ROYAL INSTITUTE
OF TECHNOLOGY

AVAILABLE “PhD” and “Post Doc” POSITIONS AT

KTH ROYAL INSTITUTE OF TECHNOLOGY

DURING 2011/12 FOR

CHINESE SCHOLARSHIP COUNCIL (CSC) APPLICANTS

AVAILABLE PHD POSITIONS BY SUBJECTS:

AVAILABLE POST DOC POSITIONS BY SUBJECTS:

PHD POSITIONS

PhD. Position: Small satellites and suborbital probes for multipoint scientific missions

Subject Area: Aerospace Engineering

Detailed Subject Area: The topic of the project is development of small probes for multipoint small satellite and suborbital scientific missions. Both scientific instrumentation as such and onboard systems, such as data acquisition and control, deployable structures, power systems, etc will be part of the PhD student work.

Description of Project:

Measurements from multiple payloads resolving the spatial/temporal ambiguity provide qualitatively new information. This makes the multipoint measurements a branch of space research which is destined to develop rapidly in the coming years. The ways one can take here are many. One is represented by the ESA Cluster mission – to have the state of art technology combined with the rugged design. The other was demonstrated by Swedish Astrid-2 microsatellite: to go to small, more affordable payloads to be able to launch a large number of them. The payload mass becomes critical as the number of payloads grows, thus small probes are of particular interest.

Currently the department of Space and Plasma Physics at KTH is engaged in a number of projects utilising small payloads for scientific measurements in space. One project is SWIM cubesat, developed by Interamerican University of Puerto Rico, where our group is providing a miniature magnetometer. Several projects are being carried out in the framework of ESA/SNSB/DLR's REXUS programme, providing university students at PhD and MSc level an opportunity to develop, build and fly their experiments on sounding rockets. There are ongoing plans for multipoint cubesat missions in collaboration with Technical University of Berlin, where KTH has science lead role. Finally, we are aiming at playing an active role in Swedish national sounding rocket programme.

The proposed PhD student position is part of the doctoral programme in Aerospace Engineering, gathering the expertise of many departments at KTH active in the field, such as Aeronautics and Vehicle Engineering, Space and Plasma Physics, Mechanics, Automatic Control, etc. PhD students in Aerospace Engineering are offered an inter-disciplinary research programme, with possibilities to develop competence combining several engineering fields represented.

The PhD student will work on developing and validating small scientific probes for multipoint orbital and suborbital missions. Particular emphasis is on working with our miniaturized fluxgate and induction magnetometers, data acquisition and control system fos small payloads, deployable structures, etc.

Relevant backgrounds for the project are Aerospace Engineering, Electrical Engineering, Engineering Physics, Mechatronics or similar.

Project Website:

Name of responsible professor/researcher: Nickolay Ivchenko

Name of Supervisor (if other): Nickolay Ivchenko

E-mail address of contact person: nickolay.ivchenko@ee.kth.se

KTH School: EES

KTH Department: Space and Plasma Physics

Type of available position: CSC - Full PhD position (4 years)

PhD. Position: Developing the FPLAPW+kp method for High Computing Performance --- Analyzing Functional Materials for Solar Cell Applications

Subject Area: Applied Materials Physics Nanostructured Materials Theoretical Analysis Computer Code Development

Detailed Subject Area: *) Understand material physics on atomic- and nano-scale

*) Fortran 90 code developments of program packages for analysing materials and material structures. Be part in a code development programme.

*) First-principles calculations of materials properties.

*) Theoretical analyzing materials for solar cell applications.

*) Model defects and nanostructures.

Description of Project:

Materials modeling contain computational methods for analyzing various materials on the atomic and nanoscale level, like semiconductors, rare-earth metals, polymers, nanoparticles, etc. During the last thirty years, the methods have been extremely successful in the analysis of novel material structures, and the density-functional theory (DFT) was therefore appropriately awarded with the Nobel Price in 1998. Swedish research is very well recognized in this field, and according to the Swedish Research Council report Evaluation of Swedish Condensed Matter Physics, 2004, the research groups of Prof Börje Johansson have helped "to make Sweden one of the Meccas for theoretical and computational studies of materials and surface physics". The research group Applied Materials Physics at KTH has broad and comprehensive experiences of these density-functional calculations, and the group has contributed to understand numerous novel material structures.

This project aims to developing the FPLAPW+kp method for high computing performance, and to study functional materials for solar cell applications.

In the Kohn-Sham scheme within the DFT/LDA, the Hamiltonian can be divided into Hamiltonians for each k-state, and the total electron density is obtained self-consistently by a summation over the k-states. The most time-consuming part of the self-consistent field calculation is the diagonalization routine for the different k-points. Much time and efforts have been spent on improving the diagonalization routine. The recent progress in crystal growth has resulted in materials with rather complex structures.

Our preliminary results show that the problem with the time-consuming diagonalization can partly be overcome (without loosing the accuracy of the calculation) by reducing the number of k-points, if one in addition uses a complete expansion of the wave function within the kp approach. The method can be used in the self-consistent field calculation of the Kohn-Sham scheme for any kind of material, and the kp approach is most efficent for systems that require dense k-meshes, like for instance in calulations of optical properties of systems with complex Fermi surfaces. The algorithm will be of great interest for many theoretical research groups,

since the algorithm can be used also in other band-structure computational methods. This project is a collaborative work together with groups at Leoben University in Austria.

The PhD student will also employ the calculation method to analyze various materials structures for solar cell applications. Primarily, the focus will be on CuInGaSe2 which is one of the most promising material for thin-film photovoltaics ("solar cell") the world record for a ZnO/CdS/CuInGaSe2/Mo solar energy conversion efficiency is about 20%. Grain boundares and interfaces are important for the device, and only by understanding the electronic properties of these structures, one can design tomorrow's high-performance solar cells.

We are looking for one student with a university master degree in Physics, Physics Engineering, or Materials Engineering. Applicants are invited to submit their CV to the supervisor Associate Professor Clas Persson (Clas.Persson@mse.kth.se).

Further information about the fellowship and the research program can be obtained directly on http://www.mse.kth.se/~cpersson under Future Projects. For more information about the Royal Institute of Technology, Stockholm, please visit http://www.kth.se

Project Website: http://www.mse.kth.se/~cpersson/

Name of responsible professor/researcher: Clas Persson (associate prof)

Name of Supervisor (if other): Clas Persson (associate prof)

E-mail address of contact person: Clas.Persson@mse.kth.se

KTH School: ITM

KTH Department: Department of Materials Science and Engineering

Type of available position: CSC - Full PhD position (4 years)

PhD. Position: Reactions in a tundish during continuous casting

Subject Area: Applied Process Metallurgy

Detailed Subject Area: Our division works with studies of processes and reactors relevant for the steel industry. This is done both by using computational fluid dynamics, thermodynamic modeling and laboratory experiments. More information regarding our staff oand publications can be found at www.mse.kth.se

Description of Project:

The tundish is traditionalla i vessel that act as a buffer from the ladle to the continuous casting machine. The last decade many efforts has been spent on modeling the fluid flow in the tundish. This, in order to, for example, study the effect of obstacles on the fluid flow. This, in turn will lead to an increased time for the steel in the tundish, which is beneficial for the floatation of inclusions to the slag. In addition, the temperature has been modeled as well as measured during plant trials in order to make sure that no uneven temperatures exist, in particular for machines with several strands. Howver, very limited information is available on the chemical interactions in the tundish such as steel/slag, steel/air, slag/inclusions. In this project a combined thermodynamic and kinetic approach will be used to study tehse reactions. Computational fluid dynamics will be used as a tool to study this, but a coupling with thermodynamics is an essential part of the work.

Project Website:

Name of responsible professor/researcher: Professor Pär Jönsson

Name of Supervisor (if other): Professor Lage Jonsson

E-mail address of contact person: par@mse.kth.se

KTH School: ITM

KTH Department: Materials Science and Engineering

Type of available position: CSC - Full PhD position (4 years)

PhD. Position: Theoretical design of optical probes for mapping of protein topology

Subject Area: Biochemistry, computational chemistry and biology

Detailed Subject Area: This multidisciplinary research project is located at the intersection between biochemistry and theoretical chemistry. It aspires to gain microscopic understanding of processes governing the functionality, photo-stability and other important properties of

optical biomarkers (probes) for determination of protein structure using state of the art theoretical approaches.

Description of Project:

Proteins are the workhorses in any living creatures and serve as catalysts in more than 4000 bodily reactions, The function of any protein is itself related to the its structure and surface topology, determined by protein folding. Unfortunately, the protein does not always fold to its native state but sometimes misfold making it non-functional. This misfolding of proteins is related to many diseases in human beings. Diseases such as cystic fibrosis and sickle cell anaemia, Alzheimer's disease, Parkinson's disease and type II (non-insulin dependent) diabetes are all due to the misfolding of proteins. In order to design drugs for the treatment of these diseases, one needs to understand the misfolding pathways and the structure of misfolded protein and intermediate structures. There are many probes routinely used to characterize proteins in the native states and misfolded states based on NMR and optical spectroscopy. The latter technique is based on absorption and emission measurements on a probe which is attached to proteins either intrinsically or extrinsically. This technique has been extensively used due to the simplicity and low-cost of the conducting experiments. The amino acids such as tryptophan and tyrosine have been used as intrinsic probes while organic dyes such as nile red, phenol blue have been used as extrinsic probes. In the misfolded or non-native state of the protein, the core of the protein is exposed to solvents and this change in environment affects the optical property of the intrinsic or extrinsic probe molecule which precisely is the basic principle behind the protein characterization using optical probes. Extrinsic probe molecules are in demand since the change in absorption spectra, or flourescence spectra, due to change in microenvironment, solvents and protein media is remarkable. Recent theoretical development to model a bulk system at a highly accurate quantum mechanical level open up the possibility to model optical, electronic and magnetic properties of molecules in a solvent environment or in a protein environment.

The main goal of this research project is to gain understanding of protein environment influence on the optical properties of various probes at the microscopic level and to establish relationships between various protein surface microstructures and the behavior of the optical probes. The envisioned research will be carried by a multiscale approach, in which the protein interaction with the optical probe will be modeled by means of the Car-Parrinello hybrid QMMM (quantum mechanics – molecular mechanics) methodology and the optical response of the probe will be treated by time-dependent density functional theory, in which the protein environment is accounted for by various effective models which preserve the atomistic description of the protein.

Project Website: www.theochem.kth.se

Name of responsible professor/researcher: prof. Hans Ågren

Name of Supervisor (if other): prof. Hans Ågren

E-mail address of contact person: agren@theochem.kth.se

KTH School: BIO

KTH Department: Theoretical Chemistry

Type of available position: CSC - Joint PhD/PhD guest student (1-2 years)

PhD. Position: Cellulose based chemicals and materials

Subject Area: Cellulose polymer chemistry materials

Detailed Subject Area: A great interest is taken to decrease the use and need for non-renewable raw materials. At the same time there is a possibility to increase the refinement value of renewable resources presently used in the process industry. This is possible through a more efficient use of the valuable molecular structures of the raw material, i.e. the wood-based fibre, in order to create new materials. By optimizing the present processes more raw materials can be recovered and in turn used for future products.

The production of cellulose-based products is today marginal in comparison to the paper and packaging industry which is a consequence of the difficulties found in the chemical process of cellulose due to its fibril structure. The production of regenerated cellulose or cellulose derivatives requires cellulose with a high purity, either cotton fibres or dissolving pulp, as starting material. It is important with a low content of hemicelluloses and lignin. An alternative fibre separation process is steam explosion. The main production area is regenerated cellulose, e.g., Rayon or Lyocell fibres. Derivatives can be produced as ethers or esters. Traditional derivatives such as cellulose acetate are used in e.g., textiles and cigarette filters whereas ethers, usually being water soluble (e.g., carboxylmethylcellulose (CMC)) are used as thickeners in paint. An expanding area for wood-based products is within the field of medical applications, e.g., binders in pharmaceutical matrices (pills) but also fibres with antimicrobial properties for wound care.

Existing cellulose derivatives are often inhomogeneous at different hierarchical structural levels (see figure 1) which results in poorer qualities of the final product. As a consequence, it is desirable to produce cellulose derivatives with a designed and controlled chemical and supramolecular structure for application for refined products e.g. drugs alternative fine chemicals.

Reactivity and accessibility can be improved by pre-treating the fibre mechanically, chemically, or enzymatically.

The solubility of cellulose in different solutes is usually limited. The accessibility of the solvent is limited to the cellulose molecules of the fibril surface, the fibril aggregates, or to the crystals in the cell wall. Aggregation of cellulose fibrils can also result in inaccessibility of amorphous cellulose and hemicelluloses. The structure of the wood cell with different chemical compositions creates further complications. Taken together, it is difficult to achieve a homogenous derivatization.

A possibility is to increase the accessibility of crystalline and amorphous domains in different morphological structure through swelling in different types of solvents, e.g. ionic solvents such as 1-N-butyl-3-imidazolium chloride, 3-methyl-N-butyl-pyridinium chloride or benzyldimethyl(tetradecyl)ammonium chloride (Swatlosky, 2002 Heinze 2005). An increase in accessibility is a critical parameter for a homogenous or designed substitution of the cellulose and in turn better control of the degree of substitution, molecular weight and distribution of molecular weight.

The project aims to refine biopolymers, principally cellulose, but also hemicelluloses, starch, chitin, or lignin, and modify biopolymers into desirable components in new products, e.g. in barriers for packaging, bio composites and pharmaceutical products.

Description of Project:

”Enzymatic and chemical modification of biopolymers for use in novel materials – textiles, packaging, pharmaceuticals and composites”

Then main focus of the project will be:

• Increased accessibility and reactivity of cellulose where ionic solvents and enzymatic treatments will be evaluated (SEC)

• Chemical/physical surface modification to increase biocompatibility, adhesion, with matrices of different materials, e.g., barriers for packaging, bio composites and paper.

• Characterization of structure/properties with advanced spectroscopy and microscopy (solid phase NMR, AFM, Raman, Maldi etc.)

• Product evaluation (Electrospinning, film forming)

Reactivity and accessibility can be improved by pre-treating the fibre mechanically, chemically, or enzymatically. Changes in cellulose structure will be analyzed with advanced spectroscopy and microscopy, e.g., CPMAS NMR, MALDI, RAMAN, and AFM. CPMAS NMR measurements will yield information concerning crystalline and amorphous domains amongst different polymorphous structures of the cellulose. To gain information concerning molecular weight and distribution of substitutes, Maldi can be used. Product properties can be evaluated by different types of spinning, i.e. electrospinning, film forming etc.

1. Evaluate different fibre raw materials (spruce, eucalyptus, annual plants)

2. Evaluate different types of systems based on enzymes and solvent systems, e.g., ionic liquids

3. Characterization of the effect of treatments in respect of solubility of different pulps, accessibility, and reactivity

4.Modification of different cellulose based fibers for new/improved types of cellulose derivatives

5. Analysis of factors determining the correlation between cellulose hierarchical structure and accessibility

Project Website:

Name of responsible professor/researcher: Monica Ek

Name of Supervisor (if other): Monica Ek

E-mail address of contact person: monicaek@kth.se

KTH School: CHE

KTH Department: Fiber and Polymer Technology

Type of available position: CSC - Full PhD position (4 years)

PhD. Position: Modelling the formation and growth of a filter cake: the effects on straining of colloids from a smectite gel expanding into fractures

Subject Area: Chemical Engineering

Detailed Subject Area: Clay colloid chemistry Separations and Transport Phenomena

Description of Project:

As an important engineering barrier in the deposition hole in a repository for spent nuclear fuel, the most important safety function of the compacted bentonite buffer is to limit transport of corrosive agents to the canister and potential nuclide releases from the canister. Given that a fracture with low salinity seeping water intersects the deposition hole, however, the compacted bentonite would swell when it takes up water, forming an expansive gel of smectite, and can release smectite particles into the seeping water in the fracture. The smectite gel would then carry with it the accessory minerals that were originally contained in the buffer until where there are no longer strong repulsive forces between individual smectite particles and they move independently and randomly of each other. The particles of the accessory minerals that do not form colloids thus left behind would gradually build up a porous bed, and the smectite particles now have to move through the bed to expand further. As more gel expands, the porous bed or the filter cake would keep increasing in size, gradually giving rise to small enough pores to slow down the transport and subsequent the loss of the smectite particles.

In this project, we wish to be able to understand and simulate the dynamic processes of the formation and growth of the filter cake due to the presence of the accessory minerals in the compacted bentonite buffer, to explore its effect on staining of colloids from a smectite gel expanding into the seeping water in the fracture. The results would be of general interest and may be applied for assessment of e.g. dam stability.

Project Website: http://www.kth.se/che/divisions/chemical-engineering/research?l=en_UK

Name of responsible professor/researcher: Assoc. Prof. Longcheng Liu

Name of Supervisor (if other): Prof. Ivars Neretnieks

E-mail address of contact person: lliu@ket.kth.se

KTH School: CHE

KTH Department: Chemical Engineering and Technology

Type of available position: CSC - Full PhD position (4 years)

PhD. Position: Piping and erosion of bentonite buffer during the early saturation phase

Subject Area: Chemical Engineering

Detailed Subject Area: Clay colloid chemistry Separations and Transport Phenomena

Description of Project:

In the Swedish KBS-3 concept for the disposal of spent nuclear fuel in a deep repository, the most important properties of the bentonite buffer being considered for its function purposes are its high thermal conductivity, low hydraulic conductivity, diffusion limited mass transport, rheology, plasticity, sufficient swelling potential, and cation exchange capacity. All of these properties depend, however, critically on the density of the buffer and therefore any potential mass loss or redistribution events should be well understood and characterized. Among many possibilities, one such event is the piping and erosion of the bentonite buffer caused by groundwater inflow in a deposition hole. It results in channelled flow adjacent to buffer/rock interface, causing transport of bentonite particles and redistribution of bentonite. This initial stage erosion has been identified as a possible problem during the early saturation phase.

In this project, we wish to be able to understand and simulate the piping and erosion of the bentonite buffer during the early saturation phase, against experimental observations, by taking the saturation and swelling of the compacted bentonite, the formation and transport of an expansive gel of smectite etc. into account. The objective is to explore the influence of the saturation phase erosion caused by groundwater leakages on the safety function of the bentonite buffer. The results would be of general interest and may be applied for assessment of e.g. dam stability with respect to the problems of erosion onset.

Project Website: http://www.kth.se/che/divisions/chemical-engineering/research?l=en_UK

Name of responsible professor/researcher: Assoc. Prof. Longcheng Liu

Name of Supervisor (if other): Prof. Ivars Neretnieks

E-mail address of contact person: lliu@ket.kth.se

KTH School: CHE

KTH Department: Chemical Engineering and Technology

Type of available position: CSC - Full PhD position (4 years)

PhD. Position: Development of the weighted correlation approach and the application in studies of liquid states

Subject Area: Chemical Engineering

Detailed Subject Area: Clay colloid chemistry Thermodynamic statistics Density Functional Theory

Description of Project:

Within the framework of the density functional theory (DFT), a weighted correlation approach (WCA) was developed in order to obtain the density distributions of an inhomogeneous fluid. It resulted in a formally exact expression, by means of the concept of a weighted pair correlation function, used to evaluate the change of the single-particle direct correlation function of the system relative to that of a reference state. When combining this approach with the fundamental measure theory (FMT) for practical study of the structural and thermodynamic properties of a charged hard-sphere fluid subjected to a spatially varying, external potential, it was found that the resulted FMT/WCA approach is superior to the typical DFT approaches and even it has an advantage over the anisotropic, hyper-netted chain approaches.

In this project, we wish to consummate and then apply the newly developed FMT/WCA approach in the studies of liquid states, to explore e.g. the effect of the heterogeneous surface charge distribution of the colloidal particles on the structural and thermodynamic properties of an electric double layer. The applicability of the FMT/WCA approach into e.g. a non-restrictive primitive model, an extreme case where zero surface charge may be involved, or systems that are not too dilute when the ionic diameter goes to zero, will also be investigated and analyzed.

Project Website: http://www.kth.se/che/divisions/chemical-engineering/research?l=en_UK

Name of responsible professor/researcher: Assoc. Prof. Longcheng Liu

Name of Supervisor (if other): Prof. Ivars Neretnieks

E-mail address of contact person: lliu@ket.kth.se

KTH School: CHE

KTH Department: Chemical Engineering and Technology

Type of available position: CSC - Full PhD position (4 years)

PhD. Position: Reaction Crystallization in Production of Pharmaceuticals

Subject Area: Chemical Engineering

Detailed Subject Area: Crystallization of Pharmaceuticals

Description of Project:

Crystallization is widely used for separation and purification of inorganic and organic compounds. Crystallization of pharmaceuticals and other high-value compounds, is normally done in batch-wise operated, agitated tanks. However, continuous technologies are of interest for increased control of the crystallization conditions, for tailor-making of product properties, for production of nano-particles, and for investigation of the fundamentals of crystallization. In reaction crystallization solutions are mixed and product properties depend strongly on the mixing conditions. This project will focus on developing/evaluating novel technology for reaction crystallization, and the work will include theoretical and experimental evaluation of the possibilities and limitations of different processing alternatives, as well as of the determination of crystallization and mixing kinetics.

Project Website: http://www.kth.se/che/divisions/transport_phenomena/research/IK?l=en_UK

Name of responsible professor/researcher: Åke C. Rasmuson

Name of Supervisor (if other): Åke C. Rasmuson

E-mail address of contact person: rasmuson@ket.kth.se

KTH School: CHE

KTH Department: Chemical Engineering and Technology

Type of available position: CSC - Full PhD position (4 years)

PhD. Position: Mathematical modeling of Biomass /solid fuel thermal conversion using high-temperature agent (air/steam/Oxygen)

Subject Area: Chemical Engineering

Detailed Subject Area: The project aims at researching and developing a mathematical model for a fixed bed biomass gasifier considering kinetic and transport phenomena in order to make predictions of high-temperature agent-HTAG process.

This project is one part of KTH High-temperature Agent Gasification which has been financed by the Swedish Energy Agency (STEM), Vetenskapsrådet(VR), and industries.

This project will involve small-scale experiments in the laboratory at KTH. Mathematical model will be a complementary tool that will be used to gain more understanding for the high-temperature air/steam gasification.

We are looking for one student with a university master degree in chemical engineering, or mechanical engineering, or engineering physics.

Description of Project:

The project aims at researching and developing a mathematical model for a fixed bed biomass gasifier considering kinetic and transport phenomena in order to make predictions of high-temperature agent-HTAG process.

This project is one part of KTH High-temperature Agent Gasification which has been financed by the Swedish Energy Agency (STEM), Vetenskapsrådet(VR), and industries.

This project will involve small-scale experiments in the laboratory at KTH. Mathematical model will be a complementary tool that will be used to gain more understanding for the high-temperature air/steam gasification.

We are looking for one student with a university master degree in chemical engineering, or mechanical engineering, or engineering physics.

Project Website: www.mse.kth.se/energy

Name of responsible professor/researcher: Weihong Yang

Name of Supervisor (if other): weihong yang

E-mail address of contact person: weihong@kth.se

KTH School: ITM

KTH Department: Material Science Engineering

Type of available position: CSC - Full PhD position (4 years)

PhD. Position: Synthesis of functional nanomaterials for biomedical and nanoelectronics applications

Subject Area: Chemistry

Detailed Subject Area: Nanomaterials

Description of Project:

Nanomaterials possess unique physical and chemical properties, and have found a wide range of applications from material science, nanoelectronics, and medicine. The objective of this project is to develop methods and protocols for the synthesis of functional nanomaterials with well-defined surface structure and functionality. Fundamental studies will be conducted to investigate the structure-property relationship. In addition, the synthesized nanomaterials will be used as nanoprobes in imaging and detecting diseases, and as the components in nanodevice fabrication.

Project Website:

Name of responsible professor/researcher: Prof. Mingdi Yan

Name of Supervisor (if other): Prof. Mingdi Yan

E-mail address of contact person: mingdi.yan@gmail.com

KTH School: CHE

KTH Department: Chemistry

Type of available position: CSC - Full PhD position (4 years)

PhD. Position: Development of molecular dynamic systems for nanomedical applications

Subject Area: Chemistry

Detailed Subject Area: Supramolecular chemistry, nanochemistry, organic chemistry

Description of Project:

The field of dynamic chemistry is a rapidly emerging area, where dynamic processes are employed to generate systems of structural or functional diversity, amenable to adaptive change in response to an applied constraint or selection pressure. Such processes are for example ubiquitous and essential in biological systems, serving as inspiration sources for biomimetic design of synthetic receptors and ligands. In chemistry, dynamics can be used to generate adaptive and responsive systems, applicable to a wide variety of functions - for example catalysis, molecular switches and motors, responsive materials, dynamic recognition, and dynamic drug design.

The present project regards the development of new dynamic systems for applications in nanomedicine. This involves synthesis and characterization of discrete molecular and nanochemical constructs, generation of static and dynamic systems, and mechanistic studies of reaction dynamics. The products will subsequently be subjected to target-oriented, target-directed and/or target-accelerated synthesis/assembly. Pharmacologically important entities will primarily be targeted, as well as synthetic counterparts. In addition, molecular nanosystems will be directly addressed with special emphasis on their generation, adaptivity, delivery, and therapeutic properties.

Project Website: http://www.kth.se/che/divisions/orgkem/research/ramstrom?l=en_UK

Name of responsible professor/researcher: Prof. Olof Ramström

Name of Supervisor (if other): Prof. Olof Ramström

E-mail address of contact person: ramstrom@kth.se

KTH School: CHE

KTH Department: Chemistry

Type of available position: CSC - Full PhD position (4 years)

PhD. Position: Mechanistic Studies on Iridium Catalyzed Water Oxidation

Subject Area: Chemistry

Detailed Subject Area: Molecular modeling of chemical reactions. Density functional theory is used to map catalytic reaction paths. Catalytic electrolysis of water.

Description of Project:

Light driven water splitting to oxygen and hydrogen is proposed as a method for converting solar energy to chemical energy. The chemical energy can then be used whenever and wherever the need is by recombining the hydrogen and oxygen to water. The electrolysis of water is composed of two half reactions, water oxidation and proton reduction. The water oxidation reaction produces molecular oxygen, protons, and electrons. To run the reaction efficiently the reaction must be run in presence of a catalyst, typically a ruthenium or iridium complex. While the ruthenium complexes have been shown to be very active the stability is relatively poor. For the iridium complexes the situation is the opposite that the stability is good but the activity needs to be optimized. We are therefore aiming to understand the mechanisms of these iridium catalysts and to predict more active complexes that are still sufficiently stable. We use density functional theory to map the potential energy surfaces. From that we determine the bottlenecks of the reaction and we find the possible degradations pathways. After understanding the catalysts we make alterations of the structures in the computer models (in silico) to optimize the catalytic performance. All the work is done in close collaboration with experimental groups, where the results of the computations can be tested.

Project Website: ww.theochem.kth.se/people/mahlquist/

Name of responsible professor/researcher: Mårten Ahlquist

Name of Supervisor (if other): Mårten Ahlquist

E-mail address of contact person: mahlquist@theochem.kth.se

KTH School: BIO

KTH Department: Theoretical Chemistry

Type of available position: CSC - Joint PhD/PhD guest student (1-2 years)

PhD. Position: Synthesis and characterization of new organic dyes for dye sensitized slar cells

Subject Area: Chemistry, Sustainable Energy, Material science

Detailed Subject Area: organic synthesis, physical chemistry, electrochemistry, spectroscopy

Description of Project:

Synthesis and characterization of new organic dyes for dye sensitized slar cells, based on n-type(TiO2) or p-type(NiO) nanostructured semiconductors.

Project Website: http://www.kth.se/che/divisions/orgkem/research/lichengsun?l=en_UK

Name of responsible professor/researcher: Professor Licheng Sun

Name of Supervisor (if other): Professor Licheng Sun

E-mail address of contact person: lichengs@kth.se

KTH School: CHE

KTH Department: Department of Chemistry

Type of available position: CSC - Full PhD position (4 years)

PhD. Position: Development of new catalysts for light driven water oxidation

Subject Area: Chemistry, Sustainable Energy, Material science

Detailed Subject Area: synthetic chemistry, coordination chemistry, electrochemistry

Description of Project:

Synthesis and characterization of transition metal(Ru, Co, Mn, Fe) complexes as catalysts for visible light driven water oxidation, immobilization of the catalysts on electrode surfaces, molecular devices etc.

Project Website: http://www.kth.se/che/divisions/orgkem/research/lichengsun?l=en_UK

Name of responsible professor/researcher: Professor Licheng Sun

Name of Supervisor (if other): Professor Licheng Sun

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KTH School: CHE

KTH Department: Department of Chemistry

Type of available position: CSC - Full PhD position (4 years)

PhD. Position: Bio-inspired molecular catalysts for light driven hydrogen generation

Subject Area: Chemistry, Sustainable Energy, Material science

Detailed Subject Area: electrochemistry, photochemistry, physical chemistry

Description of Project:

to develop new type of molecular catalysts, such as Ni complexes or Co complexes for visible light driven hydrogen generation, incooperation of these catalysts into molecular devices etc.

Project Website: http://www.kth.se/che/divisions/orgkem/research/lichengsun?l=en_UK

Name of responsible professor/researcher: Professor Licheng Sun

Name of Supervisor (if other): Professor Licheng Sun

E-mail address of contact person: lichengs@kth.se

KTH School: CHE

KTH Department: Department of Chemistry

Type of available position: CSC - Full PhD position (4 years)

PhD. Position: Interference Management for Future Wireless Networks

Subject Area: Communication Theory

Detailed Subject Area: Wireless Communications, Wireless Networks, Interference Management Network Coding, Relaying, Interference Alignment

Description of Project:

We will investigate efficient interference management strategies for wireless networks. With increasing user-amount and data-rate, future wireless networks are essentially characterized as interference-limited. However, the efficient approaches for combating interference are still largely open. This project aims at developing theoretical limits and practical design principles for interference limited wireless networks. More specifically, interference within multi-cell or multi-terminals shall be considered. Efficient coding approaches, e.g., network coding, lattice codes shall be used to mitigate or even exploit interference in both signal domain and finite field. To efficiently limit interference and maintain transmission rates, cooperative relaying approaches shall also be considered. As a promising technique, interference alignment shall also be studied for various network settings.

Project Website:

Name of responsible professor/researcher: Mikael Skoglund/Ming Xiao

Name of Supervisor (if other): Mikael Skoglund/Ming Xiao

E-mail address of contact person: Ming.Xiao@ee.kth.se

KTH School: EES

KTH Department: Communication Theory

Type of available position: CSC - Full PhD position (4 years)

PhD. Position: High pressure injection of liquid fuel, atomization and mixing

Subject Area: Computational Fluid Dynamics

Detailed Subject Area: High pressure fuel injection into a Diesel engine. Fuel cavitation, evaporation and mixing. Modelling of multi-phase flows. Liquid fuel evaporation. Turbulent mixing.

Description of Project:

Increasingly higher pressure injection of liquid fuel into the cylinder of Diesel engines showed to improve engine efficiency and lower levels of emissions. Under such conditions the fuel cavitates already inside the injector and the break-up of the liquid fuel jet is very different from the break-up processes that take place under lower pressure conditions. The aims of the project include improved understanding the cavitating liquid fuel jet inside the injector through detailed simulation. Furthermore, the jet break-up at different phases under engine like conditions are to be clarified.

The project is to be associated with on-going work within the multi-disciplinary Combustion Engine Center at KTH (CICERO).

Project Website:

Name of responsible professor/researcher: Professor Laszlo Fuchs

Name of Supervisor (if other): Prof. Laszlo Fuchs

E-mail address of contact person: lf@mech.kth.se

KTH School: SCI

KTH Department: Mechanics

Type of available position: CSC - Full PhD position (4 years)

PhD. Position: Time-spectral solution of stability and confinement problems in fusion research

Subject Area: Computational physics

Detailed Subject Area: Further development of a new method for solution of initial-value problems formulated as partial differential equations. The method is fully spectral, also in the time domain, resulting in semi-analytical solutions. Expected areas of application are fluid mechanics as well as magnetohydrodynamic problems in fusion research.

Description of Project:

A generalized fully spectral weighted residual method (GWRM) for solution of initial value partial differential equations is being developed in this project. For all temporal, spatial and physical parameter domains, the solution is represented by Chebyshev series which enables global semi-analytical solutions. The method thus avoids time step limitations, in contrast to most methods presently used. The spectral coefficients are determined by iterative solution of a system of algebraic equations, for which a globally convergent root solver has been developed. Accuracy and efficiency are controlled by the number of included Chebyshev modes and by the use of temporal and spatial subdomains.

Application to a number of problems, including a system of resistive magnetohydrodynamic (MHD) equations, has shown the strong potential of the method. Comparisons of the GWRM with the explicit Lax-Wendroff and implicit Crank-Nicolson finite difference methods, for a number of initial-value problems, show that the method is accurate and efficient. Future applications of the GWRM are, for example, advanced initial value problems in fluid mechanics and MHD. In particular, this project aims at studies of stability and confinement of the reversed-field pinch fusion concept, using nonlinear MHD and kinetic GWRM models.

Project Website:

Name of responsible professor/researcher: Jan Scheffel

Name of Supervisor (if other): Jan Scheffel

E-mail address of contact person: jans@kth.se

KTH School: EES

KTH Department: Fusion Plasma Physics, Alfvén Laboratory

Type of available position: CSC - Full PhD position (4 years)

PhD. Position: Computer simulations of structure of materials.

Subject Area: Computer simulations of structure of materials.

Detailed Subject Area: In this project, large computer simulations will be used to study in detail how the microscopic structure in a material is altered during manufacture and processing. One important part of the project is to formulate and implement different physical phenomena in so called phase-field models. This type of modeling makes it possible to study different phenomena at a level of detail that is much greater than previously. One particular topic in the present project is the interaction of material flow, deformation and phase change. The project will be carried out in collaboration with industrial partners.

Description of Project:

In this project, large computer simulations will be used to study in detail how the microscopic structure in a material is altered during manufacture and processing. One important part of the project is to formulate and implement different physical phenomena in so called phase-field models. This type of modeling makes it possible to study different phenomena at a level of detail that is much greater than previously. One particular topic in the present project is the interaction of material flow, deformation and phase change. The project will be carried out in collaboration with industrial partners.

For this project, one or more graduate students are needed. A suitable background is Master or corresponding degree (equivalent to Swedish civilingenjör), with knowledge in physics or materials science, and an interest in mathematical modeling and advanced computer simulations.

For work in the same area a post doctoral position is also available. The successful applicant should hold a doctoral degree in a suitable field and have experience in advanced computer simulations.

Project Website:

Name of responsible professor/researcher: Gustav Amberg

Name of Supervisor (if other): Gustav Amberg

E-mail address of contact person: gustava@mech.kth.se

KTH School: SCI

KTH Department: Mechanics

Type of available position: CSC - Full PhD position (4 years)

PhD. Position: Compact MIMO antennas for RFID

Subject Area: Electrical Engineering

Detailed Subject Area: Multiple-Input Multiple-Output (MIMO), Radio Frequency Identification (RFID), antennas, wireless communications

Description of Project:

Radio Frequency Identification (RFID) system is becoming increasingly popular in fields such as electronic toll collection, tracking containers, asset identification, retail item management, access control, remote monitoring, vehicle security, etc. In the present project, we tend to combine MIMO and RFID technology and design compact MIMO antennas for RFID applications. The specific goals are to investigate and improve several aspects of the performance of the compact MIMO RFID antenna systems such as data rate, reliability, coverage, mutual coupling between compact antenna elements, impedance and axial rate bandwidth, etc.. The devices will be designed, fabricated and measured for various applications.

Project Website:

Name of responsible professor/researcher: Prof. Sailing He

Name of Supervisor (if other): Sailing He

E-mail address of contact person: sailing@kth.se

KTH School: EES

KTH Department: Electromagnetic Engineering

Type of available position: CSC - Full PhD position (4 years)

PhD. Position: Sustainability criteria and the development of biofuel markets

Subject Area: Energy and climate studies

Detailed Subject Area: The research program explores models for effective development of sustainable energy systems globally. The idea is to define and verify implementable solutions that satisfy criteria of efficiency, reliability and sustainability, and which can be replicated. The solutions proposed should be in line with the development of energy markets and renewable technology options, the global climate agenda, and regional and global development goals. We evaluate how sustainable solutions can be motivated beyond their technological performance and economic efficiency, and become more attractive in the context of regional development, environmental and social benefits, as well supply security and reliability. We take into account sustainable development requirements, the global integration of energy systems, and the interests of various stakeholders.

Description of Project:

Biofuels have been in the center of an intense debate in recent years. The issue of establishing a sustainable biofuels cycle is complex because multiple dimensions need to be considered. Policy makers face the necessity to regulate production and usage of biofuels as this energy segment is expected to multiply its size throughout the upcoming decades.

The objective of this research is to explore the impacts of European sustainability criteria on the development of bioethanol production and markets and the implications that this may have on the development of biofuels at a global level. The research will discuss the sustainability criteria proposed by the Europoean institutions in light of factors such as the development of biofuel markets globally, the effects on climate change mitigation and related costs, the impacts on development in developing regions and Europe.

Project Website:

Name of responsible professor/researcher: Semida Silveira

Name of Supervisor (if other): Semida Silveira

E-mail address of contact person: semida.silveira@energy.kth.se

KTH School: ITM

KTH Department: Energy Technology

Type of available position: CSC - Full PhD position (4 years)

PhD. Position: Thermochemical recuperation of waste heat

Subject Area: Energy and Environmental Engineering

Detailed Subject Area: Waste Heat Combined Cycle Chemical Heat Pump

Description of Project:

In contrast to conventional physical technologies available for recovery of heat, chemical recuperation of heat has significantly regained interest during the past decade due to higher magnitude of reaction heat compared to that of the latent heat.

In particular, two concepts have been identified which engage chemical reactions within the process: 1) Chemical Recuperation of Heat through Fuel Synthesis 2) Chemical Recuperation of Heat through Reaction Coupling.

Based on the first concept a different approach would be to chemically manipulate the fuel itself through which the waste heat is used to carry out an endothermic reaction. The result is the generation of a secondary fuel within the cycle which can be used to reduce the primary plant's fuel consumption and thus increase the overall efficiency. Based on the second concept, one can temporally store the heat using a pair of endothermic/ exothermic reactions for later release to cogeneration or district heating system or even continuous upgrade of the heat temperature level.

In this project, focus is on integrating both concepts so as to make it applicable in power cycle configurations, such as the Chemically Recuperated Combined Cycle integrated with the chemical heat pump. Analysis with respect to the increase of thermal and exergy efficiency, the criteria of selecting suitable working pairs, the practical limitations in real applications and the cost assessment etc. will particularly shape the scope of the work.

Project Website: http://www.kth.se/che/divisions/chemical-engineering/research?l=en_UK

Name of responsible professor/researcher: Assoc. Prof. Longcheng Liu

Name of Supervisor (if other): Prof. Ivars Neretnieks

E-mail address of contact person: lliu@ket.kth.se

KTH School: CHE

KTH Department: Chemical Engineering and Technology

Type of available position: CSC - Full PhD position (4 years)

PhD. Position: CO2 separation from flue gases/syngas with ionic liquids

Subject Area: Energy and Environmental Engineering

Detailed Subject Area: CO2 Capture CO2 Removal Flue gases Syngas Energy

Description of Project:

As the environmental consideration and stricter regulations have increased, mitigating the emission of CO2 becomes an international and imperative issue. CO2 capture from flue gases and CO2 removal from syngas to produce transportation fuels from biomass via gasification have become more attractive in order to significantly reduce CO2 emmission. CO2 separation (capture/removal), a requisite and energy-intensive unit in all of these processes, has become an important research issue. Current technologies for CO2 separation are expensive and energy-intensive, and new technologies are needed to be investigated. This project is to provide fundamental theoretical study in order to apply ionic liquids to separate CO2. The

research results will lead to developing more efficient strategies for the process of CO2 separation with ionic liquids.

Project Website: http://www.kth.se/che/divisions/chemical-engineering/research?l=en_UK

Name of responsible professor/researcher: Assoc. Prof. Longcheng Liu

Name of Supervisor (if other): Prof. Ivars Neretnieks

E-mail address of contact person: lliu@ket.kth.se

KTH School: CHE

KTH Department: Chemical Engineering and Technology

Type of available position: CSC - Full PhD position (4 years)

PhD. Position: Thermochemical Energy Conversion of Biomass

Subject Area: Energy and Environmental Engineering

Detailed Subject Area: Biomass Thermochemical Conversion Gasification Syngas Energy

Description of Project:

Thermochemical conversion of biomass is the pyrolysis process, which comprises of all chemical changes occurring when heat is applied to a material in the absence of oxygen. The product of biomass pyrolysis includes water, charcoal, oils or tars, and gases such as methane, hydrogen, carbon monoxide, and carbon dioxide. On the contrary, gasification is a complex thermal process that depends on the pyrolysis mechanism to generate gases, which when reacted with oxygen and steam can convert the majority of the biomass into a fuel gas. The fuel gas product can in turn be further purified to synthetic gas, which is mainly composed of carbon monoxide and hydrogen, and used to produce chemicals and liquid fuels.

The scope of this project covers possible evaluation of novel strategies of gasification process for use with district heating and combined heat and power plants along with production of synthetic gas and further processing, for conversion into fuel.

Project Website: http://www.kth.se/che/divisions/chemical-engineering/research?l=en_UK

Name of responsible professor/researcher: Assoc. Prof. Longcheng Liu

Name of Supervisor (if other): Prof. Ivars Neretnieks

E-mail address of contact person: lliu@ket.kth.se

KTH School: CHE

KTH Department: Chemical Engineering and Technology

Type of available position: CSC - Full PhD position (4 years)

PhD. Position: Retro-fitting of gas-turbine and steam-turbine power plants with CSP

Subject Area: Energy: Polygeneration

Detailed Subject Area: EXPLORE Polygeneration is an unique umbrella project for research and development on modular and efficient energy production for the future demand on a highly flexible energy system of the modern sustainable society. The explore polygeneration project addresses both high level oriented questions on the techno-economic evaluation of energy systems and its dynamics as well as detailed research on particular fields of interest such as for example: Climate and Energy Services Energy Products and Services Positive Energy Buildings The Modern Cities´ Sustainable Energy Services Sustainable Future Transportation Efficient & Emission Neutral Polygeneration Energy Transformation Cycles & Processes.

The comprehensive Explore approach is mirrored in a modular polygeneration unit/ polygeneration lab that is developed continuously in order to demonstrate specific state-of-the-art components and technology including gas turbine technology, stirling engine technology, gasification technology, digestion technology, Concentrated Solar Power technology, energy storage technology, fuel cell technology, water desalination technology and cooling technology.

In this way multidimensional and interdisciplinary research and educational platform “EXPLORE Poygeneration" covers all major climate- and energy-related research in a global perspective. It is thus an excellent platform for all researchers at KTH and partner universities to “gather around".

For more information about the EXPLORE Polygeneration project, see http://www.explore-polygen.se

Description of Project:

Retro-fitting of existing steam- and gas turbine power plants with Concentrated Solar Power (CSP) receivers and a compatible heliostat field has a great potential to significantly reduce CO2 emissions on a short- to midterm basis in sun-belt countries. The proposed project aims at investigating the techno-economic consequences of such retro-fitting in a multi-dimensional approach: from a global view, the study shall address the impact on overall energy production cost and potential in CO2 savings based on existing installed plants in sun-belt countries. More specifically, the study shall identify and investigate promising retrofitting concepts for a number of plant sizes and cycles and provide efficiency and leveled electric cost figures based on current technology as well as future technology improvements. Furthermore, it is proposed to study the CSP retrofitting on a specifically identified power plant in for example China in order to identify and develop promising technology advancements for retrofitting purposes.

Project Website:

Name of responsible professor/researcher: Dr. Björn Laumert

Name of Supervisor (if other): Dr. Björn Laumert

E-mail address of contact person: Bjorn.Laumert@energy.kth.se

KTH School: ITM

KTH Department: Energy

Type of available position: CSC - Full PhD position (4 years)

PhD. Position: Oscillating wing energy conversion

Subject Area: Energy: Polygeneration

Detailed Subject Area: EXPLORE Polygeneration is an unique umbrella project for research and development on modular and efficient energy production for the future demand on a highly flexible energy system of the modern sustainable society. The explore polygeneration project

addresses both high level oriented questions on the techno-economic evaluation of energy systems and its dynamics as well as detailed research on particular fields of interest such as for example: Climate and Energy Services Energy Products and Services Positive Energy Buildings The Modern Cities´ Sustainable Energy Services Sustainable Future Transportation Efficient & Emission Neutral Polygeneration Energy Transformation Cycles & Processes.

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For more information about the EXPLORE Polygeneration project, see http://www.explore-polygen.se

Description of Project:

Wind energy is a growing sector in renewable energy production. Traditionally wind turbines are used that convert the wind energy into mechanical energy for electricity production. As the size of the wind turbines increases problems related to environmental effects (noise, etc), aeroelasticity, gear loads and installation get more pronounced. On this background a new wind energy conversion method is looked into that is based on an oscillating wing principle. The energy conversion is based on the fact that the fluid adds energy to the wing structure during oscillation of the latter. The proposed project is aimed at looking into detail into the involved physical mechanism such as to have a sound basis for performing optimum design of such devices. In addition a techo-economical analysis shall be performed such as to see the potential of this method compared to other renewable energy generation devices.

Project Website:

Name of responsible professor/researcher: Dr Damian Vogt

Name of Supervisor (if other): Dr Damian Vogt

E-mail address of contact person: Damian.Vogt@energy.kth.se

KTH School: ITM

KTH Department: Energy Technology

Type of available position: CSC - Full PhD position (4 years)

PhD. Position: Effects of Transition Modeling in Turbomachinery Aeroelasticity

Subject Area: Energy: Polygeneration

Detailed Subject Area: EXPLORE Polygeneration

EXPLORE Polygeneration is an unique umbrella project for research and development on modular and efficient energy production for the future demand on a highly flexible energy system of the modern sustainable society. The EXPLORE polygeneration project addresses both high level oriented questions on the techno-economic evaluation of energy systems and its dynamics as well as detailed research on particular fields of interest such as for example: Climate and Energy Services Energy Products and Services Positive Energy Buildings The Modern Cities´ Sustainable Energy Services Sustainable Future Transportation Efficient & Emission Neutral Polygeneration Energy Transformation Cycles & Processes.

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For more information about the EXPLORE Polygeneration project, see http://www.explore-polygen.se

Description of Project:

Computational Fluid Dynamics (CFD) tools are nowadays extensively used in the prediction of unsteady aerodynamics and aeroelasticity in turbomachines. A variety of proprietary and non-proprietary tools have been presented over the last decades that allow predicting the unsteady aerodynamic loads as well as aerodynamic damping at a high degree of detailing. Validation of these tools against test data and engine tests show that the results generally are of acceptable accuracy however also that the tools are not capable of predicting the correct physics in some cases. One of the phenomena that is not solved to date is the effect of transition on the aerodynamic damping. Ekaterinaris and Platzer (1994) have shown that the correct prediction of the transition point is of paramount experience for obtaining the correct aerodynamic damping. On this background a compound experimental and numerical project is proposed that investigates this phenomenon in detail. Outcome of the project shall be a validated model for correctly predicting transition in turbomachinery aeroelasticity applications.

Project Website:

Name of responsible professor/researcher: Dr Damian Vogt

Name of Supervisor (if other): Dr Damian Vogt

E-mail address of contact person: Damian.Vogt@energy.kth.se

KTH School: ITM

KTH Department: Energy Technology

Type of available position: CSC - Full PhD position (4 years)

PhD. Position: Modelling the sources and fate of environmentally hazardous substances in the urban environment

Subject Area: Environmental modelling

Detailed Subject Area: Today, there are numerous sources of environmentally hazardous substances in the urban environment, including organic pollutants, such as e.g., nonylphenols, and heavy metals, such as cadmium and lead. Despite management of point sources, many pollutants today remain at an elevated level in the urban environment, with diffuse sources becoming dominant. In order to manage these pollutants, increased knowledge of their sources and fates is required. Particularly, there is a need for understanding the coupling between the

urban sources of pollutants and their monitored status in the environment. This need stems from the fact that while policies and regulations aim at altering the strength of the diffuse sources, this strength can never be directly measured by field observations. A change in the strength of the diffuse source may, however, propagate to the environmental level of the pollutant, and thereby be indirectly detected. In order to understand the monitored levels of pollutants in response to their historical sources and to predict the effect of alteration of today's sources on future environmental levels of the pollutant, it is important to be able to couple the monitored levels to the actual source terms.

Description of Project:

This project aims at providing conceptual models for the sources of selected environmentally hazardous substances in the urban environment. It also aims at quantify the urban pollutant flows through substance flow analysis (SFA) and couple those to available, monitored levels of pollutants in the urban environment through pollutant fate models. The coupling of SFA and fate models is expected to provide a useful tool for help guiding the management of the substance in specific cases of urban environments.

Project Website: www.ima.kth.se

Name of responsible professor/researcher: Maria Malmström

Name of Supervisor (if other): Maria Malmström

E-mail address of contact person: malmstro@kth.se

KTH School: ITM

KTH Department: Industrial ecology

Type of available position: CSC - Full PhD position (4 years)

PhD. Position: Electric energy storage in a microturbine system

Subject Area: EXPLORE Polygeneration

Detailed Subject Area: EXPLORE Polygeneration is an unique umbrella project for research and development on modular and efficient energy production for the future demand on a highly flexible energy system of the modern sustainable society. The EXPLORE polygeneration project addresses both high level oriented questions on the techno-economic evaluation of energy

systems and its dynamics as well as detailed research on particular fields of interest such as for example: Climate and Energy Services Energy Products and Services Positive Energy Buildings The Modern Cities´ Sustainable Energy Services Sustainable Future Transportation Efficient & Emission Neutral Polygeneration Energy Transformation Cycles & Processes.

The comprehensive EXPLORE approach is mirrored in a modular polygeneration unit/ polygeneration lab that is developed continuously in order to demonstrate specific state-of-the-art components and technology including gas turbine technology, stirling engine technology, gasification technology, digestion technology, Concentrated Solar Power technology, energy storage technology, fuel cell technology, water desalination technology and cooling technology.

In this way the multidimensional and interdisciplinary research and educational platform “EXPLORE Poygeneration" covers all major climate- and energy-related research in a global perspective. It is thus an excellent platform for all researchers at KTH and partner universities to “gather around".

For more information about the EXPLORE Polygeneration project, see http://www.explore-polygen.se

Description of Project:

The polygeneration lab hosts a microturbine. This microturbine is designed for residential combined heat and power production (microCHP). It is externally fired and the output depends on the fuel supply, while the need for electricity over time is different and requires high peaks and a high dynamics.

The task of this project is to identify typical load profiles and combine it with typical fuel supply profiles. By extending existing models, and develop new, the requirements for an “electric energy” buffer will be defined. The project involves selection and acquisition of one or more buffer components. After installation, the dynamic behavior will be evaluated.

Project Website:

Name of responsible professor/researcher: Anders Malmquist

Name of Supervisor (if other): Anders Malmquist

E-mail address of contact person: andmal@kth.se

KTH School: ITM

KTH Department: Energy Technology

Type of available position: CSC - Full PhD position (4 years)

PhD. Position: Lignin liquefaction for energy and chemical applications

Subject Area: Fibre and Polymer Science

Detailed Subject Area: Wood Chemistry

Description of Project:

In biomass, lignin is the second most abundant component after cellulose. Today, there are different types of technical lignins available commercially. However, lignin has not been fully exploited for effective or valuable utilizations.

In earlier studies at KTH, the lignin obtained after steam explosion of different wood species had been systematically characterized(1). It has also been proved that liquefaction of the steam exploded lignin or other technical lignins from different sources resulted in bio-oils having a low-molecular-mass distribution with a preponderance of aliphatic hydrocarbon structures(2). Therefore the bio-oils could be applied as biofuels for automobiles or for fuel cell in generation of electricity. At the meantime, various monomeric, dimmeric and obligomeric phenols could be obtained from the bio-oils after further separation and purification.

This project is a continuation of the research on the lignin liquefaction. The ultimate target of the project is an establishment of technically and economically feasible process in production of bio-fuels or phenols from lignin.

References:

1. Li, J., Gellerstedt, G. Toven, K.: Steam explosion lignins their extraction, structure and potential as feedstock for biodiesel and chemicals. Bioresource Technology (2009), 100: 2556-2561.

2. Gellerstedt, G., Li, J., Eide, I., Kleinert, M. and Barth, T.: Chemical structures present in biofuel obtained from lignin. Energy & Fuel. (2008). 22: 4240-4244

Project Website:

Name of responsible professor/researcher: Jiebing Li

Name of Supervisor (if other): Jiebing Li

E-mail address of contact person: jbing@kth.se

KTH School: CHE

KTH Department: Fibre and Polymer Technology

Type of available position: CSC - Full PhD position (4 years)

PhD. Position: Numerical simulations of particle behavior in unsteady flows of physiological relevance

Subject Area: Fluid Mechanics

Detailed Subject Area: Biological fluid dynamics, biomechanics, blood flow, particle transport and dispersion

Description of Project:

Cardiovascular diseases are the major cause of death (over 50%) in the western world today. The process of development of atherosclerosis is not fully understood yet. However, in some early stage it is related to the accumulation of lipoproteins transported by the blood in the inner layer of arteries. The atherosclerotic plaques are usually found at specific locations in large arteries, near bifurcation and regions of large curvatures. The flow in these areas is characterized by separation and unsteadiness, which indicates that local flow conditions contribute to atherogenesis. The aim of the project is to investigate pulsatile flows of physiological relevance and examine the transport, accumulation and dispersion of particles at bifurcations. Different geometries will be considered and the behavior of different proteins present in the blood studied. The analysis is based on numerical simulations of the flow.

The research in Fluid Mechanics at KTH is organized within the Linn e FLOW

Centre (www.flow.kth.se). The centre is one of the 20 original centers of excellence set up by the Swedish Research Council, as the result of a highly competitive process with international

evaluation. About 40 PhD students and more than 15 senior scientists are part of the Linn e FLOW Centre at the moment.

Project Website: www.flow.kth.se

Name of responsible professor/researcher: Prof Laszlo Fuchs

Name of Supervisor (if other): Luca Brandt

E-mail address of contact person: luca@mech.kth.se

KTH School: SCI

KTH Department: Mechanics

Type of available position: CSC - Full PhD position (4 years)

PhD. Position: Numerical simulations of micro-organisms in turbulent flows

Subject Area: Fluid Mechanics

Detailed Subject Area: Biological physics, oceanography, mixing and diffusion in turbulent flows, bacteria suspensions.

Description of Project:

Microorganisms play crucial roles in a broad range of fields and processes, from the recycling of nutrients in biogeochemical cycles (oceanography, agriculture), to the formation of biofilms (water supply systems, food industry), to the disease of larger organisms (medicine, but also oceanography, etc.). The watery environment of microorganisms is characterized by a complex set of gradients, both chemical and fluid mechanical. Chemical gradients - or gradients in chemoeffectors - elicit chemotaxis, by which microorganisms can adapt their swimming behavior to take advantage of nutrient resources, swim away from noxious substances, or home in on prey. Chemotaxis has been extensively studied, primarily in model systems like the bacterium Escherichia coli, but recently also in marine bacteria through the advent of novel microfluidic tools. On the other hand, the effect of fluid dynamical gradients has been largely ignored, primarily because of the complexity of the biophysical interactions involved. Yet, flow

is ubiquitous in microbial environment, and so is turbulence, which characterizes the life of microbes in water supply systems, the ocean, and bioreactors. The complexity of this problem stems from the interaction between the flow, the morphology of the organism, its swimming dynamics and the dynamics of the chemoeffector. On the one side, turbulence produces shear forces that reorient organisms, depending on their detailed morphology. On the other side, turbulence stirs an mixes chemoeffectors, altering the gradients and thus affecting chemotaxis. It is this complex web of interactions that is at heart of the ecology of a microbe and that we will address with state-of-the-art computational tools.

The project is a collaboration with prof Stocker, Department of Civil and Environmental Engineering, MIT, USA.

The research in Fluid Mechanics at KTH is organized within the Linn e FLOW Centre (www.flow.kth.se). The centre is one of the 20 original centers of excellence set up by the Swedish Research Council, as the result of a highly competitive process with international evaluation. About 40 PhD students and more than 15 senior scientists are part of the Linn e FLOW Centre at the moment.

Project Website: http://www.mech.kth.se/~luca/

Name of responsible professor/researcher: Luca Brandt

Name of Supervisor (if other): Luca Brandt

E-mail address of contact person: luca@mech.kth.se

KTH School: SCI

KTH Department: Mechanics

Type of available position: CSC - Full PhD position (4 years)

PhD. Position: Instability of polymeric flows

Subject Area: Fluid Mechanics

Detailed Subject Area: Physics, Hydrodynamic instabilities, Non-Newtonian fluids, Polymeric fluids

Description of Project:

Turbulence in dilute polymer solutions is a topic full of fundamental and technological interest. Traditionally the field of application has been turbulent drag reduction. More recently the field of elastic turbulence, where nonlinearities emerging from the coupled polymer equation are responsible for generation of turbulence, has gathered interest.

We plan to investigate the effect of polymers on basic instabilities of a fluid flow. In particular we first select well studied fluid instabilities at low Reynolds number (configurations stable in the case of pure fluid) and see if instability can be generated by addition of polymers. The instabilities thus generated are expected to depend on the parameters of the polymers, including their time-scales and the maximum length. Different basic fluid instabilities will be considered including thermal instabilities, and instabilities in the presence of rotation.

In a different aspect of the problem, the nondimensionlized turbulent heat transport (Nusselt number) shall be calculated for a Rayleigh-Benard convection with dilute polymeric liquid. The study will elucidate the effects of polymers on thermal boundary layer and investigate the possibility of turbulent heat transport enhancement in the presence of polymers.

The analysis is based on instability theory and numerical simulations of the flow. The simulations will be performed with in-house software, in particular the Pencil code.

A sound knowledge of hydrodynamics is necessary. The candidate is required to have good programming skills, acquaintance with Linux operative system and basic communication skills in English. Programming experience in Fortran (particularly Fortran 90) is preferred but not essential. Computational time will be provided in the PDC clusters at KTH.

The project is a collaboration between NORDITA, Nordic Institute for Theoretical Physics and the Linne FLOW Centre at KTH.

NORDITA (www.nordita.org) is the Nordic Institute for Theoretical Physics.

Its purpose is to carry out research and strengthen the Nordic collaboration within the basic areas of theoretical physics.

The research in Fluid Mechanics at KTH is organized within the Linn e FLOW

Centre (www.flow.kth.se). The centre is one of the 20 original centers of

excellence set up by the Swedish Research Council, as the result of a highly competitive process with international evaluation. About 40 PhD students and more than 15 senior scientists are part of the Linne FLOW Centre at the moment.

Project Website: www.flow.kth.se www.nordita.org

Name of responsible professor/researcher: Luca Brandt

Name of Supervisor (if other): D. Mitra and L. Brandt

E-mail address of contact person: dhruba.mitra@gmail.com

KTH School: SCI

KTH Department: Mekanik

Type of available position: CSC - Full PhD position (4 years)

PhD. Position: GLOBAL ANALYSIS OF THE SPLICEOME

Subject Area: Gene Technology

Detailed Subject Area: Research of the group focuses on development of molecular methods facilitating highly parallel amplification and analysis of genetic variations and expressed signature genes. Trinucleotide threading (TnT) and protease-mediated allele-specific extension (PrASE) are two techniques that the group has developed to assess DNA variations and profile expressed gene. The PrASE method is particularly suitable for magnetic bead capturing and naked-eye detection of in situ array sequenced and genotyped DNA molecules. This method that increases the spatial size of each DNA molecule by a thousand fold, opens up new possibilities to develop point-of-care devices for DNA analysis that can be produced and used at low cost. The TnT technique is currently adapted for genome-wide exon capturing and parallel amplification of exon junctions (alternative splicing) followed by massive DNA sequencing of the selected regions. Other applications of TnT involve allelotyping by next-generation sequencing technologies and expression profiling of genes involved in different cancers including basal cell carcinoma and ovarian cancer.

Description of Project:

The sequences within genes are disrupted by segments called introns and the removal of these from pre-messenger RNAs produces mRNA and protein isoforms. This alternative processing of primary RNA results in increased functional diversity in cells and phenotypical complexity in mammals. Accordingly, disruption of tissue specific splicing may lead to development of various

diseases. For instance, recent efforts have revealed that alternatively spliced expressed genes correlate with cancer development and response to therapy. However, estimation and evaluation of the levels of mRNA isoform, both within and between tissues, has been hampered by technical issues such as specificity, sensitivity and completeness. For example, efforts that have employed expressed sequence tags (ESTs) have had very limited statistical power, and therefore have underestimated the levels of tissue specific splice variants. Microarray-based platforms are cost-effective alternatives to EST sequencing, but it is widely acknowledged that these approaches suffer from cross-reactivity and most often ignore low-expressed variants. RNA-Seq approach that utilizes massive sequencing platforms to view tissue specific alternative splicing has the potential to address these limitations. However, this method requires much more sophisticated upstream procedures than the protocols in use today. The disadvantage of this approach is that at least 95 percent of the data do not produce information about splicing events. Also, as a consequence, the method may neglect low-level expressed variants.

To address the difficulties associated with RNA-Seq, this proposal presents an approach that has the potential to specifically and with high sensitivity select and parallel-amplify exon junctions. The approach employs the TnT method, which has been exploited for the multiplex analysis of single nucleotide polymorphisms (SNPs), and to investigate levels of gene expression in different cell lines. In addition, we have shown that the technique is fully compatible with the new-generation massive sequencing platforms. In brief, trinucleotide threading (TnT) is a method for multiplexed amplification of genomic DNA. It also has the capacity for simultaneously studying a huge number of expressed genes. The assay utilizes reverse-transcriptase-generated cDNA as template in a trinucleotide threading reaction, in which DNA threads are formed. The formation of threads relies on the sequential action of a DNA polymerase, which closes a gap between a pair of annealed primers (a biotinylated extension primer and a phosphorylated thread-joining primer), and a ligase which links the two primers, generating a complete thread. The gap-closing extension reaction only features three out of the four nucleotides to avoid generation of unspecific products. In addition, the TnT assay allows cyclic extension-ligation reaction to linearly amplify the target, which increases the sensitivity of the method and thereby makes it possible to detect low abundant expressed genes or gene variants. The DNA threads, carrying common amplification handles, are parallel-amplified employing only one set of PCR primers. In the proposed project these handles contain new-generation sequencing tags to permit sequencing and digital analysis of expressed genes on these platforms.

The concept of expression profiling by TnT can easily be adapted to provide important information about splicing events. As described above, TnT primers for target positions can be designed and used for parallel amplification. These primers can be designed to target exon-exon junctions. In addition to detecting splice variants, several data points are produced for

each transcript, which enables whole transcriptome profiling in the same run. The proposed method generates short and easily identified sequences, and is not impaired by short read-lengths.

Project Website:

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KTH School: BIO

KTH Department: Gene Technology

Type of available position: CSC - Full PhD position (4 years)

PhD. Position: Characterization of carbohydrate synthase domains involved in membrane protein targeting using biochemical and molecular modeling approaches

Subject Area: Glycoscience and molecular modeling for studying protein/lipid interactions

Detailed Subject Area: This research project is to be conducted in tight collaboration between the Divisions of Glycoscience (Prof Bulone) and Theoretical Chemistry (Prof Ågren) at the School of Biotechnology. It is a multidisciplinary project involving experimental molecular approaches in the area of biochemistry and biophysics, combined with theoretical molecular modeling to characterize protein/lipid interactions.

The target proteins are membrane-bound carbohydrate synthases involved in the pathogenicity of microorganisms belonging to the oomycete family and being responsible for important economic loss in the aquaculture (fish pathogens, including salmon pathogens) and agriculture industries (pathogens of potato, tomato, etc). A very recent key reference from the proposed supervisors illustrating the importance of the problem is available online at http://www.plospathogens.org/article/info%3Adoi%2F10.1371%2Fjournal.ppat.1001070.

The importance of the work has also been recently highlighted in the press (e.g. KemivärldenBiotech, NyTeknik, etc: see for instance:

http://www.processnet.se/iuware.aspx?pageid=792&ssoid=125599

http://www.nyteknik.se/popular_teknik/kaianders/article2476774.ece

http://www.kth.se/aktuellt/genombrott-i-kampen-mot-fiskdoden-1.66208

Description of Project:

The microtubule interacting and trafficking (MIT) domain is a small protein module that was first noted in sorting nexin 15 (SNX15), [1] spastin and spartin, [2] and was named after their roles in protein-microtubule interactions. [2] Afterward the MIT domain was also identified in many other proteins such as Vps4, ribosomal s6 protein kinase (RSK)-like protein, and calpain 7 (CLPN7). [3] In some proteins, for instance spastin and Vps4, the MIT domain appears in the N-terminal part and is expected to participate in the endosomal trafficking process. [2,3] It has been proposed that the MIT domain acts as an adaptor domain for the ESCRT-III complex involved in endosomal trafficking. [3] The asymmetric 3-helix structure of the MIT domain is able to bind certain proteins, and such MIT-protein interactions could occur in endosomal molecules, localizing enzymatic activities associated with MIT proteins. [4,5] Although most MIT-containing proteins are considered as protein recognition modules by binding ESCRT-III/CHMP proteins [6-8], some of them, for instance Vps4 and SNX15, are hypothesized to be temporarily localized on an endosomal membrane to carry out their function. [3]

In this project we aim to explore the MIT domains that occur in oomycete chitin synthases, which points toward a specific important function to target these enzymes to the membrane compartments. It has been indicated through molecular dynamics (MD) simulations that these MIT domains bind different sets of lipids involved in the trafficking and targeting of membrane proteins, which is in good agreement with the experimental results. We have also found the key residues in these domains that show the strong interaction with phosphatidic acid but not with other common membrane phospholipids such as phosphatidylcholines, and an explanation on the specific binding sites. These novel results demonstrate a significant function of MIT domains in enzyme localization on membranes, especially on lipid rafts with specific lipid compositions. In this project we take account of these new findings and further explore MIT membrane interactions, using combined resources offered by experiment and modelling at the School of Biotechnology, KTH.

Reference

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Genomics, 81 (2003) 437–441

[3] H. Takasu, J. G. Jee, A. Ohno, N. Goda, K. Fujiwara, H. Tochio, M. Shirakawa, H. Hiroaki, Biochemical and Biophysical Research Communications, 334 (2005) 460–465

[4] P. E. Row, H. Liu, S. Hayes, R. Welchman, P. Charalabous, K. Hofmann, M. J. Clague, C. M. Sanderson, and S. Urbé, THE JOURNAL OF BIOLOGICAL CHEMISTRY, VOL. 282, pp. 30929–30937, 2007

[5] H. T. H. Tsang, J. W. Connell, S. E. Brown, A. Thompson, E. Reid, C. M. Sanderson, Genomics, 88 (2006) 333–346

[6] S. C. L. Yeo, L. Xu, J. Ren, V. J. Boulton, M. D. Wagle, C. Liu, G. Ren, P. Wong, R. Zahn, P. Sasajala, H. Yang, R. C. Piper, A. L. Munn, Journal of Cell Science 116, 3957-3970, 2003

[7] E. Reid, J. Connell, T. L. Edwards, S. Duley, S. E. Brown, C. M. Sanderson, Human Molecular Genetics, 2005, Vol. 14, pp.19–38

[8] A. Scott, J. Gaspar, M. D. Stuchell-Brereton, S. L. Alam, J. J. Skalicky, W. I. Sundquist, PNAS, 2005, vol. 102, pp. 13813–13818

Project Website: Please visit http://www.biotech.kth.se/glycoscience/Vincent_Bulone and links to publications therein

Name of responsible professor/researcher: Professors Vincent Bulone and Hans Ågren

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KTH School: BIO

KTH Department: Glycoscience and Theoretical Chemistry

Type of available position: CSC - Joint PhD/PhD guest student (1-2 years)

PhD. Position: Using water footprint as a method to control water usage

Subject Area: Industrial Ecology/Water fottprints

Detailed Subject Area: Climate change, rapid population growth and unsustainable practices are putting our water resources at risk. Whether it is the fuel that makes our cars run or the packaging that keeps our food fresh, the products we use every day require a large amount of water to produce. In a water stressed world, the water footprint of products will be a key environmental indicator in the drive towards an increased sustainable development.

The interest in the water footprint is rooted in the recognition that human impacts on freshwater systems can ultimately be linked to human consumption, and that issues like water shortages and pollution can be better understood and addressed by considering production and supply chains as a whole," says Professor Arjen Y. Hoekstra, creator of the water footprint concept and scientific director of the Water Footprint Network. "Water problems are often closely tied to the structure of the global economy. Many countries have significantly externalised their water footprint, importing water-intensive goods from elsewhere. This puts pressure on the water resources in the exporting regions, where too often mechanisms for wise water governance and conservation are lacking. Not only governments, but also consumers, businesses and civil society communities can play a role in achieving a better management of water resources.

This project aims at developing the method of water footprint to be used in companies and cities in China.

Description of Project:

Climate change, rapid population growth and unsustainable practices are putting our water resources at risk. Whether it is the fuel that makes our cars run or the packaging that keeps our food fresh, the products we use every day require a large amount of water to produce. In a water stressed world, the water footprint of products will be a key environmental indicator in the drive towards an increased sustainable development.

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closely tied to the structure of the global economy. Many countries have significantly externalised their water footprint, importing water-intensive goods from elsewhere. This puts pressure on the water resources in the exporting regions, where too often mechanisms for wise water governance and conservation are lacking. Not only governments, but also consumers, businesses and civil society communities can play a role in achieving a better management of water resources.

This project aims at developing the method of water footprint to be used in companies and cities in China.

In this project we are looking for a PhD-student from China with a master science in environmental engineering or industrial Ecology

Project Website: www.ima.kth.se

Name of responsible professor/researcher: Prof. Ronald Wennersten

Name of Supervisor (if other): Prof. Ronald Wennersten

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KTH School: ICT

KTH Department: Industrial Ecology

Type of available position: CSC - Full PhD position (4 years)

PhD. Position: Sustainable manufacturing

Subject Area: Machine and process technology

Detailed Subject Area: The subject area is focusing on the enhancement of the sustainability efficiency of manufacturing processes which is depending on the state of the art in machine tool technology. Large efforts are spending for the improvement of energy consumption of machine tools (including tool handling systems, auxiliary devices and controls). Of the various difficulties in machining, machine tool dynamics is one of the most crucial one because it drastically increases dynamic process forces that is non-sustainable in a sense of energy use. If uncontrolled, vibrations can reduce

machining performance, increase tool wear, create high levels of noise and can be the cause for tool breakage that are non-sustainable in a sense of waste.

One of the objectives within the sustainable machine tool research is to provide a

comprehensive understanding of the vibrations phenomenon in different machining

operations. This understanding is founded on integrated modelling of machining

process-machine tool on which stability analysis will be performed. Stability refers to the sustainable process operational area where machine tool vibrations probability is low. Another objective is to develop practical means for suppressing vibrations that can be applied in industry. These practical methods inclludes:

-Increase in the dynamic stiffness of the mechanical system.

-Reduction of the vibrations effects by passive and active damping.

The research activity integrates in a unified concept the machining system digital modeling, design and condition testing and monitoring. Within the research field methods and techniques are developed to sustain the required productivity, accuracy and reliability of machining systems. The machine tool dynamics and the machining process dynamics are two indispensable integrated parts which are taken into account simultaneously in designing, modeling and optimizing the machining system.

Description of Project:

The environmental problems, caused by the consumption of natural resources and pollution in the production and life of technical products lead to increasing demands and stronger regulations for manufacturing and usage of products. Manufacturing industries are additionally under the economic pressure to compensate increasing costs and create adding value. The EU defined the following objectives in its Lisbon Agenda:

• Creating more value for more (growth) and better jobs.

• Increasing the competition of EU industries.

• Sustainable development of economies.

The Sustainable Manufacturing is based on new science-based solutions that will contribute to the EU scientific excellence and manufacturing added value. Apart from its economic and social importance that are not directly investigated, Sustainable Manufacturing research will enhance

environmental sustainability through more efficient production by reduced waste and energy use, thus supporting the aim of decoupling growth from increased resource use. Objectives of Sustainable Manufacturing refer to the acceleration of technological innovation by model based

sustainable design of manufacturing systems. Firstly, sustainability dimensions of machining processes and machine tools will be investigated separately. Secondly, the interactions between machining processes and machine tools will be taken into account via integrated manufacturing systems modelling. All developed models and simulations will be experimentally verified.

The Sustainable Manufacturing objectives are consistent with the EU Sustainable Development Strategy. The strategy promotes sustainable production to reduce environmental pollution and supports a short term research into sustainable development. Another key strategy challenge refers to limiting the climate change. For this 8% reduction of CO2 emissions and 12% reduction of energy consumption should be achieved in the EU by 2010-2012. One way to achieve this is to apply manufacturing processes with reduced specific energy use and to adapt machine

tools to such a stage that the vibrations are reduced.

In support of Sustainable Manufacturing design efforts, information that relates manufacturing systems inputs to sustainable impacts needs to be available. Within the research methodology, the following sustainability measures will be developed:

- Machining process and machine tool energy use.
- Machine tool vibrations.
- Tool consumption and waste.
- Cooling-lubricant.
- CO2 equivalent.
- Energy costs.
- Health and safety.

Advanced technologies, machine tool energy effectiveness and the efficiency of machining processes are needed as answers for the future of sustainable manufacturing systems. Costs of energy and cooling-lubricants have an impact on the economic effectiveness. The reduction of waste is a contribution to the economic and ecologic effectiveness. Therefore Sustainable Manufacturing is on the way to overcome not only the existing limitation in manufacturing

performance, which was the main objective to increase economic efficiency, but even in the dimensions to

reduce the consumption of energy, resources and CO2 emissions.

Project Website: www.iip.kth.se

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KTH School: ITM

KTH Department: Production Engineering

Type of available position: CSC - Full PhD position (4 years)

PhD. Position: tactility experience, information given through the fingers

Subject Area: Machine Design

Detailed Subject Area: Tribology/Industrial design

Description of Project:

Background

The look and feels of consumer products are of tremendous importance to their commercial success. There is currently considerable interest to develop ways to improve the measurement of these factors. There are several reasons for this. Firstly, there is a need to provide information that so that attractive, desirable products can be designed. There is also a perceived need for quality control procedures to help provide consistency of products and to measure the degradation of feel with time. Phenomenological and material parameters as surface roughness, hardness and heat transfer are also related to the subjective feelings.

Purpose

The main purpose has been to gain experience in design of surface touch experiments and to link subjective outcomes with their physical cause.

Project Website: http://www.kth.se/itm/inst/mmk/forskning/skd/2.5252/human-touch-tribology-1.18778

Name of responsible professor/researcher: Ulf Olofsson

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KTH School: ITM

KTH Department: Machine Design

Type of available position: CSC - Full PhD position (4 years)

PhD. Position: Recycling of light weight structures in a life cycle perspective

Subject Area: Machine Design

Detailed Subject Area: EcoDesign

Description of Project:

By using lightweight materials as for example fibre composites in especially moving structures as ships, both economy and environmental impact is affected positively seen in a life cycle perspective. This has been demonstrated in the Swedish LASS project, were different types of ships are investigated. The life cycle comprises all activities from product design, raw material extraction, product manufacturing, use and maintenance of product to final disposal. One problem though especially for composite materials is the lack of an economical and viable method for recycling. To facilitate end of life treatment the product needs to be prepared already at the design stage. A model for controlling information necessary for different types of disposal has been developed especially focusing on composite material. But this information also needs to be incorporated into the design of the product.

Project Website: http://www.kth.se/itm/inst/mmk/forskning/skd/2.5252/lass-lightweight-construction-applications-at-sea-1.18776

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KTH School: ITM

KTH Department: Machine Design

Type of available position: CSC - Full PhD position (4 years)

PhD. Position: Particle emission from wheel to road interaction

Subject Area: Machine Design

Detailed Subject Area: Tribology

Description of Project:

Background

Material loss from the wheel, to road interaction generate airborne loose debris. The main concerns about airborne wear particles are environmental. They include health effects, visibility problems and soiling of surfaces. Such concerns have led many countries to set limits for PM10 (particles with an aerodynamic diameter smaller than 10 μm). One example is the EU directive 96/62/EC on ambient air quality assessment and management, with its daughter directive 99/30/EC. Increased attention to the effects of airborne particles in the atmosphere on human health has also led to movements towards setting limits for PM2.5.

Purpose

The purpose of this project is to develop simulations models for the generation of airborne particles from wheel to road interaction. When such a tool has been developed and calibrated one can use it to systematically simulate the necessary changes to reach acceptable emission levels for roadl traffic.

Project Website: http://www.kth.se/itm/inst/mmk/forskning/skd/2.5252/forskning-skd-1.19854?l=en_UK

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KTH School: ITM

KTH Department: Machine Design

Type of available position: CSC - Full PhD position (4 years)

PhD. Position: Retention of Valuable Metals in the high alloy steel process by using CO2

Subject Area: Materials and Metallurgical Process

Detailed Subject Area: Process Metallurgy, especially in stainless steel process

Description of Project:

Retention of Valuable Metals in the high alloy steel process by using CO2

Due to increasing energy demand and environmental restrictions, it is of great importance in the steels industry to recover and reutilize the valuables in the slag, as well as in the dust. The present project aims at development of suitable process routes towards recovery and reutilization of metal valuables in the steel cycle, with special emphasis on Cr, Mo, V, Ti, Mn, and Ni. It is realized that it is not sufficient to modify the existing process route for the production of steel to accommodate the retainment/recovery/reutilization of valuable metals from the rest products. In order to achieve maximum benefits, it is therefore necessary to have a “new detailed look” at the steel processes of today. New process concepts with thermodynamic, mass transfer and kinetic considerations will be generated to selectively withhold the valuables and remove the undesirable impurities. The proposed project strategy will involve effective control and manipulation of the slag chemistry. The philosophy in steelmaking of today is the “zero slag” operation to decrease the energy costs as well as the environmental load of dumping slags. It is also proposed to initiate a new generation of technologies leading to optimal utilization of metal values in steel scrap.

Retention and recovery of Cr in the steel making process have been done by the present division. The designed work for the new Ph.D student is the retention and recovery of Mn.

It has been pointed out by the Swedish industries the need for retaining Mn in the steel bath and minimize the loss of manganese to the slag. The amount of Mn that eventually ends up in the slag needs to be recovered and reintroduced into the steel cycle. It is well-known that Mn is a reactive mental vis-à-vis oxygen and can very easily end up in the slag phase in oxidic form. The present project plan will cover the trials with respect to both retention as well as recovery of Mn.

Project Website: http://researchprojects.kth.se/index.php/kb_1/io_9328/io.html

Name of responsible professor/researcher: Dr. Lidong Teng

Name of Supervisor (if other): Lidong Teng, Docent

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KTH School: ITM

KTH Department: Department of Materials Science and Engineering

Type of available position: CSC - Full PhD position (4 years)

PhD. Position: High Pressure and High Temperature Studies of Geophysical & Hard Materials

Subject Area: Materials Science

Detailed Subject Area: Computational Materials Science

Description of Project:

The aim of this proposal is to expand and accelerate our understanding of Earth's interior and of hard materials We will carry out fundamental studies of high pressure behavior of geophysically relevant materials at megabar pressure regime. First of all the exploration of the megabar pressure range is highly interesting by itself, since in this region new physics and chemistry can be expected. Second, the general problem about the equation-of-state in this pressure range is highly significant for a vast number of geophysical materials. An important byproduct from such studies could be an improved understanding and performance of materials at ambient conditions. The underlying mechanisms determining the geometrical

arrangement of atoms can be elucidated by the study of matter at extreme conditions, probing a new range of electron densities. The main thrust in this proposal is to integrate a highly accurate theoretical instrument (ab initio electronic structure theory) with the state of the art high pressure techniques for a healthy cross-fertilization between the theory and experiments. The gained knowledge from the high pressure and temperature behavior of materials will be applied to design and understand new hard materials. Thus, our work follows the materials science paradigm synthesis – structure/ composition – properties – computation.

Project Website:

Name of responsible professor/researcher:

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KTH School: ITM

KTH Department: Materials Science & Engineering

Type of available position: CSC - Joint PhD/PhD guest student (1-2 years)

PhD. Position: Advanced Materials for Solar Energy Conversion and Storage

Subject Area: Materials Science

Detailed Subject Area: Computational Material science

Use of Computational Materials Science to design and understand new materials.

Description of Project:

The successful realization of the proposed project will lead to a deeper understanding of existing materials and to the designing of new materials for energy conversion and storage. Specifically, we focus on converting to and storing solar energy in the chemical form. We will explore one of the most suitable pathways for mobile applications such as for ocean transportation (ships): water splitting for hydrogen production and chemical storage of hydrogen in a suitable host material.

In our studies, we plan to apply the state-of-the-art computational tools as well as developing new methods to investigate the relevant materials at the atomic level, based on first-principles theories in combination with advanced experimental approaches.

Specifically, on the topic of energy conversion through water splitting, we will investigate both the homogenous and heterogeneous catalysis. In detail, we plan to:

• Advance the understanding of the interface between H2O and semiconductor nanoparticles and their electronic/structural properties at 0 K and at finite temperatures.

• To design new semiconductor nanoparticles with the band-gap and band-edge potentials in the suitable range for visible light driven water cleavage.

• To reveal the fundamental principles of the photo-electrochemical reactions that occur on the semiconductor-water interfaces.

• To investigate proton coupled electron transfer reactions in water oxidation process by Ru-based catalyst.

• To design new bioinspired catalysts for efficient production of hydrogen.

Regarding the storage of hydrogen, our focus will be on light-metal hydrides and metal-organic frameworks as hydrogen storage materials. In detail, we plan to:

• Advance the understanding of the interaction between H2 and the pore walls in metal-organic frameworks,

• Design functionalized metal-organic frameworks with suitable properties for on-board applications.

• Develop new catalyst for hydrogen sorption reactions in complex light metal hydrides

Project Website:

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KTH School: ITM

KTH Department: Materials Science and Engineering

Type of available position: CSC - Full PhD position (4 years)

PhD. Position: Design of high-performance nonvolatile memories based on phase-change materials

Subject Area: Materials Science

Detailed Subject Area: Computational Materials Science

Description of Project:

It is a never ending quest for recording media with high-speed, high-density, low power consumption and good scaling characters in today's multimedia society. The goal of this project is to develop high-speed, low power consumption and good scaling chalcogenide based memories by theoretical and experimental methods. Phase-change materials, GST, (Ge-Sb-Te) have been in commercial use in rewritable optical storage (DVD-RW e.g.) for a decade and are currently investigated as nonvolatile electronic storage to replace conventional FLASH-memory. However, the mechanism behind the utilization is not yet clear, therefore, current studies to tune the property of phase-change materials are generally based on empirical trials. With a combination of the theory and experiments, this project will tune the properties of phase-change materials with the aim to get new materials with better performance. Using static and dynamic ab initio calculations, and quantum Monte Carlo simulations, this project will extensively study the stoichiometry, structures, chemical bonding and band structure, electrical and optical properties of phase-change materials in the amorphous and crystalline states. Furthermore, the effect of doping on the structure and properties of GST will also been studied to tune the performance of phase-change materials and to identify new and better phase-change materials. Finally, the predicted new phase-change materials with better performance by calculations will be deposited by magnetron sputtering. The stoichiometry, structures, the phase transition between amorphous and crystalline states and properties of the deposited films will be investigated. Furthermore, it is expected to obtain a quantitative relation between the stoichiometry, structure and performance of the phase-change materials. The results of this project will not only provide fundamental understandings of this family of technologically important materials, but also will guide their practical applications.

The ultimate aim is to design next generation 1 TB, 32 layers DVD based on Phase Change Materials (GST).

Significance of this project

Present-day multimedia strongly relies on rewritable phase-change optical and electrical memories. Recently, using phase-change materials towards a universal memory has attracted growing interests. This project will contribute to this research field and it is significant in terms of both basic research and technological applications.

Project Website:

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KTH School: ITM

KTH Department: Materials Science and Engineering

Type of available position: CSC - Joint PhD/PhD guest student (1-2 years)

PhD. Position: Recovery of Metal Values from high alloy steel slags and Dust by Molten Salt Extraction Process

Subject Area: Metallurgy and Materials Process Science

Detailed Subject Area: PhysicalChemistry of Metallurgy and ElectroChemistry

Description of Project:

Recovery of Metal Values from high alloy steel slags and Dust by Molten Salt Extraction Process

There is an ongoing program, the “Steel Eco-Cycle” is a revolutionary approach towards redesigning steel production so that the processes are more advantageous with respect to environment, energy and economy. The present group, with proven competence in the fundamentals of process metallurgy, will explore new process concepts towards a better recovery of metals like Mo, Cr, V, Nb and Mn from dusts as well as metallurgical slags.

The general aim of the present project is to recover the major portion of metal values from waste slags by a molten salt extraction process. The advantages of such a process are the significant economic gains considering the increasing trend in the metal prices. Further, the method leads to a waste slag that has no harmful metals like Cr and can be used safely for road fills or other construction purposes. The long-term objective of the present project is to extend the process towards the recovery of metal values from low-grade ores in an eco-friendly process route.

The main work of the present Ph.D project will be focused on the following aspects:

1. Partition of the metal values between the salt and slag phases

Our earlier experiments have shown that it is possible to recover a high percentage of the metal values (like Cr) from slags into the salt phase. While we have earlier carried out investigations regarding the impact of various process parameters like temperature and oxygen partial pressure, it is now planed to prove newer and more effective salt mixtures with expectations of better recovery.

2. Electrolysis of the molten salt phase

The recovery of the metal values (Cr, V, Mo, Mn) from the salt phase will be addressed by adopting different strategies, i.e.:

a) Electrolysis of the salt phase adjusting the deposition potentials and recover the metals as the cathode deposits.

b) Vaporization of the metal chlorides and condensing the same.

c) Leaching of the salt phase by water and extracting the metals as hydroxides by

hydrometallurgical method.

Of these, it is believed that the hydrometallurgical route should be taken with caution as it involves further treatment of the waste water with the associated burdens on environment and economy. The evaporation-condensation route can be viable for certain chlorides with high vapour pressure. However, NaCl that has a high vapour pressure at the melting point will follow the metal chlorides. Thus, electrolysis appears to be a serious candidate for metal extraction.

While, we have worked out the theories with regard to the electrode potentials of single metals, it is realized that co-deposition of metals is common. The impact of oxygen partial pressure in the gas atmosphere above the salt melt seems to have implications on the process efficiency, and will be investigated. The investigations need be extended to Mo (some

experiments with positive results have already been carried out), V, Nb and Mn containing slags.

Project Website: www.kth.se

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KTH School: ITM

KTH Department: Department of Materials Science and Engineering

Type of available position: CSC - Full PhD position (4 years)

PhD. Position: Antenna Systems for MIMO Application

Subject Area: MIMO System for Wireless Communication

Detailed Subject Area: With the development of wireless communication systems, higher bit-rate transmission is required by the users to satisfy various kinds of services simultaneously, such as internet access, video and music. Digital communication using multiple-input multiple output(MIMO) has recently emerged as one of the most significant technical breakthroughs, which can increase the channel capacity without sacrificing additional spectrum or transmitted power. This subject is nowadays a hot topic that many researchers focus on.

Description of Project:

Future wireless communication systems require higher bit-rate transmission to ensure various kinds of services, such as internet access, video and music. Multiple-input multiple output (MIMO) system has recently emerged as one of the most significant solutions, as it can increase the channel capacity without sacrificing additional spectrum or transmitted power. In a MIMO wireless communication system, the transmitting end, as well as the receiving end, has to be equipped with multiple antenna elements so that parallel sub channels can be established between the transmitter and receiver antennas to increase the channel capacity. For a base station, the space is large enough that antenna separations of many wavelengths are available.

However, for a mobile terminal, it is a great challenge to implement multiple antennas due to its limited space. When antennas are packed closely, its performances such as radiating efficiency, impedance bandwidth, and diversity gain will deteriorate because of mutual coupling, which will influence the channel capacity.

In this project, we will mainly study why and how the antenna performances are influenced by mutual coupling when antennas are very close to each other, and find good solutions to these influences. We will also design compact MIMO antenna systems, decoupling (matching) networks, or other devices that can reduce mutual coupling. The design of any device should be fabricated and tested under certain environment to verify its applications.

Project Website:

Name of responsible professor/researcher:

Name of Supervisor (if other): Lars Jonsson

E-mail address of contact person: ljonsson@kth.se

KTH School: CSC

KTH Department: Electromagnetic Engineering,School of Electrical Engineering

Type of available position: CSC - Joint PhD/PhD guest student (1-2 years)

PhD. Position: First Principles Simulations of Molecular Electronics and Photonics

Subject Area: Molecular Modelling

Detailed Subject Area: Molecular Electronics, Molecular Photonics, Theoretical Chemistry, Condensed Matter Physics

Description of Project:

It has become possible to make various electronic and photonic devices with small molecules. However, the basic principles that control the operation of these devices are largely unknown. Theoretical modeling with first principles methods can provide the answers for many of the

questions and offer design strategies to improve the performance of these tiny devices. Over the years, we have developed several theoretical methods and computational approaches to study some of the basic units of the devices, for instance molecular junctions in which a molecule is sandwiched between two metal or carbon nanotube electrodes. We can now determine the exact conformation of the molecule inside the junction by simulating its inelastic electron tunneling spectra. We can understand why and when the molecule can emit light under the excitation of the electron current. In the future, we should take into account the magnetic properties of molecular devices, and consider the surface plasmon enhanced Raman and fluorescence of a single molecule near the metal surfaces. The goal is to make a computational software that can uniformally deal with electron and spin transport, light emitting, plasmonic excitation etc in a single molecular device.

Project Website: www.theochem.kth.se/~luo

Name of responsible professor/researcher: Prof. Yi Luo

Name of Supervisor (if other): Prof. Yi Luo

E-mail address of contact person: luo@kth.se

KTH School: BIO

KTH Department: Theoretical Chemistry

Type of available position: CSC - Full PhD position (4 years)

PhD. Position: enhanced light-matter interaction in quantum dot based nanostructure for solar energy applications

Subject Area: nanophotonics

Detailed Subject Area: quantum dot based nanostructure, enhanced light matter interaction, exciton excitation and photon absorption, solar cell application

Description of Project:

The quest for renewable energy is of fundamental concern for modern society, with clean, efficient renewable energy technologies ready to compete head to head with oil, gas, coal and even nuclear energy. Quantum-dot (QD) based photovoltaic (PV) cells have been extensively

studied where electron-hole pairs in QDs, generated after absorbing photons from solar radiation, will be collected as photocurrent between the front and back electrodes of the PV cell. In this project we will design the front electrode into nanostructure metamaterial so as to enhance the funnelling of solar radiation to the QD absorbers. Furthermore, we will try to position QD absorbers into photonic-stop-band lattice structure so as to prevent the photons of solar radiation from escaping the cell, allowing photons not absorbed on a first pass to have further opportunities for being absorbed. With the present project we have the ambition to significantly improve the ability to capture solar radiation, thus increase the use of renewable energy and contribute to the sustainable development of society and economy.

Project Website:

Name of responsible professor/researcher: Ying Fu

Name of Supervisor (if other): Ying Fu

E-mail address of contact person: fu@kth.se

KTH School: BIO

KTH Department: Theoretical chemistry

Type of available position: CSC - Full PhD position (4 years)

PhD. Position: McNoC: Multicore Network on Chip Platforms

Subject Area: Network on Chip

Detailed Subject Area: Research and development of on-chip interconnect and memory architectures for tera-scale performance and low power Systems-on-Chip (SoC). Packet switched and circuit switched networks are studied.

The research into on-chip memory architectures includes distributed shared memory, cache coherence, memory consistency and virtualization.

Application areas include telecommunication, robotics, consumer electronics and automotive.

Description of Project:

Research and development of on-chip interconnect and memory architectures for tera-scale performance and low power Systems-on-Chip (SoC). The network architecture contains a best effort packet switched network and a guaranteed bandwitdh, high performance circuit switched network. To objective is to develop a sclabale, flexible network that can be configured to serve either ultra-high performance or very low-power applications.

The research into on-chip memory architectures includes distributed shared memory, scalable and hierarchical cache coherence, suppuort for memory consistency models and virtualization.

Application areas include telecommunication, robotics, consumer electronics and automo

Project Website: http://www.ict.kth.se/nostrum/

Name of responsible professor/researcher: Prof. Axel Jantsch

Name of Supervisor (if other): Dr. Zhonghai Lu

E-mail address of contact person: axel@kth.se

KTH School: ICT

KTH Department: Electronic Systems

Type of available position: CSC - Full PhD position (4 years)

PhD. Position: McNoC: Multicore Network on Chip Platforms

Subject Area: Network on Chip

Detailed Subject Area: Research and development of on-chip interconnect and memory architectures for tera-scale performance and low power Systems-on-Chip (SoC). Packet switched and circuit switched networks are studied.

The research into on-chip memory architectures includes distributed shared memory, cache coherence, memory consistency and virtualization.

Application areas include telecommunication, robotics, consumer electronics and automotive.

Description of Project:

Research and development of on-chip interconnect and memory architectures for tera-scale performance and low power Systems-on-Chip (SoC). The network architecture contains a best effort packet switched network and a guaranteed bandwitdh, high performance circuit switched network. To objective is to develop a sclabale, flexible network that can be configured to serve either ultra-high performance or very low-power applications.

The research into on-chip memory architectures includes distributed shared memory, scalable and hierarchical cache coherence, suppuort for memory consistency models and virtualization.

Application areas include telecommunication, robotics, consumer electronics and automo

Project Website: http://www.ict.kth.se/nostrum/

Name of responsible professor/researcher: Prof. Axel Jantsch

Name of Supervisor (if other): Dr. Zhonghai Lu

E-mail address of contact person: axel@kth.se

KTH School: ICT

KTH Department: Electronic Systems

Type of available position: CSC - Guest researcher position (3-12 months)

PhD. Position: McNoC: Multicore Network on Chip Platforms

Subject Area: Network on Chip

Detailed Subject Area: Research and development of on-chip interconnect and memory architectures for tera-scale performance and low power Systems-on-Chip (SoC). Packet switched and circuit switched networks are studied.

The research into on-chip memory architectures includes distributed shared memory, cache coherence, memory consistency and virtualization.

Description of Project:

Research and development of on-chip interconnect and memory architectures for tera-scale performance and low power Systems-on-Chip (SoC). The network architecture contains a best effort packet switched network and a guaranteed bandwitdh, high performance circuit switched network. To objective is to develop a sclabale, flexible network that can be configured to serve either ultra-high performance or very low-power applications.

The research into on-chip memory architectures includes distributed shared memory, scalable and hierarchical cache coherence, suppuort for memory consistency models and virtualization.

Application areas include telecommunication, robotics, consumer electronics and automo

Project Website: http://www.ict.kth.se/nostrum/

Name of responsible professor/researcher: Prof. Axel Jantsch

Name of Supervisor (if other): Dr. Zhonghai Lu

E-mail address of contact person: axel@kth.se

KTH School: ICT

KTH Department: Electronic Systems

Type of available position: CSC - Joint PhD/PhD guest student (1-2 years)

PhD. Position: Security in all-optical networks

Subject Area: Optical Networking

Detailed Subject Area: Due to the huge potential bandwidth offered by optical fibers, optical transmission has been established as the enabling technology for high-capacity communication networks. In order to overcome the electronic bottleneck, transparent optical networks establish all-optical data connections, referred to as lightpaths, between node pairs creating a virtual topology over the physical interconnection of optical fibers. Although transparency offers many advantages, e.g., insensitivity to data rate and protocol format, it makes network monitoring much more difficult. In addition, the vulnerabilities associated with optical

transparency and the ex-tremely high data rates involved make security and reliability two crucial aspects. The difficulty in detecting and locating physical-layer attacks, i.e., power jamming and tapping, and/or malicious behaviour resides in the fact that monitoring must be performed in the optical domain. On the other hand, successful prevention techniques, as well as fast and efficient reaction/restoration mechanisms in the presence of faults and/or deliberate attacks, can prevent severe service disruption and the loss of large amounts of critical data.

In general, failure and attack management consists of prevention, detection, and reaction mechanisms. Prevention mechanisms in transparent optical networks are usually based on hardware approaches aimed at overcoming the physical vulnerabilities of optical components. For example, automatic gain control and power limiting amplifi ers can be applied to thwart power-jamming attacks. However, it is not always possible to take advantage of the hardware approaches due to high price of such equipment. Detection techniques aim at detection and localization of attacks based on information received from specialized optical monitoring equipment, which can be quite expensive. Thus, full monitoring capabilities cannot realistically be assumed at all nodes. Reaction mechanisms restore the proper functionality of the network by isolating the source of the failure and by reconfi guring the connections. Such techniques can use preplanned backup paths or reactive rerouting schemes, creating a trade-off between speed and the utilization of network resources. In general, the higher the reliability performance required, the more spare resources are needed and, consequently, the higher the cost of the network equipment involved.

Reaction mechanisms, per se, are not new and a lot of work on this topic has been published and can be found in the literature. For example, many works study extensively these mechanisms in a variety of different scenarios. However, all these solutions deal only with network element failures, but not with malicious attacks. The main difference resides in the fact that an element failure affects only the connection traversing that element while attacks, on the other hand, may spread broadly also on connections that do not share resources, making this conventional protection approaches not effective.

Description of Project:

The main purpose of this project is to develop an efficient security planning framework for physical-layer attack and fault management including cost-effective prevention, detection and reaction mechanisms. More specifically the objective of this project are:

-To develop an unified routing and wavelength assignment (RWA) approach comprehen-sive of both link-based and node-based attacks using a general failure graph indicating which connection can disrupt which other connections, both directly and indirectly

-To develop an improved detection mechanism by devising a monitoring placement policy aimed at maximizing the number of identified failure scenarios using minimal amount of equipment

-To develop an improved reaction mechanism by devising strategies to compute pre-planned back-up paths accounting for a complete attack and fault relational model.

The combination of the above objectives will result in attack resilient framework, based on an a-priori planning technique, able to significantly contain the overall network cost.

Project Website: http://www.ict.kth.se/MAP/FMI/Negonet/

Name of responsible professor/researcher: Lena Wosinska

Name of Supervisor (if other): Lena Wosinska

E-mail address of contact person: wosinska@kth.se

KTH School: ICT

KTH Department: FMI/ICT/KTH

Type of available position: CSC - Full PhD position (4 years)

PhD. Position: Philosophy of technology in an intercultural Chinese-Western perspective.

Subject Area: Philosophy

Detailed Subject Area: Philosophy of technology

Description of Project:

With increasing international cooperation, differences in social and philosophical approaches to technology also become increasingly important. Largely for linguistic reasons, discussions in philosophy of technology in China and in the West have taken place in parallel, with relatively few contacts. It is the purpose of the present project to investigate interrelations – both similarities and differences – between Chinese and Western philosophy of technology in order to achieve improved mutual understanding. This will be done by close studies of texts from both traditions (of course with the understanding that Chinese and Western philosophy are both very diversified and that each contains many different traditions). The first step will be to identify major themes in the philosophical discussions on technology and its social consequences in both traditions (such as: views on the relation between science and technology, autonomy of technology, its role in social development, the relationship between technological advancement and human welfare, technological risks, etc.) After this, the most important themes for comparison will be identified and they will be compared through careful study of central texts in both traditions.

This research requires good knowledge of both Chinese and English, which is the reason why we much prefer a PhD student from China to perform this work.

Our department has cooperations with three Chinese universities: Northeastern University (Shenyang, philosophy of technology, profs. Chen Fan and Ma Huiduan), Peking University (philosophy, prof Chen Bo) and Tsinghua University (philosophy, prof Fenrong Liu). We will use these contacts to ensure that the PhD student is directed to the appropriate Chinese sources and also to ensure that the project will be useful for the Chinese academic environment as well.

Our department also has well-developed contacts throughout Western philosophy of technology. The intended supervisor Sven Ove Hansson is President Elect of the Society for Philosophy and Technology.

Project Website:

Name of responsible professor/researcher: Sven Ove Hansson

Name of Supervisor (if other): Sven Ove Hansson

E-mail address of contact person: soh@kth.se

KTH School: ABE

KTH Department: Department of philosophy and the history of technology

Type of available position: CSC - Full PhD position (4 years)

PhD. Position: Nanowire-based nanophotonic devices

Subject Area: Photonics

Detailed Subject Area: Nanophotonics, Photonic Integration, Optical Communications, Nanotechnology, Communication technology, Optics

Description of Project:

Nanophotonics is one of the main areas within nanoscience and nanotechnology, and it has significant impacts on microelectronics and photonics industry, with the potentials to build integrated optics with a density of components and functionalities which is several orders of magnitude larger than today. In the present project, we intend to investigate the optical properties of nanowire-based nanophotonic devices and their applications. The specific goals are understanding and investigating the optical properties of nanowires, in particular, metallic nanowires developing efficient coupling methods between dielectric nanowires and metallic nanowires, also the coupling between nanowires and conventional waveguides design, fabrication, and characterization of nanowire-based nanophotonic devices, and explore their applications.

Project Website: http://web.it.kth.se/~min/

Name of responsible professor/researcher: Prof. Min Qiu

Name of Supervisor (if other): Prof. Min Qiu

E-mail address of contact person: min@kth.se

KTH School: ICT

KTH Department: Optics and Photonics

Type of available position: CSC - Guest researcher position (3-12 months)

PhD. Position: Metamaterials in application to functional photonic devices.

Subject Area: Photonics and metamaterials

Detailed Subject Area: Nanophotonics is an emerging field that utilizes high resolution lithography and nanofabrication to develop nanoscale optical devices, in many cases enabled by artificial materials. Metamaterials is a new class of artificially structured material that exhibits exceptional elactromagnetic properties. Light propagation through such artificial media differs from the classical understanding. For example a material can exhibit a negative refractive index, which causes light to bend in opposite direction. By manipulating the values of electrical permittivity and permeability, different new, not yet observed performances can be found. Recently the new technology oriented towards nanofabrication made it possible to reach enough resolution to be able to fabricate these structures with enough accuracy and quality.

Description of Project:

In this project we will design, fabricate and evaluate novel nanophotonic devices based on silicon nanowires and photonic crystals for densely integrated photonic circuits.

We will also investigate new, artificially structured materials that exhibit new properties to propagating light.

We will design such materials and fabricate them.

Finally we design and fabricate nanophotonic components based on these materials that allow for development of new highly integrated structures.

Project Website:

Name of responsible professor/researcher: Lech Wosinski

Name of Supervisor (if other): Lech Wosinski

E-mail address of contact person: lech@kth.se

KTH School: ICT

KTH Department: FMI

Type of available position: CSC - Full PhD position (4 years)

PhD. Position: NMR spectroscopic studies of adsorption on organic fibers and on nanoparticles

Subject Area: Physical chemistry/NMR spectroscopy

Detailed Subject Area: Our research is at the crossroads of NMR spectroscopy, the most versatile method of chemical science and engineering, of material science, of colloid and surface science, and of medical technology. On the methodology side, our group is developing new NMR spectroscopic and imaging tools, primarily for studying various problems in the broad field of heterogeneous materials where the latter ranges from molecular associates through nanoparticles to porous materials. We also apply NMR spectroscopy for studies of molecular association and order in systems such as (i) liquid crystals, both thermotropic and lyotropic ones, (ii) adsorbed layers, (iii) associates of biopolymers, polymers and surfactants and colloids. We also use NMR cryoporometry, often in combination with other NMR methods, to study pore size distribution and pore interconnectivity in both organic and inorganic materials. In particular, we are investigating wood and wood-based materials and moisture in them and pharmaceutical delivery systems, primarily tablets. Often, we cooperate with companies that are global technology leaders in consumer and pharmaceutical products. If suitable, we exploit thermodynamics and statistical mechanics to provide molecular interpretation of our results.

Description of Project:

We have during the past few years developed the NMR depletion method for studying adsorption isotherms (1-2). When having done those studies it became clear that NMR is a particularly suitable tool for studying adsorption from mixed solutions. In the past year we have also shown that we can, by the same methods and by high-resolution magic-angle spinning NMR spectroscopy access adsorption onto materials such as cellulose which are difficult to investigate by other, such as optical, methods. In addition, diffusion NMR (3) turned out to be a unique source of information of biomolecular adsorption on nanoparticles. The project is about extending the scope of those studies and investigate in detail the adsorption of (i) surfactant, (ii) polymer and (iii) biopolymer and the mixtures of thereof onto organic fibers and nanoparticles. In addition, new methods are going to be developed for studying the molecular conformation and dynamics of the molecules in their adsorbed states.

(1) L. Evenäs, I. Furó, P. Stilbs and R. Valiullin, Adsorption isotherm and aggregate properties of fluorosurfactants on alumina measured by 19F NMR, Langmuir 18, 8096-8101 (2002).

(2) L. Nordstierna, I. Furó, and P. Stilbs, Mixed adsorption of fluorinated and hydrogenated surfactants, Langmuir 22, 7969 - 7974 (2006).

(3) A. E. Frise, E. Edri, I. Furó, and O. Regev, Protein dispersant binding on nanotubes studied by NMR self-diffusion and cryo-TEM techniques, J. Phys. Chem. Lett. 1, 1414-1419 (2010).

Project Website:

Name of responsible professor/researcher: Prof. István Furó

Name of Supervisor (if other): Prof. István Furó

E-mail address of contact person: furo@kth.se

KTH School: CHE

KTH Department: Chemistry

Type of available position: CSC - Full PhD position (4 years)

PhD. Position: Electrophoretic NMR: method and applications

Subject Area: Physical chemistry/NMR spectroscopy

Detailed Subject Area: Our research is at the crossroads of NMR spectroscopy, the most versatile method of chemical science and engineering, of material science, of colloid and surface science, and of medical technology. On the methodology side, our group is developing new NMR spectroscopic and imaging tools, primarily for studying various problems in the broad field of heterogeneous materials where the latter ranges from molecular associates through nanoparticles to porous materials. We also apply NMR spectroscopy for studies of molecular association and order in systems such as (i) liquid crystals, both thermotropic and lyotropic ones, (ii) adsorbed layers, (iii) associates of biopolymers, polymers and surfactants and colloids. We also use NMR cryoporometry, often in combination with other NMR methods, to study pore size distribution and pore interconnectivity in both organic and inorganic materials. In particular, we are investigating wood and wood-based materials and moisture in them and pharmaceutical delivery systems, primarily tablets. Often, we cooperate with companies that are global technology leaders in consumer and pharmaceutical products. If suitable, we exploit thermodynamics and statistical mechanics to provide molecular interpretation of our results.

Description of Project:

During the past few years we have developed a unique instrumentation and greatly improved the available methodology for measuring by NMR spectroscopy the electrophoretic or the electroosmotic mobility. In addition, electrophoretic and diffusion NMR can, in combination, provide a measure of charge for molecules. This project is about using the developed

instrumentation for studying ion pairing and other forms of electrostatically governed association, primarily in ionic liquids and in biomolecular solutions.

(1) F. Hallberg, I. Furó, P. V. Yushmanov and P. Stilbs, Sensitive and robust electrophoretic NMR. Instrumentation and experiments, J. Magn. Reson. 192 69-77 (2008).

(2) F. Hallberg, C. F. Weise, P. V. Yushmanov, E. Thyboll Pettersson, P. Stilbs and I. Furó, Molecular complexation and binding studied by electrophoretic NMR spectroscopy, J. Am. Chem. Soc. 130 7550-7551 (2008).

(3) F. Hallberg, I. Furó and P. Stilbs, Ion pairing in ethanol/water solution probed by electrophoretic and diffusion NMR, J. Am. Chem. Soc. 131 13900-13901 (2009).

(4) F. Hallberg, T. Vernersson, E. Thyboll Pettersson, S. V. Dvinskikh, G. Lindbergh and I. Furó, Electrokinetic transport of water and methanol in Nafion membranes as observed by NMR spectroscopy, Electrochim. Acta 55 3542–3549 (2010).

Project Website:

Name of responsible professor/researcher: Prof. István Furó

Name of Supervisor (if other): Prof. István Furó

E-mail address of contact person: furo@kth.se

KTH School: CHE

KTH Department: Chemistry

Type of available position: CSC - Full PhD position (4 years)

PhD. Position: Molecular spintronics – interplay between transport and magnetism

Subject Area: Physics

Detailed Subject Area: Computational Physics

Description of Project:

Today's electronic devices have already reached the nanoscale and the next natural step is to build devices which directly exploit quantum coherence and thus entirely new operating principles. Of crucial importance for this to happen is to learn how to efficiently manipulate the spin degree of freedom in the electric transport through magnetic molecules, nanowires and nanocontacts. In this project, the focus is on theoretical and computational research in the areas of nanomagnetism and molecular electronics for tomorrow's electronic devices. The computational tools we use include density functional theory, non-equilibrium Green function theory and atomistic spin dynamics.

We have active collaborations with several groups in Europe and overseas and our research group is part of a lively, multidisciplinary environment with many young students active in fundamental physics as well as applied research.

To get more details about the types of projects we pursue, please have a look at these examples of published work from our group:

*Investigation of the Conducting Properties of a Photoswitching Dithienylethene Molecule, ACS Nano 4, 2635 (2010).

*Colossal magnetic anisotropy of monatomic free and deposited platinum nanowires, Nature Nanotechnology 3, 22 (2008).

*Pseudo-half-metallicity in the double perovskite Sr2CrReO6 from density-functional calculations, Applied Physics Letters 86, 032513 (2005).

*Magnetism in atomic-size palladium contacts and nanowires, Phys. Rev. Lett. 93, 057201 (2004).

Project Website: http://www.mse.kth.se/~delin

Name of responsible professor/researcher: Anna Delin

Name of Supervisor (if other): Anna Delin

E-mail address of contact person: annadel@kth.se

KTH School: ITM

KTH Department: ITM

Type of available position: CSC - Full PhD position (4 years)

PhD. Position: Nanostructured thermoelectric devices

Subject Area: Physics

Detailed Subject Area: Computational physics for sustainable energy systems

Description of Project:

Global energy uncertainty and the limited resources coupled with increased energy needs fuels the search for improving the efficiency of energy conversion technologies. Thermoelectric devices can play a very important role in efficient energy harvesting, and recovery. Thermoelectric devices are 'fuel-free' solid-state devices with no moving parts and therefore are extremely reliable. TEs can harvest residual low-grade energy which otherwise is wasted. To date, their use is limited by low conversion efficiency.

This PhD project is part of the NEXTEC EU project which is concerned with the application of modern nanotechnology principles to the design and creation of novel material architectures with enhanced thermoelectric properties. The NEXTEC project has ten partners across Europe, including leading companies such as Siemens and Electrolux.

Our role in NEXTEC is to use and develop computational methods for calculating transport properties such as, e.g., the Seebeck coefficient and thermal conductivity. The ultimate aim is to gain deeper understanding of what general design principles give efficient thermoelectric devices.

Our research group is part of a lively, multidisciplinary environment with many young students active in fundamental physics as well as applied research.

Project Website: http://www.mse.kth.se/~delin

Name of responsible professor/researcher: Anna Delin

Name of Supervisor (if other): Anna Delin

E-mail address of contact person: annadel@kth.se

KTH School: ITM

KTH Department: MSE

Type of available position: CSC - Full PhD position (4 years)

PhD. Position: Code development of VASP for atomistic modeling of materials.

Subject Area: Physics, Materials Science,

Detailed Subject Area: Code development for atomistic modeling of materials.

Programming the Fortran90 codes VASP and Wien2k.

Calculate material properties for solar energy applications.

Description of Project:

The project involves code development and implementation of VASP and Wien2k. These Fortran90 codes are large program packages on national high-performance supercomputers with MPI, used in atomistic modeling of semiconductor materials.

The PhD candidates should be in the field of physics, with special interest in programming and code developments. Various theoretical models will be implemented in the program packages, tested, and verified by calculating material properties of semiconductors. Our research activities are focused on materials for solar energy technology, and the PhD candidate will be part in our search for novel materials and material structures. For more information, please visit www.mse.kth.se/~cpersson/ and contact the team leader.

Project Website: www.mse.kth.se/~cpersson/

Name of responsible professor/researcher: Clas Persson

Name of Supervisor (if other): Clas Persson

E-mail address of contact person: Clas.Persson@mse.kth.se

KTH School: ITM

KTH Department: Materials Science and Engineering

Type of available position: CSC - Full PhD position (4 years)

PhD. Position: Effects of dust on plasmas and novel dust diagnostics

Subject Area: Plasma Phyiscs

Detailed Subject Area: Complex Plasma Physics

Description of Project:

Complex plasmas are multi-phase systems, containing free charge carriers (electrons, ions, charged macro-particles) and represent the plasma state of soft matter. This project aims to contribute to the latest developments in complex plasmas and its applications, such as control of dust in plasma processing, its role in environmental problems, plasma medicine, nano-fluidics and plasma biology. All these new interdisciplinary trends will benefit from a deeper understanding of the basic nano-scale physics and depend crucially on dust diagnostics. The main objective of this project is therefore to conduct investigations of the following topics by a focused experimental effort accompanied by theory and data analysis

(1). Perform experimental tests of the kinetic theories of plasma fluctuations

(2). Design novel dust diagnostics, of particular importance for invisible nanometer/submicron dust particles (using results of (1))

The latter has potential for both laboratory and space applications.

The thesis can be formulated with more weight on theory or experiment depending on the applicant skills and interest.

Project Website:

Name of responsible professor/researcher: Svetlana Ratynskaia

Name of Supervisor (if other): Svetlana Ratynskaia

E-mail address of contact person: srat@kth.se

KTH School: EES

KTH Department: Space and Plasma Physics

Type of available position: CSC - Full PhD position (4 years)

PhD. Position: Dusty plasma as a model for complex systems

Subject Area: Plasma physics

Detailed Subject Area: Complex plasma physics

Description of Project:

Complex ionized media are multi-phase systems, containing free charge carriers (electrons, ions, charged macro-particles). A remarkable form of complex ionized medium is a plasma seeded with solid particulates of nano to micrometer size. The particles become charged and through their screened electrostatic interaction they constitute a medium with particular material properties. The dust component on one hand mimics the physics of solids and fluids. On the other hand it allows observations at the kinetic level thanks to the large temporal and spatial scales involved.

Hence, the aim of this project is to use the physical properties and characteristics of complex plasmas for a new look at fundamental problems in the theory of complex systems and fluids, with focus on

• Non-Gaussian statistics and anomalous transport in “soft” phases

• Viscoelastic flows and turbulence in partially ordered states

• Relationship between self-organized criticality and turbulence

The main objectives of this project are to be achieved by a focused theoretical effort accompanied by molecular dynamics simulations, data analysis and experiments. The experimental part of the program is based on the data of 2D and 3D dust structures formed in RF and DC plasma discharges.

The project is in collaboration with Max-Plank Institute Extraterrestrial Physics, Garching, Germany and University of Tromso, Norway.

Project Website:

Name of responsible professor/researcher: Svetlana Ratynskaia

Name of Supervisor (if other): srat@kth.se

E-mail address of contact person: srat@kth.se

KTH School: EES

KTH Department: Space and Plasma Physics

Type of available position: CSC - Full PhD position (4 years)

PhD. Position: Biogas from organic waste

Subject Area: Renewable energy

Detailed Subject Area: An important aspect of urban sustainability is the handling of food waste and other organic waste. Here, biogas production offers an interesting solution by combining waste treatment, energy production and production of fertilizer. The project aim is to assess the environmental and economic consequences of three different future alternatives to handling and treatment of urban organic waste in a regional context, using the Stockholm county as a case.

Description of Project:

An important aspect of urban sustainability is the handling of food waste and other organic waste. Here, biogas production offers an interesting solution by combining waste treatment, energy production and production of fertilizer. The project aim is to assess the environmental and economic consequences of three different future alternatives to handling and treatment of urban organic waste in a regional context, using the Stockholm county as a case. In the project, the environment and economy oriented computer based tool ORWARE will be used, updated with a new module for water footprint analysis. Based on the results from the quantitative analysis, an economy oriented stakeholder evaluation of the results and their potential business and social implications will be performed. The project is an interdisciplinary research effort in cooperation between the Divisions of Industrial Ecology and Industrial Dynamics at KTH, the Holmen energy company and the Upplands Vasby municipality. The expected results

of the project are an improved understanding of the economic, environmental and social consequences of treating the organic waste in either (i) a rather large number of intermediate size municipal biogas plants or (ii) a very limited number of large industrial biogas plants. The results will be of significance for both the generic discussion of organic waste treatment in a large city as well as for the specific situation in the Stockholm region.

Project Website:

Name of responsible professor/researcher: Ronald Wennersten

Name of Supervisor (if other): Ronald Wennersten

E-mail address of contact person: rw@kth.se

KTH School: ITM

KTH Department: Industrial Ecology

Type of available position: CSC - Full PhD position (4 years)

PhD. Position: Propagating and standing ULF waves in Earth's magnetosphere

Subject Area: Space Physics

Detailed Subject Area: The topic of the project is space physics, focusing on propagating and standing plasma waves in the Earth's magnetosphere, the region above the atmosphere where the Earth's magnetic field plays a significant role.

Description of Project:

The specific aim is to study the characteristics and driving mechanisms of magnetospheric ULF waves (with typical frequencies in the mHz range), often referred to as geomagnetic pulsations, broken down into the following subtopics:

- Under what external and internal conditions do magnetospheric ULF pulsations occur?
- What are the driving mechanisms of the pulsations and where are the generation regions located?
- How do the pulsations relate to injection events in the magnetosphere?
- What are their azimuthal propagation characteristics?

The topics above will be addressed by combining data from the ESA CLUSTER and NASA THEMIS spacecraft flotillas. While CLUSTER makes detailed observations from a polar orbit of the wave electric and magnetic fields using four vantage points close enough to each other to permit a determination of the local nature of the pulsations, THEMIS, with a number of spacecraft at various locations in the equatorial region, provides a unique perspective which allows identification of the source regions and drivers of the oscillations. Also, the azimuthal propagation characteristics of the pulsations will be investigated.

Project Website:

Name of responsible professor/researcher: Lars Blomberg

Name of Supervisor (if other): Lars Blomberg

E-mail address of contact person: lars.blomberg@ee.kth.se

KTH School: EES

KTH Department: Space and Plasma Physics

Type of available position: CSC - Full PhD position (4 years)

PhD. Position: Temporal properties of magnetosphere-ionosphere interaction in the auroral zone.

Subject Area: Space Physics

Detailed Subject Area: Within the subject of space plasma physics, the interaction between the ionosphere (the upper, electrically conducting part of the atmosphere), and the magnetosphere (the region in space dominated by the magnetic field of Earth) is a fascinating, complex, and challenging area. Apart from its own intrinsic interest, it serves as a relatively easily accessible laboratory for studying general astrophysical processes.

The most spectacular phenomenon associated with the magnetosphere-ionosphere interaction is the aurora, or northern lights. The processes leading to the energization of the magnetosphere-ionosphere plasma responsible for the aurora, are still not well understood, and in particular there is debate about the relative importance of nearly static processes, and processes associated with wave phenomena.

Description of Project:

The temporal properties of electric and magnetic field structures in the auroral (northern light) zones are relatively unknown. Knowledge of the typical time scales for the physical processes in the auroral zone allows to discriminate between and evaluate the various theories proposed for auroral processes, such as acceleration by quasi-static processes versus mechanisms associated with various types of plasma waves.

In this project, the time scales of plasma physical processes will be investigated by using multi-point magnetic and electric field measurements made by the four Cluster satellites. By calculating cross-correlation between data series from the different satellites, the lag of which depends on the spacecraft separation, we can study the lifetimes of auroral electromagnetic structures. By also studying the coherence function, temporal properties of the electromagnetic fields as a function of spatial scales and/or frequencies can be determined, which will provide a very powerful test of existing theories describing auroral processes, and provide insight in processes believed to be important for many other astrophysical phenomena.

Project Website:
http://www.kth.se/ees/omskolan/organisation/avdelningar/spp/research/physics-of-the-earth-s-magnetosphere-1.65929?l=en_UK

Name of responsible professor/researcher: Tomas Karlsson

Name of Supervisor (if other): Tomas Karlsson

E-mail address of contact person: tomas.karlsson@ee.kth.se

KTH School: EES

KTH Department: Space and Plasma Physics

Type of available position: CSC - Full PhD position (4 years)

PhD. Position: The coupling between solar wind, the earth magnetosphere and the aurora during substorm recovery

Subject Area: Space Physics

Detailed Subject Area: It is known since a long time that the sun is electromagnetically connected to the Earth via the solar wind (a thin, highly ionized gas that spreads continuously from the sun), the interplanetary magnetic field (which is transported from the sun to space) and the Earths own magnetic field. The comet-like cavity around the Earth that is dominated by the geomagnetic field, is called magnetosphere. The occurrence of aurora is coupled to the magnetosphere via large current systems. The aurora forms a large oval around each pole. One of the most interesting auroral phenomenon are auroral substorms. These are periodically occurring intensifications along the nightside of the auroral oval which spread along the oval during several hours, until the auroral oval recovers to its ground state. Especially the recovery of substorms is so far not very well understood and will be subject of the proposed PhD studies.

Description of Project:

One of the most important manifestations of energy coupling between the solar wind and the Earth magnetosphere are auroral substorms. Large efforts have been made to understand substorm onset while much less attention has been directed to its recovery. Often regarded as a simple return to the ground state, observations show that this is not generally true. Substorm recovery can be highly dynamic, with auroral intensifications, large distortions of the poleward oval boundary, and an erosion of the inner oval before its poleward part fades. This suggests remote parts of the magnetosphere are activated. Preliminary results show that dynamic

recoveries occur typically during high velocity solar wind and/or northward directed interplanetary magnetic field.

The goal of this project is to gain a better understanding of the recovery phase. The focus is on the cause of the observed recovery signatures. The connection between recovery signatures and the solar wind, plasma convection and global reconfiguration of the magnetosphere will be investigated. The project consists of three parts: 1) Investigate solar wind influence on substorm recovery through a statistical study using high-altitude Cluster and low-altitude DMSP satellite measurements above the auroral region 2) Determine the temporal evolution of the auroral recovery with help of multi-satellite Cluster measurements 3) Simulate substorm recovery for different solar wind conditions by utilizing an existing MHD magnetosphere model and compare to observations.

Project Website:

Name of responsible professor/researcher: Anita Kullen

Name of Supervisor (if other): Anita Kullen

E-mail address of contact person: kullen@kth.se

KTH School: EES

KTH Department: Space and Plasma Physics

Type of available position: CSC - Full PhD position (4 years)

PhD. Position: Sustainable and Resilient Green Cities

Subject Area: Sustainable Cities

Detailed Subject Area: Green and Resilient European cities Transition Action

European cities have to deal with various global challenges. Therefore, transitions, i.e. structural changes in institutional and physical systems are required. A sustainable and resilient future for a city involves the continuous ability to innovate and maintain the capacity for adaptive governance processes.

Description of Project:

Green and Resilient European cities Transition Action

European cities have to deal with various global challenges. Therefore, transitions, i.e. structural changes in institutional and physical systems are required. A sustainable and resilient future for a city involves the continuous ability to innovate and maintain the capacity for adaptive governance processes.

The project aims at:

• Studying the future prospects of various change options, their side- and long term effects, and the foreseeable institutional conditions to be fulfilled. This will be carried out for: short circuit economy, social cohesion and equity, spatial planning, heating/cooling, transportation, urban retrofitting of "automobile based development", energy production, water, urban environment and housing stock.

• Analyzing city innovative capability, triggers for citizen perception of environmental measures and local conditions for green and resilient urban development.

• Developing local scenarios for green and resilient cities. Artists, communication experts and SMEs will play an important role in local experiments in 15 urban areas in Europe.

The project will result in provision of feasible strategies for positive transition, spatial scenarios and guidance tools that would facilitate innovation and enable adaptive governance, collaborative decision-making, and behavioral change towards resilient and sustainable European cities.

Project Website: www.srgc.eu

Name of responsible professor/researcher: Ronald Wennersten

Name of Supervisor (if other): Ronald Wennersten

E-mail address of contact person: rw@kth.se

KTH School: ITM

KTH Department: Industrial Ecology

Type of available position: CSC - Full PhD position (4 years)

PhD. Position: radio-over-fiber (RoF) technologies for dstributed MIMO systems

Subject Area: telecommunication

Detailed Subject Area: Radio-over-fiber (RoF), photonics, multiple-input multiple-output (MIMO) antennas, telecommunication

Description of Project:

In this project, we want to achieve a smart and efficient distributed MIMO solution by jointly optimizing the system using new and innovative technologies in radio-over-fiber (RoF) and multiple-input multiple-output (MIMO) antennas. RoF is favored as an enabling technology for distributed MIMO systems due to inherent advantages of photonics, including high bandwidth, low loss, cost-effectiveness and immunity to electromagnetic interference. In a RoF system, the signal processing equipments are placed at the central unit, making the RMAs both simple and cheap. Moreover, the RoF technology has the potential to give better performance than alternative solutions, e.g, digital or conventional wireless link, due to its characteristics of service transparency, reliability, relatively low cost, and simple design. We will also make novel opto-electronic chips that are integrated with smart antenna array to achieve compact remote antenna nodes.

Project Website:

Name of responsible professor/researcher: Prof. Sailing He

Name of Supervisor (if other): Martin Norgren and Sailing He

E-mail address of contact person: sailing.he@ee.kth.se

KTH School: EES

KTH Department: Electromagnetic Engineering

Type of available position: CSC - Full PhD position (4 years)

PhD. Position: Computational studies of photochemical process in biological systems

Subject Area: Theoretical Chemistry and PhotoChemistry

Detailed Subject Area: This project can be classified as the multidisciplinary research on photochemistry of biomolecules in which modern methods of quantum chemistry is applied to study various light activated reactions and processes in DNA and other biomolecules.

Description of Project:

This project aims to explore various photochemical reactions encountered

in protein reaction centers, where primary focus will be put on tran-cis isomerisation

processes in retinal and other similar compounds in protein environments as well as

photo-damage and repair mechanisms in RNA and DNA. More specifically, within

this project we aim to identify the structural factors controlling tran-cis isomerisation

in proteins and develop strategies for residue mutagenesis for fine control

of this processes. The second part of this project will focus on investigations of physical and chemical mechanisms responsible for photo-stability of DNA and RNA. Both parts of this project will be carried out using a recently developed, state of the art, hybrid spin-flip TD-DFT/MM approach, which allows to model complicated excited states of chromophores and their potential energy surfaces in realistic protein environments.

Project Website: www.theochem.kth.se

Name of responsible professor/researcher: Zilvinas Rinkevicius and Hans Ågren

Name of Supervisor (if other): Zilvinas Rinkevicius

E-mail address of contact person: agren@theochem.kth.se

KTH School: BIO

KTH Department: Department of Theoretical Chemistry

Type of available position: CSC - Joint PhD/PhD guest student (1-2 years)

PhD. Position: Computational studies of photochemical process in biological systems

Subject Area: Theoretical Chemistry and PhotoChemistry

Detailed Subject Area: This project can be classified as the multidisciplinary research on photochemistry of biomolecules in which modern methods of quantum chemistry is applied to study various light activated reactions and processes in DNA and other biomolecules.

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Project Website: www.theochem.kth.se

Name of responsible professor/researcher: Zilvinas Rinkevicius and Hans Ågren

Name of Supervisor (if other): Zilvinas Rinkevicius

E-mail address of contact person: agren@theochem.kth.se

KTH School: BIO

KTH Department: Department of Theoretical Chemistry

Type of available position: CSC - Full PhD position (4 years)

PhD. Position: Theoretical study of ion conductivity in oxides

Subject Area: Theoretical material science

Detailed Subject Area: Fist principle quantum mechanical methods, in particular, those based on density functional theory to study materials properties

Description of Project:

Ion conducting materials are in the heart of many modern technologies, such as fuel cells, lithium batteries, gas separation membranes, sensors, catalysts and resistive switching memory. Commercial success of current applications and future fascinating perspectives create a growing demand for better, more advanced materials. Strive for better materials can be significantly facilitated by the understanding of microscopic processes behind the desired properties. The modern computational physics has reached a level when it has become a useful tool in material research not only able to enclose the most fundamental mechanisms determining observable materials properties but also predict them. This project is a focused theoretical study aiming at better understanding of fundamental physical mechanisms operating in complex oxides. In this project we plan to study a group of pure and doped oxides, such as, ceria, La2Mo2O9,BaCeO3 and so on, which are extremely technologically important and theoretically challenging. The project will include some method development, therefore, the candidate needs to have a strong back ground in both physics and computations methods.

Project Website:

Name of responsible professor/researcher: Natalia Skorodumova

Name of Supervisor (if other): Natalia Skorodumova

E-mail address of contact person: snv@fysik.uu.se

KTH School: ITM

KTH Department: Materiasl Science and Engineering

Type of available position: CSC - Full PhD position (4 years)

PhD. Position: Theoretical study of nanocatalysic systems

Subject Area: Theoretical material science

Detailed Subject Area: Fist principle quantum mechanical methods, in particular, those based on density functional theory to study materials properties

Description of Project:

Rapid shrinking of modern devices and introduction of nanotechnologies to virtually every area of human life creates a great demand for better designed and controlled nanodevices. To meet this demand one needs to achieve a deeper understanding of the fundamental characteristics of nanostructures, which can be provided by quantum mechanical computational methods, and master the experimental methods to prepare such systems. This project offers an opportunity to focus on the fundamental properties of metal nanowires, clusters, layered structures, surfaces and nanocrystals and their technologically important characteristics, such as, mechanical stability, electronic conductivity, chemical and catalytic activity, magnetic and thermal properties. The study will be performed using most advanced theoretical and computational techniques developed by us and other groups. The study will be performed using most advanced theoretical and computational techniques developed by us and other groups. The density functional theory-based methods will be used to study the catalytical reactions on metal clusters supported by complex substrates.

Project Website:

Name of responsible professor/researcher: Natalia Skorodumova

Name of Supervisor (if other): Natalia Skorodumova

E-mail address of contact person: snv@fysik.uu.se

KTH School: ITM

KTH Department: Materiasl Science and Engineering

Type of available position: CSC - Full PhD position (4 years)

PhD. Position: Grain boundaries and interfaces in complex oxides: ab initio study

Subject Area: Theoretical material science

Detailed Subject Area: Fist principle quantum mechanical methods, in particular, those based on density functional theory to study materials properties

Description of Project:

Most practical materials are not monocrystalline but polycrystalline. Decreasing the grain size down to nanometer scale we can increase the density of interfaces. Nanocrystalline materials have a spread 3D net of boundaries whose properties are is different from those in the grain body or bulk, but actual modification of properties depends on the structures of the interface. In real samples the type of boundaries can vary depending on the preparation method sharp interfaces to wide amorphous boundaries. We will concentrate on the electronic properties of the interfaces and ion mobility along and acroos them. One of the challenges we want to face in this project is to optimize a strategy for controllable amorphisation of boundaries applying different doping approaches, mechanical treatment and external field regimes. The defective structure of boundaries can be a source of unwanted electronic leakage in oxides, which will be also studied. The methods to be used will be first principle anf model potential molecular dynamics, Monte Carlo method.

Project Website:

Name of responsible professor/researcher: Natalia Skorodumova

Name of Supervisor (if other): Natalia Skorodumova

E-mail address of contact person: snv@fysik.uu.se

KTH School: ITM

KTH Department: Materiasl Science and Engineering

Type of available position: CSC - Full PhD position (4 years)

PhD. Position: Mechanisms for surge and stall in turbo-charger compressors

Subject Area: Turbo-machinery-Fluid dynamics

Detailed Subject Area: Flow in radial compressors of turbo-chargers. Surge and rotating stall in compressors. Large Eddy Simulations of compressors

Description of Project:

Turbo-chargers are essential in order to be able to achieve improved efficiency of internal combustion engines while reducing the size and emissions of the engine. Turbo-chargers utilize the energy of the exhaust gases so as to supply compressed air into the engine cylinder and thereby smaller engine can be constructed with the same power output. A major issue related to the compressor of the turbocharger is the fact that at low mass flows (low engine lad) the compressor may enter into a loss of efficiency or even into a situation where the compressor acts as a pump in the wrong direction (surge). The underlying fluid mechanical mechanisms of these phenomena are not understood. The goals of this project include a detailed computation of the flow in the compressor of turbo-chargers. Supporting experiments are being carried out in collaboration with other institutions.

Project Website:

Name of responsible professor/researcher: Professor Laszlo Fuchs

Name of Supervisor (if other): Prof. Laszlo Fuchs

E-mail address of contact person: lf@mech.kth.se

KTH School: SCI

KTH Department: Mechanics

Type of available position: CSC - Full PhD position (4 years)

POST DOC. POSITIONS

Post Doc. Position: Optical imaging of intracellular distributions of biomolecules

Subject Area: Biophotonics

Detailed Subject Area: Biomedical and cellular photonics

Description of Project:

A postdoctoral position is open for research in cell biology using non-linear imaging techniques such as Coherent anti-Stokes Raman Scattering (CARS), Second Harmonic Generation (SHG), Sum Frequency Generation (SFG) and multiphoton excited fluorescence microscopies. The candidate should have a strong background in cell pathology and/or biomedical engineering and molecular imaging as well as understanding of the non-linear optical imaging. The proposed research will involve study of the molecular profiles of cells and the intracellular distribution of the biomolecules to diagnose the development and progression of the diseases at the molecular and cellular level. The cellular response to the therapy will be also investigated.

Project Website: www.theochem.kth.se

Name of responsible professor/researcher: Prof. Hans Ågren

Name of Supervisor (if other): Prof. Hans Ågren

E-mail address of contact person: agren@theochem.kth.se

KTH School: BIO

KTH Department: Theoretical Chemistry

Type of available position: CSC - Post Doc. (6-12 months)

Post Doc. Position: Mechanisms and Models for bentonite erosion

Subject Area: clay colloid chemistry

Detailed Subject Area: Study of the rheological, hydraulic and erosional properties of bentonite, and modelling of the tranport process of bentonite into seeping water.

Description of Project:

Bentonite clay is envisaged in several countries as backfill material for nuclear waste repositories due to its favorable physical and chemical properties. In Sweden, natural Na-bentonite of Wyoming type (MX-80) and natural Ca-bentonite (Deponit CA-N) from Milos have been considered as candidates. The bentonite is compacted when placed around the waste canisters, and it can form a stable sol in low ionic strength waters. If that sol is formed in fractures with seeping water, the clay particles could be carried away and buffer may be lost. Thus, for the sake of performance assessments, a model is needed to evaluate the behaviour of the clay gel/sol system and to assess the rate at which the bentonite buffer surrounding the waste canister would be eroded by the seeping groundwater. The propose of this project is, therefore, trying to better understand the rheological, hydraulic and erosional properties of these two types of bentonite, and to develop a simple model to predict the swelling and erosion of the compacted bentonite as it swells and turns to a sol in low ionic strength waters, but avoiding the complexity in applying rigorous statistical mechanics to transport processes in colloidal dispersions or in bentonite gel/sol systems.

Project Website:

Name of responsible professor/researcher: Longcheng Liu

Name of Supervisor (if other): Ivars Neretnieks, Longcheng Liu

E-mail address of contact person: lliu@ket.kth.se

KTH School: CHE

KTH Department: Kemisk Apparatteknik

Type of available position: CSC - Post Doc. (6-12 months)

Post Doc. Position: Interference Management for Future Wireless Networks

Subject Area: Communication Theory

Detailed Subject Area: Wireless Communications, Wireless Networks, Interference Management Network Coding, Relaying, Interference Alignment

Description of Project:

We will investigate efficient interference management strategies for wireless networks. With increasing user-amount and data-rate, future wireless networks are essentially characterized as interference-limited. However, the efficient approaches for combating interference are still largely open. This project aims at developing theoretical limits and practical design principles for interference limited wireless networks. More specifically, interference within multi-cell or multi-terminals shall be considered. Efficient coding approaches, e.g., network coding, lattice codes shall be used to mitigate or even exploit interference in both signal domain and finite field. To efficiently limit interference and maintain transmission rates, cooperative relaying approaches shall also be considered. As a promising technique, interference alignment shall also be studied for various network settings.

Project Website:

Name of responsible professor/researcher: Mikael Skoglund/Ming Xiao

Name of Supervisor (if other): Mikael Skoglund/Ming Xiao

E-mail address of contact person: Ming.Xiao@ee.kth.se

KTH School: EES

KTH Department: Communication Theory

Type of available position: CSC - Post Doc. (6-12 months)

Post Doc. Position: Computer simulations of structure of materials.

Subject Area: Computer simulations of structure of materials.

Detailed Subject Area: In this project, large computer simulations will be used to study in detail how the microscopic structure in a material is altered during manufacture and processing. One important part of the project is to formulate and implement different physical phenomena in so called phase-field models. This type of modeling makes it possible to study different phenomena at a level of detail that is much greater than previously. One particular topic in the present project is the interaction of material flow, deformation and phase change. The project will be carried out in collaboration with industrial partners.

Description of Project:

In this project, large computer simulations will be used to study in detail how the microscopic structure in a material is altered during manufacture and processing. One important part of the project is to formulate and implement different physical phenomena in so called phase-field models. This type of modeling makes it possible to study different phenomena at a level of detail that is much greater than previously. One particular topic in the present project is the interaction of material flow, deformation and phase change. The project will be carried out in collaboration with industrial partners.

For this project, one or more graduate students are needed. A suitable background is Master or corresponding degree (equivalent to Swedish civilingenjör), with knowledge in physics or materials science, and an interest in mathematical modeling and advanced computer simulations.

For work in the same area a post doctoral position is also available. The successful applicant should hold a doctoral degree in a suitable field and have experience in advanced computer simulations.

Project Website:

Name of responsible professor/researcher: Gustav Amberg

Name of Supervisor (if other): Gustav Amberg

E-mail address of contact person: gustava@mech.kth.se

KTH School: SCI

KTH Department: mechanics

Type of available position: CSC - Post Doc. (6-12 months)

Post Doc. Position: Projects can be offered in all the above areas

Subject Area: Heat transfer, refrigeration

Detailed Subject Area: Compact heat exchangers

Minichannel heat transfer

Boiling heat transfer

Nanofluid properties and heat transfer

Enhanced heat transfer

Refrigeration systems

Heat pump systems

Organic Rankine cycles

Description of Project:

We have several ongoing projects in the areas of fundamental heat transfer (in boiling, enhanced heat transfer, nanofluids, minichannels), as well as in more applied research concerning heat pumps and refrigeration equipment. We can accept both ph.d. students and post docs in these areas of research.

Project Website:
http://www.kth.se/itm/inst/energiteknik/organisation/forskningsavdelningar/ett/projekt?l=en_UK

Name of responsible professor/researcher: Björn Palm

Name of Supervisor (if other): Björn Palm

E-mail address of contact person: bpalm@energy.kth.se

KTH School: ITM

KTH Department: Energy Technology

Type of available position: CSC - Post Doc. (6-12 months)

Post Doc. Position: Conflict between developed and developing countries in the production of biofuels

Subject Area: Industrial/Ecology Biofules

Detailed Subject Area: Biofuels have big potential to replace fossil fuels in the transport sector. However ther is a growing conflict between the use of land to produce biofuels and and to produce food. Many develope countries are now starting to produce biofules in developing countries and also planting trees for compensating carbon dioxid emissions. This makes land more scarce for the farmers in the dveloping countries. In this project we will study the conflict between differnt interests and also the frames of the different stakeholders. This is a way of revealing the conflict and also proposing different strategies for conflict resolution.

Description of Project:

Biofuels have big potential to replace fossil fuels in the transport sector. However ther is a growing conflict between the use of land to produce biofuels and and to produce food. Many develope countries are now starting to produce biofules in developing countries and also planting trees for compensating carbon dioxid emissions. This makes land more scarce for the farmers in the dveloping countries. In this project we will study the conflict between differnt interests and also the frames of the different stakeholders. This is a way of revealing the conflict and also proposing different strategies for conflict resolution.

In this project we want a post doc position or a PhD student who will get PhD within a short time after project start.

Project Website: www.ima.kth.se

Name of responsible professor/researcher: Prof. Ronald Wennersten

Name of Supervisor (if other): Prof. Ronald Wennersten

E-mail address of contact person: rw@kth.se

KTH School: ITM

KTH Department: Industrial Ecology

Type of available position: CSC - Post Doc. (6-12 months)

Post Doc. Position: Nanophotonic devices for optical communication and sensing

Subject Area: Nanophotonics

Detailed Subject Area: Integrated photonic devices are key components in multichannel optical communication networks and computer interconnects, as well as have a wide range of applications in sensor technology. In order to increase integration density of optical components on a single chip it is essential to get light confinement close to diffraction limit of light or even go below it. The sub-micron or nano-scale waveguiding can be based on silicon nanowires where strong light confinement is obtained due to ultra-high refractive index contrast between the core and the cladding, photonic crystals where light confinement is due to the periodicity of the structure and surface plasmon waveguides that can provide sub-wavelength confinement due to field localization on the metal-dielectric interfaces.

Description of Project:

The proposed work is devoted to the development of novel integrated photonic devices and will include some of the following activities:

-Design, fabrication and characterization of advanced photonic crystal- and novel nanowire-based devices for densely integrated photonic circuits, such as couplers, mode converters, polarization splitters and rotators, add-drop multiplexers, triplexers as well as photonic crystal (PhC) cavities for sensing and dispersion engineered PhC structures, such as negative refraction in application to polarization control and other devices.

-Development of fabrication techniques for indium phosphide (InP) on silicon- and InP on SOI (silicon-on-insulator)-wafers as well as InP-Si integrated components by means of novel method based on nanotechnology.

-Development of technologies for surface plasmon waveguides based on different metal-dielectric configurations in combination with other nanostructures such as quantum dots for loss compensation or other metamaterial structures.

-Experimental realization of plasmonic-, negative index- or other artificially structured meta-materials.

-Fabrication of nanophotonic components based on these new materials that allows for development of new ultra-compact integrated structures.

Project Website:

Name of responsible professor/researcher: Lech Wosinski

Name of Supervisor (if other): Lech Wosinski

E-mail address of contact person: lech@kth.se

KTH School: ICT

KTH Department: FMI

Type of available position: CSC - Post Doc. (6-12 months)

Post Doc. Position: Quantum-dot based nanostructures for multi-function nanophotonics applications

Subject Area: nanophotonics

Detailed Subject Area: nanostructure, quantum confinement, light-matter interaction, photonics, exciton polariton

Description of Project:

Resonant states in quantum dots (QDs) provide a source for high and negative dielectric constants. Using this fact in combination with light confinement in QD nanostructures at the subwavelength scale, we can achieve a size reduction of electro-optical and photonic devices which offers a possibility to drastically increase the integration density and to add new functionalities in photonic integrated circuits. This project concentrates on self-assembling processes of QD-based nanostructures that can provide useful paradigms for developing multi-

functional nanostructured devices at the molecular level. By combining multiscale quantum-mechanical and electrodynamical simulations of QD growth, nanostructure fabrication and macroscopic properties with proof-of-principle experimental activities, we aim at cost-effective and robust QD growths and QD-based multifunction nanostructure design and application.

Project Website:

Name of responsible professor/researcher: Ying Fu

Name of Supervisor (if other): Ying Fu

E-mail address of contact person: fu@kth.se

KTH School: BIO

KTH Department: Theoretical Chemistry

Type of available position: CSC - Post Doc. (6-12 months)

Post Doc. Position: Nanotechnology for light energy converters in solar cell materials

Subject Area: Nanotechnology

Detailed Subject Area: Development and characterization of nanomaterials for applications in photonics and biophotonics

Description of Project:

A post-doctoral position is open for a highly motivated candidate with background in nanomaterial chemistry, specifically in synthesis, characterization, surface modification and conjugation of the monodisperse oxide and/or fluoride lanthanide-doped photoluminescent nanocrystals. The characterization skills should include x-ray power diffraction, transmission electron microscopy, x-ray photoelectron spectroscopy . An experience in absorption and steady-state/ time-resolved photoluminescence spectroscopies of the lanthanide-doped nanocrystals is required. The research will be focused on the design of the lanthanide-doped nanocrystals with highly efficient energy upconversion from near-infrared to visible range. The developed nanomaterials will be evaluated for applications in photonics (as light energy converters in solar cell materials) and bioimaging (as contrast agents for optical imaging).

Project Website: www.theochem.kth.se

Name of responsible professor/researcher: Porf. Hans Ågren

Name of Supervisor (if other): Prof. Hans Ågren

E-mail address of contact person: agren@theochem.kth.se

KTH School: BIO

KTH Department: Theoretical Chemistry

Type of available position: CSC - Post Doc. (6-12 months)

Post Doc. Position: McNoC: Multicore Network on Chip Platforms

Subject Area: Network on Chip

Detailed Subject Area: Research and development of on-chip interconnect and memory architectures for tera-scale performance and low power Systems-on-Chip (SoC). Packet switched and circuit switched networks are studied.

The research into on-chip memory architectures includes distributed shared memory, cache coherence, memory consistency and virtualization.

Application areas include telecommunication, robotics, consumer electronics and automotive.

Description of Project:

Research and development of on-chip interconnect and memory architectures for tera-scale performance and low power Systems-on-Chip (SoC). The network architecture contains a best effort packet switched network and a guaranteed bandwitdh, high performance circuit switched network. To objective is to develop a sclabale, flexible network that can be configured to serve either ultra-high performance or very low-power applications.

The research into on-chip memory architectures includes distributed shared memory, scalable and hierarchical cache coherence, suppuort for memory consistency models and virtualization.

Application areas include telecommunication, robotics, consumer electronics and automo

Project Website: http://www.ict.kth.se/nostrum/

Name of responsible professor/researcher: Prof. Axel Jantsch

Name of Supervisor (if other): Dr. Zhonghai Lu

E-mail address of contact person: axel@kth.se

KTH School: ICT

KTH Department: Electronic Systems

Type of available position: CSC - Post Doc. (6-12 months)

Post Doc. Position: Energy-efficient Optical Networks: a Cross-Layer Design

Subject Area: Optical Networking

Detailed Subject Area: Optical networking systems are emerging as the natural solution to cater for the increase in the traffic volume while providing lower energy consumption than the traditional electronic networks. They are able to offer attractive properties, such as high transmission capacity, optical transparency and scalability. Thanks to their ability to provision traffic without the need of optical-electrical-optical (O/E/O) conversion at intermediate nodes (i.e., optical transparency) they are also able to provide benefits in terms of reduced energy consumption. The concept of transparent (all-optical) networks is widely recognized by the research community as a solution for the Network of the Future. However, except from a few cases , the optical networks currently deployed terminate the optical signal at every node, i.e., the cost and energy benefits offered by optical networks are not yet fully exploited. There are several reasons why all-optical networks are not widely deployed yet. One is the reluctance of network operators to fully embrace the all-optical concept another is the degree of maturity of state-of-the-art optical network solutions, i.e., the lack of self-contained approaches where advanced provisioning strategies are translated into technologically feasible choices at the physical layer.

Description of Project:

Optical networks are inherently more energy-efficient than their electronic counterpart due to their ability to treat large data streams in a transparent way, i.e. without O/E/O conversion.

Despite this advantage, there is still a lot that can be done to reduce the energy footprint of optical networks.

The aim of the project is to investigate and provide energy-efficient solutions for the core network. We will propose and evaluate energy-aware routing algorithms, where weights are assigned to links considering energy consumption. As a part of this study, the effect of having renewable energy sources available at some network nodes will be explored. Moreover, we will target routing approaches to redistribute traffic during off-peak hours. This will allow selected areas of the network to be put to sleep and thus save energy. This will be accomplished while the QoS levels specified by SLA will still be guaranteed for each service. Furthermore, we will evaluate different options for node architectures in terms of power-efficiency. Finally, we will study the impact of energy-efficient strategies on the control plane signaling overhead. The objective here is to explore smart solutions to efficiently advertise the energy related data throughout the network.

Project Website: http://www.ict.kth.se/MAP/FMI/Negonet/

Name of responsible professor/researcher: Lena Wosinska

Name of Supervisor (if other): Lena Wosinska

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KTH School: ICT

KTH Department: FMI/ICT/KTH

Type of available position: CSC - Post Doc. (6-12 months)

Post Doc. Position: Adsorption from complex solutions

Subject Area: Phsyical Chemistry

Detailed Subject Area: The studies concern exploration of NMR methodology to investigate adsorption from complex mixtures containing surfactants and polymers.

Description of Project:

Academic studies of adsorption are often focused on simple model systems where e.g. adsorption from a simple surfactant solution is studied using a model surface (homogeneous, molecularly flat). In contrast, industrial systems normally contain several components and in

the industrial process adsorption occurs onto heterogeneous surfaces. There is thus a need to span the gap between academic research and industrial applications. The suggested project aims to span this gap. The approach is to use NMR methodology to investigate the adsorption of the individual components from a complex mixture (e.g. an aqueous solution containing 2 different surfactants and one polymer). NMR is chosen for its sensitivity to different molecular species, and we regard that our approach has a large advantage over e.g. the tedious radiolabeling methods that are used today.

We perceive that the post-doc project, which is aimed to last for 12 months, will be the starting point for a new research direction that combines the competences of the physical chemistry and surface chemistry divisions of the chemistry department. We also foresee that the project will generate results that are of great importance and interest for industry.

We have one interested candidate for this project Dr. Ying-Xiong Wang from the Shanghai Institute of Organic Chemistry, Chinese Academy of Sciences.

Project Website:

Name of responsible professor/researcher: Prof. Per Claesson and Prof. Istvan Furo

Name of Supervisor (if other): Prof. Per Claesson and Prof. Istvan Furo

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KTH School: CHE

KTH Department: Chemistry

Type of available position: CSC - Post Doc. (6-12 months)

Post Doc. Position: Atomistic modeling of (X,Zn)O-based energy materials.

Subject Area: Physics, Materials Science,

Detailed Subject Area: Atomistic modeling of solar energy materials.

DFT calculations using VASP code.

Description of Project:

Traditional as well as innovative photovoltaic, light-emitting, and solar thermal devices will play a vital role in tomorrow's clean and sustainable energy technologies. This project will continue the on-going research on novel alloys and doping profiles of ZnO nanostructures, to achieve more efficient solar cells and light-emitting diodes. ZnO is already today utilized in a broad range of semiconductor technologies, and especially the extreme exciton energy ~60 meV is used on optoelectronics. Achieving reliable p-type bulk ZnO is currently in focus.

Intrinsic defects in ZnO can create luminescence in the visible range, and various models have been proposed to explain the light. We will therefore continuing modelling defect and complexes in semiconductors, with the focus on ZnO-based nanostructures. By calculating the formation energy and the defect transition energy for various defect complexes, we can suggest the most efficient and stable defect structure for an optimum device. Moreover, since nanostructured ZnO solids can also be used to enhance and/or modify the luminescence. In this project we will apply the present computational methods, as well as the new proposed transport models to investigate the optical and carrier-transport properties of nanostructured ZnO. With the modified nanostructured solids one can design the ZnO-based structures.

First-principles local-density approximation (LDA) within the density-functional theory (DFT) has been extremely successful the last three decades to theoretically describe numerous ground-state properties of condensed matter, and DFT was awarded with the Nobel Price in 1998. The research group Applied Material Physics at KTH has high internationally recognition in this field.

Project Website: www.mse.kth.se/~cpersson/

Name of responsible professor/researcher: Clas Persson

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KTH School: ITM

KTH Department: Materials Science and Engineering

Type of available position: CSC - Post Doc. (6-12 months)

Post Doc. Position: Code development of VASP for atomistic modeling of materials.

Subject Area: Physics, Materials Science,

Detailed Subject Area: Code development for atomistic modeling of materials.

Programming the Fortran90 codes VASP and Wien2k.

Calculate material properties for solar energy applications.

Description of Project:

The project involves code development and implementation of VASP and Wien2k. These Fortran90 codes are large program packages on national high-performance supercomputers with MPI, used in atomistic modeling of semiconductor materials.

The candidates should be in the field of physics, with special interest in programming and code developments. Various theoretical models will be implemented in the program packages, tested, and verified by calculating material properties of semiconductors. Our research activities are focused on materials for solar energy technology, and the candidate will be part in our search for novel materials and material structures. For more information, please visit www.mse.kth.se/~cpersson/ and contact the team leader.

Project Website: www.mse.kth.se/~cpersson/

Name of responsible professor/researcher: Clas Persson

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KTH School: ITM

KTH Department: Materials Science and Engineering

Type of available position: CSC - Post Doc. (6-12 months)

Post Doc. Position: Green and Resilient European cities Transition Action

Subject Area: Sustainable and Resilient Green Cities

Detailed Subject Area: European cities have to deal with various global challenges. Therefore, transitions, i.e. structural changes in institutional and physical systems are required. A sustainable and resilient future for a city involves the continuous ability to innovate and maintain the capacity for adaptive governance processes.

Industrial ecology is a multidiciplinary research field with focus on visions for sustainable urbanism.

Description of Project:

European cities have to deal with various global challenges. Therefore, transitions, i.e. structural changes in institutional and physical systems are required. A sustainable and resilient future for a city involves the continuous ability to innovate and maintain the capacity for adaptive governance processes.

The project aims at:

• Studying the future prospects of various change options, their side- and long term effects, and the foreseeable institutional conditions to be fulfilled. This will be carried out for: short circuit economy, social cohesion and equity, spatial planning, heating/cooling, transportation, urban retrofitting of “automobile based development”, energy production, water, urban environment and housing stock.

• Analyzing city innovative capability, triggers for citizen perception of environmental measures and local conditions for green and resilient urban development.

• Developing local scenarios for green and resilient cities. Artists, communication experts and SMEs will play an important role in local experiments in 15 urban areas in Europe.

The project will result in provision of feasible strategies for positive transition, spatial scenarios and guidance tools that would facilitate innovation and enable adaptive governance, collaborative decision-making, and behavioral change towards resilient and sustainable European cities.

Project Website: www.ima.kth.se

Name of responsible professor/researcher: Ronald Wennersten

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KTH School: ITM

KTH Department: Industrial Ecology

Type of available position: CSC - Post Doc. (6-12 months)