

Bachelor thesis Master thesis Project thesis

Electron microscopic images of particles with various shapes



Simulation of the intensity distribution of light scattered by a particle



Contact:

Simulation of absorption and scattering properties of nanoparticle aggregates with Discrete Dipole Approximation (DDA)

| Supervisor: | Simon Aßmann |
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| Start: | Now |
| Topic: | Optical metrology |

The central research topic of the working group "Particle Measurement" of the Institute of Engineering Thermodynamics (LTT) is the investigation of nanoparticle synthesis with laser-based measurement techniques, aiming to influence the formation process systematically by choosing suitable boundary conditions.

Hetero-particles consist of two or more different materials and are gaining increasing importance, as the interfacial contact (hetero-contact) can alter the physical properties of the particles. The absorption and scattering of light by nanoparticles are dependent on their size, shape and material. Measurement techniques such as absorption spectroscopy can thus be used for material characterization, while light scattering allows the determination of particle size and shape. The calculation of absorption and scattering properties by simulation is particularly important for complex material systems, for example, to optimize experiments or interpret measurement results.

This research includes:

- initial calculations of scattering (including the angular resolution) and absorption of simple homogeneous spheres using nanoDDSCAT+, an open-source program for light scattering simulation,
- the extension to spherical dimers and mixed systems,
- the investigation of the optical properties of the material regarding scattering and absorption, taking into account the particle shapes,
- comparison with established light scattering theories (e.g., Mie theory).

Applicants should be interested in programming, simulation, and modeling, and possess the ability to work independently. Experience and prior knowledge in the field of optics are advantageous but not mandatory.

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