

PhD scholarship in Functionalization and stabilization of light polymerized polyvinylethers through side chain modification for application in electrochemical cells

The section for “Electrochemical Materials” (EMA) researches on advanced, inorganic and organic materials for electrochemical and optical energy conversion and storage technologies. Through novel approaches to materials synthesis, surface modification, processing, and interface architectures, materials properties are tailored to achieve desired functionalities. This is supported by advanced characterization techniques to monitor the electrochemical, optical, and catalytic properties. Current activities are covering the synthesis of small molecules for organic redox flow batteries and building blocks for electrically and optically active functional polymers as well as light introduced polymerization and characterization techniques for high throughput screening of novel organic materials for electrochemical and photovoltaic applications.

Organic materials and especially polymers are promising materials for electrochemical cells as they do not contain scarce or harmful elements and their functionality can be tailored through incorporation of functional groups. Light induced polymerization of carefully chosen mixtures of monomers is a fast and smart way of preparing polymers with tailored functionality, e.g. to transport ions, such as protons or hydroxides in electrolytes.

Responsibilities and tasks

The aim of the PhD project is to explore light induced polymerization with the objective to derive stable functional membranes for applications in fuel cells, electrolysis, and flow batteries. If you are interested in exploring novel routes to organic materials and polymers and like to work within energy conversion and storage, perhaps you are our new PhD student.

In this project you will be responsible for the development of novel materials as well as their characterization as regards stability and electrochemical properties, up to testing in full battery, fuel or electrolysis cells.

- You will contribute to the development of our competences within light initiated polymerization of organic monomers.
- You will with special focus on vinyl-ether compounds prepare membranes and tune their properties through side chain modification of the monomers.
- You will use your skills within organic chemistry to synthesize monomers suitable for polymerization into membranes.
- Your research will include subsequent analysis of the prepared membranes with special focus on ion transport properties and stability.
- You will enter into a research environment that focuses on applied science with the possibility to experience all steps from molecular tuning to final device.

With this project, you will be an integral part of our interdisciplinary research activities to develop advanced electrochemical energy conversion and storage technologies. Thus, you are expected to interact actively with DTU colleagues, as well as other researchers, and, if relevant industrial collaborators, in the area of batteries, electrolysis and fuel cells.

Qualifications

Candidates should have a two-year master's degree (120 ECTS points) in Organic Chemistry or Chemical Engineering or a similar degree with an academic level equivalent to a two-year master's degree.

It is a *prerequisite* that you as a candidate have:

- hands-on experience with practical organic synthesis
- the ability to work independently, to plan and carry out complicated tasks and to be part of a dynamic research group
- very good communications skills in English, both written and spoken.

Furthermore, it will be an *advantage* if you have

- experience with polymerization reactions and catalysts
- experience with photo-initiated chemistry
- experience with membranes

Approval and Enrolment

The scholarship for the PhD degree is subject to academic approval, and the candidate will be enrolled in one of the general degree programmes at DTU. For information about our enrolment requirements and the general planning of the PhD study programme, please see the [DTU PhD Guide](#).

Assessment

The assessment of the candidates will be made by a recruitment committee composed of internal evaluators.

We offer

DTU is a leading technical university globally recognized for the excellence of its research, education, innovation and scientific advice. We offer a rewarding and challenging job in an international environment. We strive for academic excellence in an environment characterized by collegial respect and academic freedom tempered by responsibility.

Salary and appointment terms

The appointment will be based on the collective agreement with the Danish Confederation of Professional Associations. The allowance will be agreed upon with the relevant union. The period of employment is 3 years.

The PhD student is expected to start by Dec 1st 2019.

You can read more about [career paths at DTU here](#).

Further information Further information may be obtained from Head of Section Peter Holtappels, tel.: +45 21 32 52 61.

You can read more about "DTU Energy" at energy.dtu.dk.

Application

Please submit your online application no later than **2 October 2019 (local time)**.

Apply at www.career.dtu.dk

Applications must be submitted as **one PDF file** containing all materials to be given consideration. To apply, please open the link "Apply online", fill out the online application form, and attach **all your materials in English in one PDF file**. The file must include:

- A letter motivating the application (cover letter)
- Curriculum vitae
- Grade transcripts and BSc/MSc diploma
- Excel sheet with translation of grades to the Danish grading system (see guidelines and [Excel spreadsheet here](#))
- A list of 2-3 referees able to judge the ability for carrying our independent research

Candidates may apply prior to obtaining their master's degree but cannot begin before having received it.

Applications and enclosures received after the deadline will not be considered.

All interested candidates irrespective of age, gender, race, disability, religion or ethnic background are encouraged to apply.

The Department of Energy Conversion and Storage is focused on education, research, and development within functional materials and their application in sustainable energy technologies. In a sustainable energy system, a large part of the energy will be supplied by fluctuating sources such as solar and wind power. This makes it critically important to be able to convert and store the energy as needed. At DTU Energy we work on fuel cells, electrolysis, solar cells, batteries, magnetic refrigeration and other sustainable energy technologies.

DTU is a technical university providing internationally leading research, education, innovation and scientific advice. Our staff of 6,000 advance science and technology to create innovative solutions that meet the demands of society, and our 11,200 students are being educated to address the technological challenges of the future. DTU is an independent university collaborating globally with business, industry, government and public agencies.