waste heat using Reverse electrodialysis (RED) of Ammonium bicarbonate (AmB)
PhD Candidate: Yash Raka

Goals and tasks: The aim of this summer project is to evaluate the electrochemical performance of AmB RED cell. The following objectives are part of the summer project:

- Polarization curve, EIS (Gamry), and Assembly and disassembly of RED cell
- Effect of flow rate of concentrate, dilute and redox solution on hydrogen production rate
- Effect of concentration of concentrate and dilute solution and concentration ratio on polarization characteristics
- Effect of temperature on polarization characteristics (optional)

The goal of the project is to understand how Salinity gradient based energy systems work, gain hands on experience with cell assembly and operation and with electrochemical characterization techniques.

Desired skills and characteristics:

- Previous lab work experience.
- Knowledge of statistics and experience in using statistical methods for analyzing data sets.

Important info: A report or poster including a literature study and the results should be delivered after the five weeks. For questions about the summer job, contact yash.raka@ntnu.no.

#ESS1904: Conversion of CO2 into hydrocarbon using power ultrasound and electrochemistry
(2 Positions are available)
PhD Candidate: Md Hujjatul Islam

Goals and tasks: CO2 can be converted into useful fuel and chemicals through different route such as chemical, photochemical, electrochemical and biochemical methods. In this project CO2 conversion to hydrocarbon using electrochemical method will be studied. In addition to this, the effect of Power Ultrasound will be studied in the electrochemical CO2 conversion process. In this five week long summer job, the candidate is expected to:

- Participate in ongoing experimental works with the PhD and Master's thesis student.
- Logging of daily experimental data, analysis and reporting
- Prepare a poster at the end of the summer job.

Desired skills and characteristics:

- BSc or MSc student in chemistry, chemical engineering, material science or other related field.
- Previous lab work experience and understanding of UV-vis spectrophotometer is required.

Important info: For further information, please contact, Md Hujjatul Islam, email: md.h.islam@ntnu.no, Phone: +4746824145

#ESS1905: Characterization of hydroxyl radical formed by ultrasonic irradiation (Dosimetry study)
PhD Candidate: Md Hujjatul Islam

Goals and tasks: Irradiation of power ultrasound in aqueous solution produces highly active hydroxyl radicals (OH•). In order to understand the sonochemical effect of ultrasound in aqueous solution, it is crucial to characterize the amount of radicals formed by ultrasonication. In this project several chemical methods will be studied to characterize the hydroxyl radicals. The daily duties of the student will be;

- Performing experiment, logging experimental data and reporting
- Prepare a poster at the end of the summer job.

Desired skills and characteristics:

- BSc or MSc student in chemistry, chemical engineering, material science or other related field.
- Previous lab work experience and understanding of UV-vis spectrophotometer is required.

Important info: For further information, please contact, Md Hujjatul Islam, email: md.h.islam@ntnu.no, Phone: +4746824145

#ESS1906: Nickel materials for anion exchange membrane (AEM) water electrolysis
PhD Candidate: Alaa Faid; (supervisors Svein Sunde, Frode Seland and Alejandro Oyarce Barnett)

Goals and tasks: Fabricate membrane-electrode-assemblies (MEAs) based on nickel electrodes and nickel bipolar plates for testing in a AEM water electrolysis test station. Nickel material will also be tested in simulated environment in a 3 electrode electrochemical cell with fine potential control of the nickel electrode. The purposes will be to investigate how the nickel electrode behave/degrade under certain conditions of lower pH and low potentials (hydrogen evolution), while monitoring the cell performance.
Desired skills and characteristics: Background in fundamental and experimental electrochemistry is an advantage (e.g. courses TMT4252 and TMT4166), but not a prerequisite.
Important info: The student will work together in a team of PhD students and Sintef researchers, who will share equipment. The student needs to get proper HSE and experimental training before productively entering into laboratory work.
For more information contact Alaa Faid by email alaa.faid@ntnu.no.