

Master Thesis:

Nanocomposite materials characterization with Optical Coherence Tomography

Despite about two decades of intense research on nanostructured materials, the theoretical benefits of this special material class have not yet been fully exploited in industrial products. For the analysis of nanostructured polymers in industrial production environment optical coherence tomography (OCT) can be used. Mathematical models have been developed that describe light propagation in scattering media. The coherent detection principle allows for the detection of scattered light with a high sensitivity of more than 100 dB. The Mie calculations applied to a single scattering model can be used to estimate the size of the particles, provided that they are in the range of hundreds of nanometres.

Your tasks:

- Improvement of existing fiber-based OCT setup
- Automatization of the setup operation in LabView
- Performing OCT analysis of different nanostructured polymer materials.

The thesis comprise theoretical investigation of novel approaches for highly sensitive OCT as well as experimental work in the lab.

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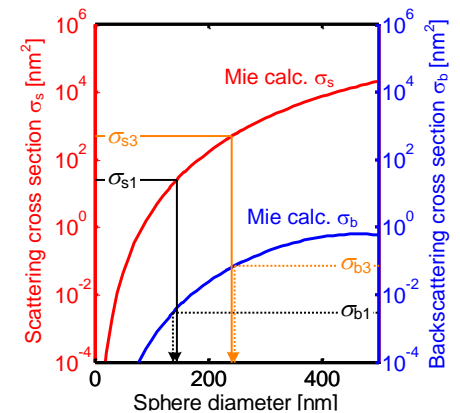
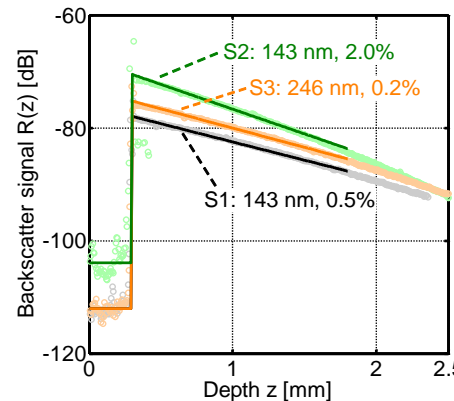
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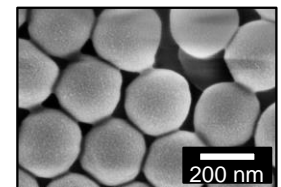
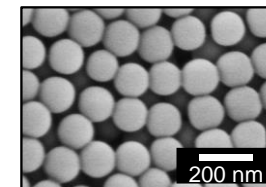
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| | Particle conc. | Nominal size | Size derived from | |
|----|----------------|--------------|-------------------|------------|
| | | | σ_s | σ_b |
| S1 | 0.5% | 143 nm | 146 nm | 138 nm |
| S2 | 2.0% | 143 nm | 146 nm | 146 nm |
| S3 | 0.2% | 246 nm | 241 nm | 246 nm |



Size determination of sub-wavelength nanoparticles with OCT. [1]

[1] Schneider, S. *et al.* Multiscale dispersion-state characterization of nanocomposites using OCT. *Sci. Rep.* **6**, 31733