**PhD scholarships on “Live” Visualizations of Single Nanoparticle Catalysts at the Atomic-Scale – DTU Physics**

Could you envision “*seeing*” chemical reactions being catalyzed at the atomic-scale? Two or more PhD scholarships are now open for experimental research in nanoparticle catalysis using advanced *operando* electron microscopy at the Center for Visualizing Catalytic Processes (VISION).

VISION is developing and applying a new unique platform for visualizing catalytic nanoparticles and reactions at the atomic-level by integrating cutting-edge electron microscopy, microfabricated nanoreactors, nanoparticle synthesis and computational modelling. This approach enables new, direct *operando* observations that are urgently needed to advance mechanistic insight into catalytic processes at the atomic-scale.

The interdisciplinary approach aims at relating the atomic-scale structure, dynamics and functions of isolated, single nanoparticles in both thermal catalysis and electrocatalysis as a radical new approach for developing new and more efficient catalysts needed to tackle the environmental challenges of our time.

In the autumn 2023, VISION’s new *one-of-a-kind* electron microscope will be housed in DTU’s new "Climate Challenge Laboratory" building. The new laboratory will host the VISION center, the Surface Physics and Catalysis section, the CatTheory section and the newly established Pioneer Center, CAPeX, as a vibrant collaborative research environment with internationally leading scientists in the fields of catalysis and power-to-X.

**Responsibilities and qualifications**

*Position 1:* You will work quantitatively with the dynamic behaviour of single nanoparticles in thermal catalysis. The tasks can include:

* Visualization of single nanoparticles in thermal catalysis using time-resolved, atomic-resolution transmission electron microscopy techniques.
* Development of quantitative image analysis to extract dynamic information encoded in single and series of atomic-resolved images of single nanoparticles.
* Investigation of dynamic processes at the heterogeneous surface of single nanoparticles as catalytic reactions progress.
* Understanding of atomic mechanisms and kinetics to develop strategies for stabilizing uniquely active but metastable surface motifs of nanoparticles as catalysts for sustainable chemical processes.

*Position 2:* You will work quantitatively with atomic-resolution electron microscopy of nanoparticles under electrocatalytic reaction conditions. The tasks can include:

* Preparation of microfabricated nanoreactors to study electrochemical reactions catalyzed by single or few nanoparticles.
* *Operando* studies of single nanoparticles during electrocatalysis using high spatiotemporal-resolution transmission electron microscopy techniques.
* Development and application of new ultrasensitive and quantitative methods for investigating liquid-surface interactions on nanoparticles at the atomic-scale.
* Relating structural dynamics and dynamical functions in electrocatalysis at the atomic-scale.
* Advance the understanding of atomic mechanisms and rates in electrocatalytic processes to develop strategies for stabilizing nanoparticles as catalysts for sustainable electrochemical processes.

In both positions, you will collaborate closely with a group of PhD students, postdocs and international leading scientists, all working at the technological edge of modern electron microscopy for advancing catalysis science.

You must have a two-year master's degree (120 ECTS points) or a similar degree with an academic level equivalent to a two-year master's degree with excellent results.

**Approval and Enrolment**

The scholarship for the PhD degree is subject to academic approval, and the candidate will be enrolled in one of the general degree programmes at DTU. For information about our enrolment requirements and the general planning of the PhD study programme, please see [DTU's rules for the PhD education](https://www.dtu.dk/english/Education/PhD/Rules).

**Assessment**

The assessment will be made by Associate Professor Christian Damsgaard, Professor Jakob Kibsgaard, Professor Peter Vesborg, Professor Joerg Jinschek and Professor Stig Helveg.

We favor candidates with a degree in physics, chemistry or materials science. The candidate should preferably have experience in electron microscopy, micro-electro-mechanical-system technology, catalysis or surface science. Experience in scientific programming, e.g. using Python, is an advantage.

The candidate has obtained excellent grades in his/her Bachelor and Master educations, good communication skills in both spoken and written English, and experience in working independently and in a team.

**We offer**

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

**Salary and appointment terms**

The appointment will be based on the collective agreement with the Danish Confederation of Professional Associations. The allowance will be agreed upon with the relevant union. The period of employment is 3 years. Starting date is 1 December 2023 (or according to mutual agreement).

You can read more about [career paths at DTU here](http://www.dtu.dk/english/about/job-and-career/working-at-dtu/career-paths).

**Further information**

Further information may be obtained from Associate Professor Christian D. Damsgaard, e-mail: ccda@dtu.dk, Professor Jakob Kibsgaard, email: jkib@fysik.dtu.dk, Professor Peter Vesborg, email: vesborg@fysik.dtu.dk, Professor Joerg Jinschek, email: jojin@dtu.dk and Professor Stig Helveg, email: stig@fysik.dtu.dk.

You can read more about VISION at [www.vision.dtu.dk](http://www.vision.dtu.dk) and DTU Physics at [www.fysik.dtu.dk/english](http://www.fysik.dtu.dk/english).

If you are applying from abroad, you may find useful information on working in Denmark and at DTU at [DTU – Moving to Denmark](https://www.dtu.dk/english/about/job-and-career/moving-to-denmark). Furthermore, you have the option of joining our monthly free seminar “[PhD relocation to Denmark and startup “Zoom” seminar](https://www.dtu.dk/english/about/job-and-career/moving-to-denmark/before-arrival/phd-relocation-to-denmark)” for all questions regarding the practical matters of moving to Denmark and working as a PhD at DTU.

**Application procedure**

Your complete online application must be submitted no later than **25 September 2023 (23:59 Danish time).** Apply online here: [*PhD scholarships on “Live” Visualizations of Single Nanoparticle Catalysts at the Atomic-Scale*](https://efzu.fa.em2.oraclecloud.com/hcmUI/CandidateExperience/en/sites/CX_1/job/2295/?utm_medium=jobshare)

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

* A letter motivating the application (cover letter)
* Curriculum vitae
* Grade transcripts and BSc/MSc diploma (in English) including official description of grading scale

*In the cover letter, we kindly ask you to consider which of the positions appeal most to you.*

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

Applications received after the deadline will not be considered.

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

***DTU Physics***
*At DTU Physics, we carry out cutting-edge research in modern physics, with particular focus on four main areas: quantum technology, sustainable energy, materials, and biophysics. Our focus is both to acquire greater knowledge about basic scientific problems and to conduct research oriented towards use in societies and companies.*

***Technology for people***
*DTU develops technology for people. With our international elite research and study programmes, we are helping to create a better world and to solve the global challenges formulated in the UN’s 17 Sustainable Development Goals. Hans Christian Ørsted founded DTU in 1829 with a clear mission to develop and create value using science and engineering to benefit society. That mission lives on today. DTU has 13,400 students and 5,800 employees. We work in an international atmosphere and have an inclusive, evolving, and informal working environment. DTU has campuses in all parts of Denmark and in Greenland, and we collaborate with the best universities around the world.*