

# Expertise in nanotechnology

**T**he iNANO Center ([www.inano.dk](http://www.inano.dk)) was established in 2002 at Aarhus University in Denmark with the aim of fostering interdisciplinary research within the area of nanoscience and nanotechnology, and thereby to promote synergistic interactions that cross traditional scientific boundaries between physics, chemistry, molecular biology, biology, engineering and medicine. Today iNANO is recognised worldwide for its excellence within research, education and innovation, and the centre provides a regional and national power hub for enhancing industrial competitiveness.

## The iNANO mission

The mission of iNANO is based on three equally important objectives:

- To play a key role in the education of the next generation of scientists in nanotechnology at the Bachelor, Master's, PhD, and postdoctoral levels;
- To strengthen interdisciplinary research in nanoscience and nanotechnology and catalyse collaborations with other international nanoscience research groups;
- To provide an innovative interface for transfer and transformation of basic nanoscientific knowledge to nanotechnology into Danish and European industry.

## Pioneering undergraduate education

At an international level, iNANO has played a pioneering role by establishing a new interdisciplinary curriculum in nanotechnology. The interdisciplinary Bachelor and Master's programme in nanotechnology with first enrolments in 2002 hosts 40-60 students per year. The curriculum

covers a broad spectrum of introductory, advanced, and specialised courses that aim at providing the students with a sufficiently broad basis to conduct interdisciplinary research in the nano area and at the same time achieve disciplinary depth and specialised skills in selected areas. Innovative teaching methods and a strong connection to both state-of-the-art research and relevant industry make the educational programme an excellent start to a career in nanoscience or nanotechnology. The success at motivating and training young people for nanotechnology careers is clear with more than 50% of the 2002 year group now enrolled in PhD programmes.

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## Graduate education - iNANOschool

In December 2002, a vocationally oriented graduate school associated to iNANO, iNANOschool ([www.iNANOschool.dk](http://www.iNANOschool.dk)), was established with funding from the Danish Research Training Committee, the Aarhus University, the County of Aarhus, and a large number of high-tech industrial partners. The iNANOschool offers a broad range of PhD courses within nanoscience and

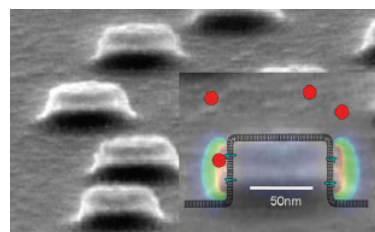
*Denmark's interdisciplinary approach to nanoscience, nanoeducation and innovation...*



nanotechnology and provides facilities for an increasing number of PhD students. Currently 120 PhD students are enrolled in the graduate school. The research areas within iNANO and iNANOschool are highly integrated and truly interdisciplinary. Overall, the research and educational activities are at the international forefront of science and serve as an ideal framework for industrial collaborations.

## Outreach and public engagement activities

The connection to society is an important part of the activities of any research and education centre. iNANO is heavily engaged both in educational activities for schools and for the general public as well as focused groups within society. For example in the current EU project NANOCAP, five trade unions and five



environmental NGO organisations are involved in educational activities and dialogue with iNANO to raise their capacity to have informed opinions in the debate on nanotechnology.

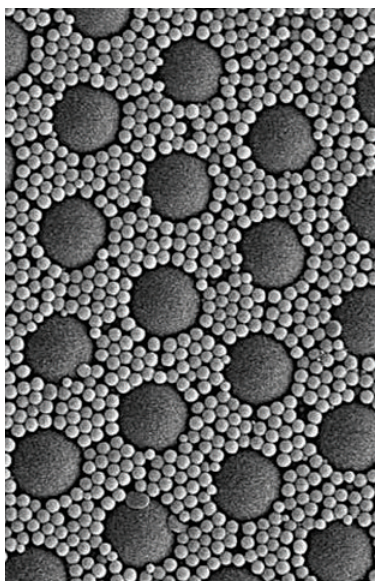
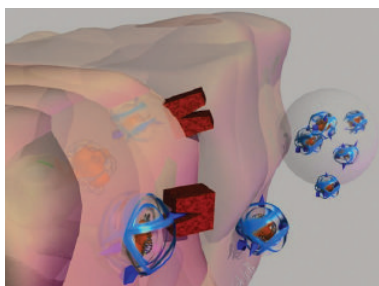
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### Interdisciplinary research activities

The research centre has, since its inauguration in 2002, provided the framework for interdisciplinary research projects in the area of nanoscience and nanotechnology, and at present 20 different research groups and a total of close to 60 senior scientists (full and associated professors), 60 junior researchers (assistant professors and post docs) and 120 PhD students are associated with iNANO. Current research activities fall within the following six target areas:

- Functional nanomaterials
- Nano energy materials
- Nanomedicine
- Self-assembled molecular structures
- Nanofood
- Nanophotonics and nanoelectronics

The research at iNANO is funded from a broad range of sources and encompasses the full scale from fundamental studies, through applied



and innovation oriented research including natural science, engineering and medical fields. The funding sources cover the spectrum of governmental Danish and European (ERC) basic science, engineering and innovation funding bodies as well as private foundations and industrial enterprises. International collaborations from the different research programmes and individual researchers link the centre to more than 170 research institutions around the world. iNANO participates in major international programmes including many projects in EU FP4, FP5, FP6 and FP7 programmes. From the first calls in FP7 four projects have already been started and a further two are in the negotiation phase. The scientific output of iNANO is of the highest level and is published in the very best scientific journals over a broad range of disciplines.

### Nanomedicine: a new focus area

iNANO has recently launched a platform in the visionary area of nanomedicine combining the expertise within the natural sciences with a broad range of medical disciplines at the Aarhus University Hospital. The application of nanotechnologies has great potential to provide breakthroughs in diagnosis, therapy and prevention of disease. The plat-

form has five themes each addressing a range of major diseases:

- Nanoparticles for drug delivery and imaging
- Nanodrug design
- Regenerative medicine through nanostructured materials
- Nanobiosensors
- Nanotoxicology/nanoethics

### Collaboration with industry and innovation

An important element of iNANO is the collaboration with national and international industrial partners. More than 40 enterprises have co-financed projects with iNANO and currently over a quarter of the PhD students are funded from industry in the very successful funding model where one-third is paid by an industrial enterprise, one-third from the Danish Agency for Science Technology and Innovation and one-third in co-financing from the university. The output from these projects has been many high quality scientific publications and patent applications. A number of key Danish companies with interest and expertise in nanotechnology are represented on the iNANO board. A particular focus is given to the area of NanoFOOD with a set of Danish companies funding a networking and research consortium.



Professor Flemming Besenbacher  
Director

Interdisciplinary Nanoscience Center  
(iNANO)  
Faculty of Science  
Ny Munkegade 118  
Aarhus University  
DK 8000 Aarhus  
Denmark

Tel: +45 89 42 36 04  
Fax: +45 89 42 36 90

fbe@inano.dk  
besenbacher.inano.dk