KARLSTADS UNIVERSITET

Ph.D student in Physical Chemistry or Materials Science

Karlstad University / Department of Engineering and Chemical Sciences

Karlstad University takes pride in combining active external cooperation with academic excellence. Karlstad University has around 16 000 students and a staff of over 1 200 members. Democratic principles, equality and diversity are cornerstones of the University. We value the enriching presence of diverse backgrounds and competencies among students and staff.

The Faculty of Health, Science and Technology at Karlstad University announces an open position for a *PhD student in Chemistry with specialization in Physical Chemistry or Materials Science* for a research project on molecular interactions in solutions, relevant for photovoltaics.

The PhD project is included in the Knut and Alice Wallenberg-funded research programme "*Mastering Morphology for Solution-borne Electronics*", in which research groups from Karlstad University, Chalmers, Lund University, and Linköping University collaborate. The main goal of the project is to predict and monitor the structures that are formed in thin polymer films during drying of multi-component solutions and optimize their properties for their use as functional materials in polymer electronics. To reach this goal we will develop and use methods to follow the dynamics of structure formation in-situ, to determine local film composition and structure, and to understand the underlying thermodynamical mechanisms.

Current research activities in physical chemistry at Karlstad University include studies of molecular interactions in solution, and in particular polymer solutions under concentration gradient, yielding thin blended films with differing morphology. The studied systems are relevant for organic solar cells and the project is part of a collaboration between chemists and materials physicists at Karlstad University. The research group participates also in the COST Action StableNextSol with more than 60 international partners. Besides funding from the Knut and Alice Wallenberg foundation, the research group has funding from the Swedish National Space Board.

The PhD position is based at the Department of Engineering and Chemical Sciences. The position is full time for 4-5 years, 80-90% PhD education and 10-20 % teaching, and with start earliest 1 October 2017 or by agreement.

Project description

The research project concerns solution-processed thin films consisting of blends of a conjugated polymer and a fullerene derivatives or another polymer that constitute the active layer of a solar cell. The films are prepared through various coating and printing processes, which crucially determine the layer morphology. Our research aims to improve understanding of the relationship between the properties of the solution and the blend film produced under evaporation of the solvent.

The PhD project will focus on the study of physical and chemical processes that determine the morphology of the blend films. Important parameters are the choice of solvent – one goal of the project is to find less harmful solvents – and the composition of the solution. This will involve experimental studies of the layer structure and composition and studies of charge transport and recombination in solution, in the blend films, and in the solar cell. The PhD student will be involved in the development of methods for in situ characterization during the drying process. Fabrication and structural characterization of the blend films are central parts of the project. Film preparation under microgravity conditions is planned, but is subject of specific external funding. This requires participation in parabolic flight campaigns. Examples of evaluation methods that will be used are absorption and emission spectroscopy, and, in collaboration with Materials Physics, scanning probe microscopy (AFM), electron microscopy, and Fourier-transform infrared spectroscopy, as well as participation in soft X-ray spectroscopy (XPS and NEXAFS) and microscopy (STXM), and X-ray scattering measurements at national and international facilities for synchrotron radiation. The experimental work will be performed primarily at Karlstad University, but coherent periods of measurements at facilities and laboratories in Sweden and abroad will occur a few times per year.

Qualification Requirements and Assessment Criteria

General requirements: The applicant should have a completed academic degree at advanced (Master) level, or completed courses of at least 240 ECTS credits (four years of full-time studies), of which at least 60 ECTS should be at advanced (Master) level, or acquired the equivalent knowledge in another way in Sweden or abroad.

The student may either be admitted to the graduate program in Chemistry with specialization in Physical Chemistry or in Chemistry with specialization in Materials Science. The specific entry requirements that apply to Physical Chemistry and Materials Science, respectively, are listed below.

Specific requirements for admission to the *Doctoral program in Chemistry with specialization in Physical Chemistry:* Special eligibility for admission to postgraduate studies in chemistry with specialization in physical chemistry has to be fulfilled by a degree at advanced level in chemistry, or other subject for consideration deemed equivalent, which includes an independent project (thesis) at the advanced level comprehensive at least 15 credits in the main field relevant for research training in Physical Chemistry. It is recommended that the scope of the independent work on the advanced level is at least 30 credits.

Specific requirements for admission to the *Doctoral program in Chemistry with specialization in Materials Science:* Special eligibility for admission to postgraduate studies in chemistry with specializing in materials science, requires a master or master of science degree with a major in materials science, material physics, chemistry, or chemical engineering, with a specialization in relevant fields. It is also required 90 credits in materials science relevant topics or major areas, including at least 60 credits, of which at least 15 credit degree project, at an advanced level within the project relevant areas, and 15 credits in mathematics.

The successful candidate will have a strong foundation in physical chemistry, and previous experience within the field of organic electronics is preferred. A high motivation for research, ability to work independent as well as to cooperate with other colleagues, creativity, and a problem-solving analytical ability is expected. Relevant physics courses at the university level, experience in molecular materials and in relevant measurement techniques is also meritorious. A positive attitude, good interpersonal skills, and excellent written and oral communication skills are essential characteristics. All applicants must have a very good command of English, both orally and in writing.

Admission

Prior to admission, an overall assessment will be made of the applicant’s suitability and his or her ability to complete the PhD studies successfully.

Application

Application should include well documented qualifications. Applicants are responsible for submitting a complete application in accordance with the advertisement and for ensuring that the documentation allows for objective and qualitative assessments. Submit your application via the university’s web based recruitment tool. A complete application should be submitted no later than the application deadline.

Applications should contain the following documents, in Swedish or English:

- Personal letter with your presentation and your motivation to apply.
- Curriculum vitae
- List of completed courses, mentioning grades and examination dates.
- Copies of diploma(s) of your academic degree(s).
- Copy of diploma work or Master thesis or a link to the electronic version.
- Statement of other merits and qualifications.
- Contact details to two reference persons or recommendation letters.

Non-electronic documents (state registration number REK 2017/171) can be addressed to:

Karlstad University
Faculty of Health, Science and Technology
Att: Åsa Ivansson
651 88 Karlstad

Sweden

Application deadline: 15 augusti, 2017

We look forward to your application!

Karlstad University has chosen advertising channels for this recruitment and decline any contacts from advertising or recruitment agencies.

Type of employment	Temporary position longer than 6 months
Contract type	Full time
First day of employment	Start earliest 1 October 2017 or by agreement
Salary	According to local agreement
Number of positions	1
Working hours	100%
City	Karlstad
County	Värmlands län
Country	Sweden
Reference number	REK2017/171
Contact	Helena Håkansson, Head of department + 46 (0) 54 700 1655 Jan van Stam, Professor + 46 (0) 54 700 2479
Union representative	Denita Gustavsson, OFR +46 (0) 54 700 1434 Thomas Bragefors, SACO +46 (0) 54 700 1714 Tony Ingemarsson, OFR +46 (0) 54 700 1404
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Link to ad	http://kau.mynetworkglobal.com/what:job/jobID:153625/