



## Invitation for Expressions of Interest: Nanomission to Germany & Switzerland 2010 on: 'Nanomaterials Processing for Renewable Energy'

**Date:** 2<sup>nd</sup>-5<sup>th</sup> March 2010

**Itinerary:** Germany & Switzerland including Karlsruhe Institute of Technology; Paul Scherrer Institute Switzerland, plus other venues to be announced.

### Introduction

Following a highly successful mission in March 2008, the NanoKTN is collaborating with the Science & Innovation Network (SIN) of BIS to organise a follow-on mission in 2010 to Germany and Switzerland. Information on KIT and PSI is overleaf.

### Focus

This Mission will focus on developments in production processes for manufacturing nanomaterials and nanocoatings for renewable energy applications.

### Objectives

The objectives are to provide a framework for networking and partnership building in the important area of nano-enabled clean energy. Outcomes expected include collaboration in EU funded research, commercial partnerships, and academic exchanges.

### Technology and Application Scope

*Manufacturing processes* to be presented and discussed include plasma and chemical deposition (PVD, CVD), sol-gel materials processing, nanomaterials manufacture, coatings technologies, nanopolymers, nanoparticles and nanostructured materials, and device manufacture.

*Clean energy applications* to be considered include; organic photovoltaics; batteries & supercapacitors; hydrogen storage; fuel cells; bio-derived energy; thermoelectric materials; insulation materials.

### Format

The mission will comprise seminars, discussions, and opportunities for networking.

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## Itinerary

The outline itinerary is given below:

- 2<sup>nd</sup> March: Travel UK to Germany (Optional meeting Fraunhofer ISE Freiburg -TBC)
- 3<sup>rd</sup> March: Workshop Karlsruhe Institute of Technology (KIT)
- 4<sup>th</sup> March: Workshop Paul Scherrer Institute (PSI)
- 5<sup>th</sup> March: Optional meeting EMPA – TBC

## Apply Now

Applications from NanoKTN members\* are now invited. Applications from appropriate organisations will be allocated on a first-come basis. Up to 15 delegates to be selected and full travel and hotel costs will be covered. Successful delegates will be informed early January 2010.

To apply, complete the application form ([www.nanoktn.com](http://www.nanoktn.com) under Events), or contact Dr Martin Kemp: [martin.kemp@nanoktn.com](mailto:martin.kemp@nanoktn.com) or Natasha Taylor: [Natasha.taylor@nanoktn.com](mailto:Natasha.taylor@nanoktn.com)

*\*Membership to the NanoKTN is free. To join visit [www.nanoktn.com](http://www.nanoktn.com)*

## Notes on Host Organisations

**Karlsruhe Institute of Technology (KIT) – [www.fzk.de](http://www.fzk.de)**

KIT resulted from a merger in October 2009 of Karlsruhe Technical University and the Karlsruhe Research Centre under the umbrella of the Helmholtz Association). The Nano Micro Center at Karlsruhe is the largest working in the field of nanotechnology and microsystems engineering in Germany.

With regard to the mission focus, KIT covers:

- Nanomaterials, nanocomposites for lithium ion batteries (materials for electrodes)
- Thin film technology (sputter technology)
- Novel electrolytes for lithium ion batteries (e.g. ionic liquids)
- Characterisation of battery materials and battery cells, including particularly in situ (z.B. XRD, NMR, SEM)
- Hydrogen storage with nanocomposites (synthesis, characterisation, fast charging and discharging, high storage capacity), safety technology
- Fuel cell characterisation (but no fuel cell production processes)
- Nanofabrication: e.g. KNMF: Karlsruhe Nano Micro Facility (<http://knmf.fzk.de/>); EU Projekt EUMINAFab (<http://www.euminafab.eu/>)

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## The Paul Scherrer Institute, Villigen, Switzerland – [www.psi.ch](http://www.psi.ch)

Since its founding it has developed into a successful, internationally renowned research institute for the natural and engineering sciences. The Solar Technology Laboratory uses facilities including a *solar furnace* and *solar simulator*. The Electrochemistry Laboratory (electrochemical energy storage and conversion - especially in conjunction with *sustainable mobility*). The aim of research is the development of novel *batteries, capacitors and fuel cells* for *electric vehicles and portable devices*.

**Batteries:** Led by Prof. Dr. Ing. Petr Novák, the focus at PSI is on lithium-ion batteries includes both on fundamental and application oriented aspects of this battery technology. We are active in the development and optimization of new materials for both the positive and the negative electrode. Electrochemical and in-situ X-ray diffraction measurements are used to obtain fundamental thermodynamic, kinetic, and structural data. These experiments, in combination with model calculations, contribute to the improvement of the battery materials. In parallel, complete composite electrodes are prepared and characterized electrochemically and with routine methods such as porosimetry and scanning electron microscopy. This combination of preparative and characterization work has led to improvements in their cycle life and specific charge and to increases in the achievable maximum current density. In this way comprehensive knowledge has been gathered about small-scale electrodes ( $\text{cm}^2$ ), which is now transferred to the development of large-area, flexible electrodes. In addition, fundamental studies on safety related aspects of this battery technology are performed. Detailed investigations of the interaction of the electrodes with the electrolyte solutions and the behaviour of the cells under extreme conditions are accomplished by applying advanced analytical methods such as in-situ FTIR and Raman spectroscopy, in-situ mass spectrometry, and differential thermogravimetric analysis.

**Interfaces & Capacitors:** *Surface analysis* is essential for the understanding and optimization of catalytic and electrochemical *interfaces* and provides information about processes and electronic and molecular properties on a microscopic scale. The main topics at present are catalysis of nano particles and electrocatalysis.

**PEM Fuel Cells:** Work includes development of improved electrocatalysts for PEM anode and the cathode reactions. Since most of the electrochemical performance losses can be attributed to the sluggish kinetics of the oxygen reduction reaction, one of our goals in pursue for advanced electrocatalysts, is the development of oxygen reduction catalysts with reduced noble metal content and good stability. Approaches include co-sputtering thin Pt/C catalyst layers on Nafion, and core-shell platinum alloys eg PtCo/C.

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## Fraunhofer Institute for Solar Energy (ISE)

The ISE coordinates the Fraunhofer Energy Alliance (Fraunhofer-Allianz Energie). Areas of research of interest with regard to the mission focus include:

- Photovoltaics, alternative PV (e.g. dye and organic PV)
- Electric storage systems
- PV calibration lab
- e-mobility
- hydrogen generation and storage
- fuel cell systems
- optical design of nano-optical and micro-optical systems, of thin film systems and of imaging and non-imaging elements

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