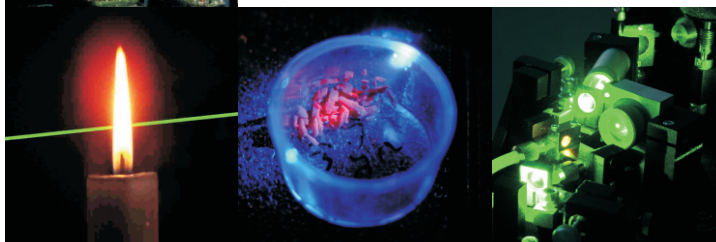


Research Projects

TP	Project title	Project leader
A1	Investigations on the kinetics of particle formation in a shock wave tube	Chr. Schulz
A2	Flame synthesis of nano-particles at reduced pressure	Chr. Schulz
A4	Fabrication of nano-particles in microwave, wall and laser heated reactors	M. Winterer
A5	Modeling of particle formation in wall and laser heated reactors	D. Hänel
A6	Molecular dynamics simulations on the nucleation and growth of nano-particles	P. Entel
A7	Fabrication of mono-disperse semiconducting nano-particles in the gas-phase	F.E. Kruis
B1	Physical and chemical characterization of nano-particles on surfaces	G. Dumpich J. Kästner
B2	Simulation of the structural and magnetic properties of metallic and semiconducting nano-particles	P. Entel
B4	Theory and computer-simulation of changes in morphology and texture	D. Wolf
B9	Spectroscopic characterization	C. Meier A. Lorke
B 10	In situ investigations on charge transport processes in nano-particles and nano-composits	H. Wiggers A. Lorke
B 12	Collective and intrinsic magnetism of size selected nano-particles	M. Farle
B 13	Time resolved and magneto-optical spectroscopy of nano-particles	G. Bacher
C1	Nano-structured functionalized materials for sensor applications	F.E. Kruis
C2	Numerical simulation of particle transport and deposition on complex surfaces	D. Hänel
C3	Nano-particles on/in epitaxial heterostructures	F.-J. Tegude W. Prost
C4	Surface modification of nano-particles	Chr. Mayer M. Acet
K	IGERT cooperation	F.E. Kruis



● Speaker of the SFB 445

Prof. Dr. Axel Lorke

Universität Duisburg-Essen
Experimentalphysik
Lotharstr. 1 / ME 245, D-47048 Duisburg

E-Mail : axel.lorke@uni-due.de

Tel. : +49 (0) 203 379-3265

FAX : +49 (0) 203 379-2709

● Vice Speaker of the SFB 445

Prof. Dr. Markus Winterer

Universität Duisburg-Essen
Institut f. Verbrennung und Gasdynamik
Lotharstr. 1 / MA 345, D-47048 Duisburg

E-Mail : markus.winterer@uni-due.de

Tel. : +49 (0) 203 379-4446

FAX : +49 (0) 203 379-4453

● Secretary

Rosa Abts

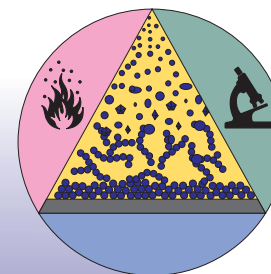
Universität Duisburg-Essen
Sekretariat des SFB 445
Lotharstr. 1 / ME 251, D-47048 Duisburg

E-Mail : rosa.abts@uni-due.de

Tel. : +49 (0) 203 379-3155

FAX : +49 (0) 203 379-2709

SFB 445



Nano-particles from the gasphase: Formation, Structure, Properties

Collaborative Research Centre of the
Deutsche Forschungsgemeinschaft

funded since January 1999

Electrical
Mechanical
Physics

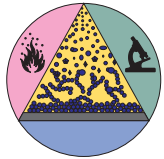
Electrical
Mechanical
Physics

Physics

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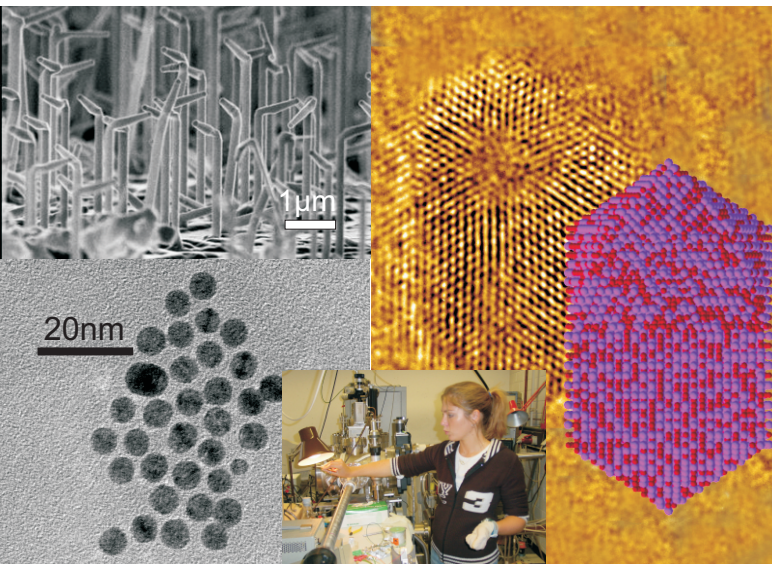
„Nano-particles“

The properties of nano-particles are fundamentally different from those of the corresponding bulk material:

- With decreasing particle size a larger and larger fraction of the material is exposed to the surface, which has far-reaching consequences for its mechanical, thermal and chemical properties.
- Because of the reduced dimensions, quantum effects are beginning to play an important role, affecting the optical, electronic and magnetic properties
- The vast amount of accessible surface makes nano-particles ideal candidates, e.g., for catalysis and gas sensors

The dependence of the particle properties on shape and size makes it possible to fabricate novel materials with tailored features and qualities.

Synthesis routes from the gas phase can because of the absence of interaction with surrounding material satisfy the highest purity requirements. The production processes are scalable and thus applicable in an industrial environment



Electrical engineering
Mechanical

Physics

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Research aims of the SFB 445:

- Investigation of the process of formation of nano-particles in the gasphase
- Kinetic of precursor reactions
- Reactive fabrication of nano-particles in flames, plasmas and laser reactors, and non-reactive particle-generation
- Modelling based on Continuum-approaches and molecular dynamics-simulations
- Investigations towards the interrelationship between structure and both physical as well as chemical properties of nano-particles
- Investigations of the interaction of nano-particles in particle-agglomerates
- Functionalized materials for sensors
- Encasement and deposition of nano-particles from the gas-phase

Highlights:

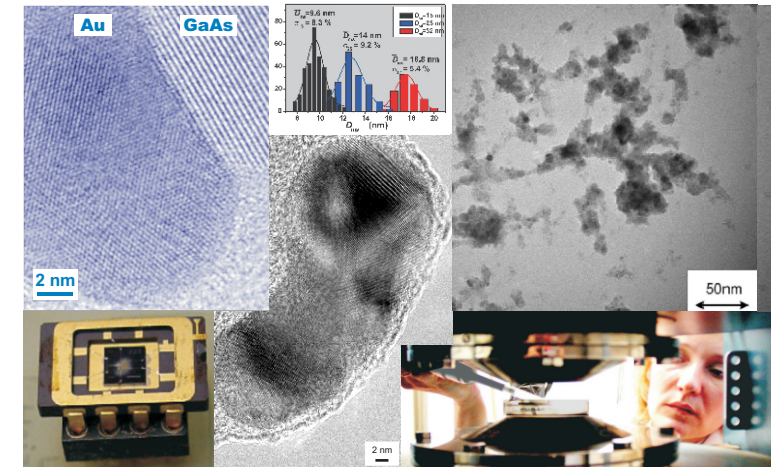
- Infrared properties of silicon nanoparticles (Vasyl G. Kravets et al. *J. Appl. Phys.* 97, 084306 (2005))
- High ac-voltage sensitivity of a quartz needle sensor used in noncontact scanning force microscopy (C. Hartmann et al. *Applied Physics Letters* 87, 214104 (2005))
- One-dimensional assemblies of silica-coated nanoparticle: Magnetic pearl necklaces (Verónica Salgueirino-Maceira et al., to be publ. *JMMM* (2006))
- Large scale synthesis of optically active silicon nanoparticles
- Gold nanoparticle-induced growth of InGaAs Whiskers
- Realization of the first aerodynamic lens for nanoparticles and cluster beams (US patent 11/269,932 pending)
- Development of nanoparticle-based gas sensor structures with high sensitivity.

Activities:

- Education of PhD students through special lectures and summer schools
- Seminars and Colloquia on latest topics of the SFB
- Organization of international workshops/symposia
- Consulting on applications regarding nanotechnology, magnetism, particle thin films and nano-materials

for latest news and announcements see:

<http://sfb445.uni-due.de/>



„Nano-particles from the gasphase“

- Formation, Structure, Properties -

This title summarizes the activities of the SFB 445 in the field of **nano-materials**. About 50 researchers are investigating the **targeted synthesis** of tailored nano-materials, their **physical characterization** as well as their **innovative application** in electrical engineering, catalysis and sensor technology. This way, the SFB 445 bridges different fields of basic and applied research in nano-technology.

Emphasis is put on an interdisciplinary approach. Researchers from Physics, Mechanical Engineering and Electrical Engineering are jointly investigating the diverse and fascinating properties of nano-particles.

Funding for the SFB 445 through the Deutsche Forschungsgemeinschaft started in 1999. In 2005, the third funding period started, with a total budget of 4.5 Million Euro



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