

# H I T E C

## Helmholtz Graduate School in Energy- und Climate Research

[Helmholtz Interdisciplinary Doctoral Training in Energy and Climate Research]

announces 7 HITEC Doctoral Fellowships

16 December 2012

### Call for applications

HITEC (Helmholtz Interdisciplinary Doctoral Training in Energy and Climate) is the graduate school for scientists and engineers who want to earn a Ph.D. in the challenging fields of energy and climate research. HITEC is a joint initiative between Forschungszentrum Jülich, the RWTH Aachen University, the Ruhr-Universität Bochum, the University of Cologne, the Heinrich Heine University Düsseldorf, and the University of Wuppertal. As a rule the Ph.D. certificate is awarded by one of the member universities. HITEC is committed to scientific excellence, to an interdisciplinary and international research environment, to an accepting learning environment which embraces diversity, and aims to turn the Ph.D. students into well needed experts for academia and industry.

HITEC is committed to scientific excellence, to an interdisciplinary and international research environment, to an accepting learning environment which embraces diversity, and aims to turn the Ph.D. students into well needed experts for academia and industry. Its faculty members, scientists and engineers, are leading experts in their fields. HITEC offers a 3-year training programme which accompanies the doctoral thesis: students can select from a variety of HITEC events, including lectures on topics or methods, hands-on training courses in the lab or professional skills training, such as scientific writing or presenting.

HITEC launches a call for applications for 7 doctoral fellowships (HITEC Ph.D. Fellowships). 12 projects, indicated below, are open for application. We are seeking highly qualified and motivated scientists and engineers for doctoral studies in the fields of materials science, semiconductor technology, plasma physics, atmospheric physics and chemistry, and energy crops. The integration in international co-operations requires the ability to cooperate in an international team, thus we expect good skills in the spoken and written English language. HITEC particularly welcomes applications from women. We also welcome applications from disabled persons.

The best 12 applicants (one candidate per project) will be invited to Germany for a week (April 2012), to join the respective research group in Jülich or at the university. The task during this one week is to jointly work on the project idea with faculty members and supervisors and to turn it into an outstanding and convincing HITEC (Ph.D.) Project. On the last day of their stay the candidates present their projects and the outline of their dissertations. Of the 12 pairs (projects / candidates) the seven best pairs (HITEC Projects / HITEC Fellows) will be selected.

- ▶ You choose one of the projects and substantiate your reasons in a personal statement. For details of the application please check the **Guidelines for Applicants**.

### **HITEC Project # 1: Determination of thermodynamic key data for the development of advanced Lithium ion battery electrode materials**

The work concerns basic research for the development of new anode and cathode materials for Lithium Ion Batteries. The goal is the generation of valuable and concise experimental thermodynamic and phase equilibria data as a basis for modeling of material systems relevant for electrode materials in Lithium Ion Batteries. A starting point will be a comprehensive compilation of literature data and a check of the experimental. The systems under investigation will be ternary intermetallic systems as feasible anode materials and metal oxide systems as cathode materials. This includes on the one hand the experimental evaluation of phase relations by means of XRD, thermal analysis and

metallography. On the other hand thermochemical investigations like i) calorimetric measurement of the enthalpy of formation and enthalpy of mixing in solid and liquid systems, ii) KEMS and isopiestic vapor pressure measurements concerning mainly the Li-activities in the respective ternary systems, iii) EMF measurements of the partial Gibbs energy of lithium in the respective ternary systems. iv) A very important issue is the thermodynamic modeling aspect using the CALPHAD approach, on which this work will be focused.

<b>Location</b> of the HITEC Fellow:	Forschungszentrum <b>Jülich</b> , Institute of Energy and Climate Research, Microstructure and Properties (IEK-2; Director Prof.Dr.-Ing. Lorenz Singheiser)
<b>Partners</b> of the HITEC Project:	University of Vienna, Austria, Dept. of Inorganic Chemistry - Materials Chemistry, Prof. Dr. Hans Flandorfer; Oak Ridge National Laboratory, National, USA, Laboratory's Surface Processing & Mechanics group, Dr. Ted Besmann
<b>Specific requirements</b>	Master in Materials Science, Physics or Chemistry; Experience with phase diagram determination, thermodynamics and computational thermochemistry
For <b>project specific</b> questions please <b>contact</b>	PD Dr.-Ing. Torsten Markus, FZ Jülich, IEK-2, t.markus@fz-juelich.de

### **HITEC Project # 2: Influence of large-scale production processes on the precipitation hardening behaviour of heat resistant ferritic Iron-base alloys**

Together with ThyssenKruppVDM, FZ Jülich, IEK-2 developed a class of high heat-strength solid solution- and Laves-phase-strengthened ferritic steels with excellent oxidation resistance due to formation of stable  $\text{Cr}_2\text{O}_3$  layers and exceptional mechanical properties up to 850°C. Actually, these alloys are applied for metallic interconnectors of solid oxide fuel cells. Due to their oxidation resistance, high temperature strength, and low thermal expansion, they are promising candidates for application in high-efficiency steam power plants operated with short-term load changes. Actually, there exist significant differences between nominally identical batches produced in large scale processes and in lab-scale. The origin of these differences is not understood up to now. Therefore, the difference between commercial material and batches from lab production shall be investigated in a multi-scale approach from macroscopic features down to the atomic microstructure of the precipitates and their interfaces to the matrix. The lab-scale batches with defined variation of the C-, N, Ti and Nb content will be produced at RWTH Aachen. The reference batch from commercial production will be CroFer 22H delivered by ThyssenKrupp-VDM. The precipitation kinetics will be determined at hot-rolled material and after cold rolling with subsequent precipitation annealing and water quenching. Microstructure will be analyzed using high resolution scanning electron and transmission electron microscopy including focused ion beam tomography, as well as light optical microscopy.

<b>Location</b> of the HITEC Fellow:	Forschungszentrum <b>Jülich</b> , Institute of Energy and Climate Research, Microstructure and Properties (IEK-2; Director Prof.Dr.-Ing. Lorenz Singheiser)
<b>Partners</b> of the HITEC Project:	RWTH Aachen University, Dept. of Ferrous Metallurgy, Prof. Dr.-Ing. Wolfgang Bleck
<b>Specific requirements</b>	Master in Materials Science and Engineering; Experience in high temperature alloys and electron microscopy
For <b>project specific</b> questions please <b>contact</b>	Prof.Dr.-Ing. Tilmann Beck, FZ Jülich, IEK-2, t.beck@fz-juelich.de Dr.-Ing. Bernd Kuhn, FZ Jülich, IEK-2, b.kuhn@fz-juelich.de

### **HITEC Project # 3: Development of liquid silicon hydride-based semiconductor technology**

Liquid silicon hydrides (silanes) have recently been identified to be promising precursors for Si-based semiconductor technology. Being in the liquid state, they allow on the one hand using low-tech devices such as ink jet nozzles to produce large-area semiconducting hydrogenated amorphous

silicon (a-Si:H) layers (“spray-on silicon”) [1,2], and on the other hand they allow deposition rates more than an order of magnitude higher compared to monosilane when used in epitaxial deposition processes [3]. They could therefore become complementary key enabling materials for future photovoltaics and other semiconductor devices such as TFTs. Novel methods for the production of semiconducting a-Si:H thin films and epitaxial processes based on liquid silicon hydride precursors shall be developed.

[1] T. Shimoda *et al.*, Solution-processed silicon films and transistors, Nature 440, 783-786, 2006

[2] L. Rosenberg *et al.*, Semiconductors: Spray-on Silicon, Nature 440, 749-750, 2006

[3] S.G. Thomas *et al.*, Precursors for group IV epitaxy for micro/opto-electronic applications, Solid State Technology, 2009

<b>Location</b> of the HITEC Fellow:	Heinrich Heine University <b>Düsseldorf</b> , Institute of Laser and Plasma Physics (Director: Prof. O. Willi) with frequent stays at Forschungszentrum Jülich, Institute of Energy and Climate Research – Photovoltaics (IEK-5; Director: Prof. Dr. Uwe Rau)
<b>Partners</b> of the HITEC Project:	Heinrich-Heine-University Düsseldorf, Institute of Laser and Plasma Physics, Prof.Dr. Georg Pretzler, Dr. Bernhard Hidding; Forschungszentrum Jülich, Institute of Energy and Climate Research – Photovoltaics (IEK-5), Dr. Friedhelm Finger
<b>Specific requirements</b>	Master in Chemistry or Physics; Experience in photovoltaics and physical chemistry desirable
For <b>project specific</b> questions please <b>contact</b>	Dr. Bernhard Hidding, Heinrich Heine University Düsseldorf, Institute for Laser and Plasma Physics, hidding@hhu.de

#### **HITEC Project # 4: The dynamics of electrons in linear plasma devices and its impact on plasma surface interactions**

Linear plasma devices allow an in-depth assessment of plasma surface interaction processes which determine the lifetime of plasma facing components in fusion reactors. Detailed knowledge about the plasma characteristics is essential to interpret the findings on PSI processes and to extrapolate to conditions in future fusion reactors, including the plasma behavior on short time scales, e.g. the dynamics of electrons.

In the frame of this project, a Thomson scattering diagnostics shall be set-up to investigate the dynamics of electrons in the linear plasma device PSI-2 at Forschungszentrum Jülich. This task includes the layout of the observation system, the commissioning of the system and systematic measurements in the PSI-2 plasma. The results will be compared with measurements with Langmuir probes. The fluctuations of the plasma will be related to spectroscopic observations at target samples exposed to the plasma, which provide information on the material erosion at the target to assess the role of plasma fluctuations for the erosion processes.

<b>Location</b> of the HITEC Fellow:	Forschungszentrum <b>Jülich</b> , Institute of Energy and Climate Research – Plasma Physics (IEK-4; Director Prof.Dr. Ulrich Samm)
<b>Partners</b> of the HITEC Project:	Ruhr-Universität Bochum, Institute of Plasma Physics V, Prof.Dr. Uwe Czarnetzki
<b>Specific requirements</b>	Master in Physics; Experience in plasma physics and plasma diagnostics
For <b>project specific</b> questions please <b>contact</b>	Prof.Dr. Bernhard Unterberg, FZ Jülich, IEK-4, b.unterberg@fz-juelich.de

#### **HITEC Project # 5: Eco-balance of biogas plants and energy crops cultivation**

Utilization of bioenergy saves fossil fuels and reduces the emission of greenhouse gases. Therefore, the sustainable production of biogas based on energy crops is currently highly discussed and supported. However, biogas plants are more and more exposed to criticism for not being ecological

friendly, especially because of the intensified agricultural production of energy crops and the upgrading of biogas to bio-methane. Emissions of greenhouse gases and energy demand increase due to cultivation, harvesting, transport and storing of energy crops, for instance. During biogas production and upgrading additional amounts of methane can be emitted to the atmosphere. Within this project the eco-balance of biogas plants will be investigated - from cultivation of energy crops to biogas upgrading. Thereby different input materials will be compared regarding energetic and ecological aspects, and the greenhouse gas potential of special types of biogas producing and upgrading plants will be investigated. Additional emphasis will be given to energetic and ecological advantages and disadvantages of digestate (i.e. residues after fermentation) applications on agricultural soils for plant production.

<b>Location</b> of the HITEC Fellow:	Ruhr-Universität <b>Bochum</b> , Institute of Thermo and Fluid Dynamics, Chair in Thermodynamics (Director Prof.Dr.-Ing. Roland Span)
<b>Partners</b> of the HITEC Project:	Forschungszentrum Jülich, Institute of Bio- und Geosciences - Plant Sciences (IBG-2) Dr. Nicolai D. Jablonowski; University of Wuppertal, Physical Chemistry, Prof. Dr. Peter Wiesen
<b>Specific requirements</b>	Master in Environmental, Agricultural, Process or Mechanical Engineering, or Biology
For <b>project specific</b> questions please <b>contact</b>	Dr.-Ing. Mandy Gerber, Ruhr-Universität Bochum, Chair in Thermodynamics, m.gerber@thermo.rub.de

### **HITEC Project # 6: Derivation of atomic oxygen and temperature in the middle atmosphere and how they are affected by global change**

The Earth middle atmosphere is the least explored and understood region of the Earth climate system. It is a transition region between the lower atmosphere, where climate change will affect human life directly, and the space environment, where the sun masks signs of anthropogenic changes. Key parameters in this context are the atomic oxygen abundance and temperature in the mesosphere / lower thermosphere.

During this thesis, a photochemical model for electronically excited atomic oxygen will be developed to retrieve atomic oxygen abundance from green line emission rates as measured by a satellite. Using this data, a non-local thermodynamic equilibrium model for CO<sub>2</sub> and OH<sup>-</sup> to retrieve temperature data will be improved and applied to infrared remote sensing data. Finally, these datasets will be analyzed with respect to solar influences and climate change.

The candidate will gain a deep insight into middle atmosphere chemistry, satellite and ground-based remote sensing techniques, modelling of radiative transfer in the atmosphere, and how climate change affects the atmosphere.

<b>Location</b> of the HITEC Fellow:	Forschungszentrum <b>Jülich</b> , Institute of Energy and Climate Research - Stratosphere (IEK-7; Director Prof.Dr. Martin Riese)
<b>Partners</b> of the HITEC Project:	University of Wuppertal, Atmospheric Physics, Prof.Dr. Ralf Koppmann; National Center for Space Science, CAS, Beijing, China, Prof.Dr. Jiyao Xu; National Center for Atmospheric Research, Boulder, USA, Dr. Anne Smith
<b>Specific requirements</b>	Master in Physics, Chemistry or Applied Mathematics; Very good programming skills (e.g. python)
For <b>project specific</b> questions please <b>contact</b>	Dr. Martin Kaufmann, FZ Jülich, IEK-7, m.kaufmann@fz-juelich.de

### **HITEC Project # 7: Global gravity-wave modelling confined by satellite observations**

Atmospheric gravity waves (or buoyancy waves) are waves in atmospheric temperature, winds and density with gravity acting as the restoring force. They are an important coupling process between different layers of the atmosphere (troposphere, stratosphere, mesosphere) and not well represented in climate models so far. In particular, gravity wave sources do not feed back directly to weather dynamics and climate change. Novel parametrizations for convective GW sources developed by Yonsei University can remedy this problem but need to be validated. At FZ Jülich we evaluated more

than 10 years of satellite data for gravity wave momentum flux. The aim of the project is to use different gravity wave source schemes for orography, convection and background and to confine free parameters of these schemes by the satellite measurements and OH measurements from Wuppertal around 86 km height. Interaction of gravity waves and large scale dynamics will be investigated at different time scales. In cooperation with a Ph.D. student from JÜLICH the improved schemes will be implemented in a chemistry climate model.

<b>Location</b> of the HITEC Fellow:	Forschungszentrum <b>Jülich</b> , Institute of Energy and Climate Research - Stratosphere (IEK-7; Director Prof.Dr. Martin Riese)
<b>Partners</b> of the HITEC Project:	Yonsei University, Seoul, Korea, Department of Atmospheric Sciences, Prof.Dr. Hye-Yeong Chun; University of Wuppertal, Atmospheric Physics, Prof.Dr. Ralf Koppmann
<b>Specific requirements</b>	Master in Physics, Meteorology or Mathematics; Experience in programming (e.g. C, IDL, FORTRAN), sound mathematical background
For <b>project specific</b> questions please <b>contact</b>	Dr. Peter Preusse, FZ Jülich, IEK-7, p.preusse@fz-juelich.de

### **HITEC Project # 8: The Asian summer monsoon and its impact on the composition of the stratosphere**

The great population growth in southeast Asia and the accompanying rapid economic growth cause increasing regional and global pollution of the atmosphere. The Asian summer monsoon (ASM) constitutes a seasonally persistent circulation pattern transporting climate-relevant emissions from the surface boundary layer to the lower stratosphere. In order to develop strategies to limit the impact on global climate, it is very important to understand such transport pathways in detail. The objectives of this thesis are: (1) to identify transport pathways driven by the the ASM (2) to determine the distribution and the seasonality of key constituents (including water vapour, CO and SO<sub>2</sub>) resulting from such specific transport ways. To address these objectives, the Chemical Lagrangian Model of the Stratosphere (CLaMS) will be used. CLaMS is a chemical transport model designed to simulate chemistry, advection, and mixing in the stratosphere and upper troposphere. Because of the Lagrangian representation of transport, with the intensity of mixing in the model being driven by the strength of flow deformation, CLaMS is particularly well suited for quantification of transport across strong transport barriers like the tropopause.

<b>Location</b> of the HITEC Fellow:	Forschungszentrum <b>Jülich</b> , Institute of Energy and Climate Research - Stratosphere (IEK-7; Director Prof.Dr. Martin Riese)
<b>Partners</b> of the HITEC Project:	Institute of Atmospheric Physics, CAS, Beijing, Prof.Dr. Yi Liu; University of Wuppertal, Atmospheric Physics, Prof.Dr. C. Michael Volk
<b>Specific requirements</b>	Master in Meteorology; Experience with data analysis, statistics and modelling of transport, experience with Fortran and IDL
For <b>project specific</b> questions please <b>contact</b>	Dr. Paul Konopka, FZ Jülich, IEK-7, p.konopka@fz-juelich.de

### **HITEC Project # 9: Atmospheric profiling of clouds, temperature and humidity using a ground-based infrared spectrometer**

Recently, the Atmospheric Emittance Radiance Interferometer (AERI) has been added to the Jülich Observatory for Cloud Evolution (JOYCE; <http://www.geomt.uni-koeln.de/en/general/research/joyce>). It continuously measures atmospheric emission (3.3 to 19 µm or 3020 to 520 1/cm) at 1/cm resolution. Simulation studies (Löhnert et al. 2009; Turner et al. 2007) have been performed to study the information of measurements for temperature and humidity profiling and to show the potential of AERI measurements to retrieve ice and liquid cloud microphysical properties.

The aim of the P.hD.-thesis is to expand the theoretical work to real measurements and continuous application. Specific focus shall be on the synergetic use of the JOYCE microwave radiometer and

cloud radar measurements, i.e. using these measurements to constrain the retrieval. The work will include the performance of radiative transfer simulation, the development of retrieval algorithms and the respective application to measurements. Using the suite of observations available at JOYCE and radiosoundings the retrieval performance shall be validated.

<b>Location</b> of the HITEC Fellow:	University of <b>Cologne</b> , Institute of Geophysics and Meteorology (Director Prof.Dr. Susanne Crewell)
<b>Partners</b> of the HITEC Project:	Forschungszentrum Jülich, Institute of Energy and Climate Research, Stratosphere (IEK-7, Prof.Dr. Martin Riese) and Troposphere (IEK-8, Prof.Dr. Andreas Wahner); NOAA, Severe Storms Laboratory, Norman, USA, David D. Turner, Ph.D.
<b>Specific requirements</b>	Master in Atmospheric Physics, Geophysics, Physics or Mathematics; Experience in remote sensing and retrieval development is beneficial
For <b>project specific</b> questions please <b>contact</b>	Dr. Ulrich Löhnert, University of Cologne, Institute of Geophysics and Meteorology, loehnert@meteo.uni-koeln.de

### **HITEC Project # 10: Novel mathematical approaches for estimating air quality and climate forcing emissions of technical energy processes**

Climate and air quality variability are ultimately driven by emissions from technical energy conversion processes, engendering fluxes of green house gases, reactive gas emissions, and aerosols into the atmosphere. However, fluxes can hardly be observed directly and reliably quantified. This fact severely hampers progress in predictive skills of climate and atmospheric chemistry models. Today's flux inversion techniques suffer from reliability. In case of greenhouse gases, even with cutting edge methods, errors in initial values directly impact the result of emission flux estimates.

By introducing novel mathematical approaches to inversion techniques, combining advanced models with remote sensing data, the proposed research is devoted to dwarf this problem by breaking new grounds on emission flux estimation. An "Extended Ensemble Kalman Smoother" with full adjoint modelling will be developed.

We propose a study for addressing algorithmic designs of the emission inversion problem to estimate fluxes of reactive gases into the atmosphere. The work will rely in part on the existing adjoint chemistry transport model EURAD-IM.

<b>Location</b> of the HITEC Fellow:	Rhenish Institute for Environmental Research at the University of <b>Cologne</b> (RIU, Director Prof.Dr. Andreas Wahner) with frequent stays at University of Wuppertal, Faculty C, Mathematics and Informatics, Prof.Dr. Birgit Jacob, and Forschungszentrum Jülich, Institute of Energy and Climate Research - Troposphere (IEK-8; Director Prof.Dr. Andreas Wahner)
<b>Partners</b> of the HITEC Project:	MACC emission subproject <a href="http://www.gmes-atmosphere.eu/">http://www.gmes-atmosphere.eu/</a>
<b>Specific requirements</b>	Master in Mathematics or Theoretical Physics/Geophysics; Experience in numerical analysis, control theory
For <b>project specific</b> questions please <b>contact</b>	Prof.Dr. Birgit Jacob, University of Wuppertal, <a href="mailto:Jacob@math.uni-wuppertal.de">Jacob@math.uni-wuppertal.de</a> or PD Dr. Hendrik Elbern, Forschungszentrum Jülich and Rhenish Institute for Environmental Research at the University of Cologne, <a href="mailto:h.elbern@fz-juelich.de">h.elbern@fz-juelich.de</a>

### **HITEC Project # 11: On the temperature dependence of the kinetic isotope effect**

Stable carbon isotopic analyses, complementary to concentration measurements, are effective tools for characterizing the sources of volatile organic compounds (VOCs) and understanding the processes governing their distribution in the atmosphere. The average physical age of an individual VOC in the atmosphere can be determined from the observed isotopic composition, when the source isotopic composition of the VOC and the kinetic isotope effect (KIE) of oxidation reactions involved in the atmospheric VOC degradation are known. A recent pilot study showed that below 273K KIE increases.

Applying temperature dependent KIE has significant impacts on the interpretation of ambient observations.

In this project the KIE will be investigated as function of temperature. To this end the successful candidate will plan and conduct experiments of VOC oxidation, apply isotope mass spectrometry and interpret results with the help of chemical models. Laboratory findings will be complemented by measurements in the atmosphere. The results of this project will contribute to advance process understanding in atmospheric chemistry. The use of stable isotopes for process understanding in atmospheric research is a highly innovative field.

<b>Location</b> of the HITEC Fellow:	Forschungszentrum <b>Jülich</b> , Institute of Energy and Climate Research - Troposphere (IEK-8; Director Prof.Dr. Andreas Wahner)
<b>Partners</b> of the HITEC Project:	University Wuppertal, Atmospheric Physics, Prof.Dr. Ralf Koppmann
<b>Specific requirements</b>	Master degree (or equivalent) in Chemistry, Physics, or Atmospheric Science; Very good experimental skills; experience in physical chemistry and/or isotope mass spectrometry are helpful
For <b>project specific</b> questions please <b>contact</b>	PD. Dr. Astrid Kiendler-Scharr, FZ Jülich, IEK-8, a.kiendler-scharr@fz-juelich.de

### **HITEC Project # 12: Secondary organic aerosol formation from biogenic VOCs: the influence of oxidants from anthropogenic emissions on aerosol formation**

Aerosols and their direct and indirect climate effects currently pose the largest uncertainties in future projections of the climate. Up to 80% of the particulate mass is composed of organic species for which sources are to date insufficiently constraint. One question is, to what extent volatile organic compounds (VOC) from biogenic origin contribute to organic aerosol via secondary organic aerosol (SOA) formation. While experimental data on the oxidation by ozone and hydroxyl radicals is available, very little is known about the SOA formation from NO<sub>3</sub> oxidation. NO<sub>3</sub> mainly originates from anthropogenic sources such as traffic emissions.

In this project the SOA formation during the reaction of biogenic VOCs with NO<sub>3</sub> will be investigated in the unique atmospheric simulation chamber SAPHIR. Biogenic VOCs from direct emissions of plants will be used and the atmospheric chemical degradation will be explored at natural concentration levels. The successful candidate will design experiments, measure VOCs and particle formation by mass spectrometric techniques, and interpret results with chemical models. With its excellent experimental equipment and infrastructure IEK-8 provides an ideal setting to significantly contribute to an improved understanding of organic aerosol.

<b>Location</b> of the HITEC Fellow:	Forschungszentrum <b>Jülich</b> , Institute of Energy and Climate Research - Troposphere (IEK-8; Director Prof.Dr. Andreas Wahner)
<b>Partners</b> of the HITEC Project:	University Wuppertal, Atmospheric Physics, Prof.Dr. Ralf Koppmann
<b>Specific requirements</b>	Master degree (or equivalent) in Chemistry, Physics, or Atmospheric Science; Very good experimental skills; experience in organic chemistry and/or mass spectrometry are helpful
For <b>project specific</b> questions please <b>contact</b>	PD. Dr. Astrid Kiendler-Scharr, FZ Jülich, IEK-8, a.kiendler-scharr@fz-juelich.de

For **application specific** questions please **contact HITEC Office:**  
Dr. Bärbel Köster, Managing Director; b.koester@fz-juelich.de; +49 2461 611595

**Please package all documents into 1 pdf-file and submit your application electronically until 8 February 2012; submit to: b.koester@fz-juelich.de**