Correlative Analysis of Nanostructured Materials

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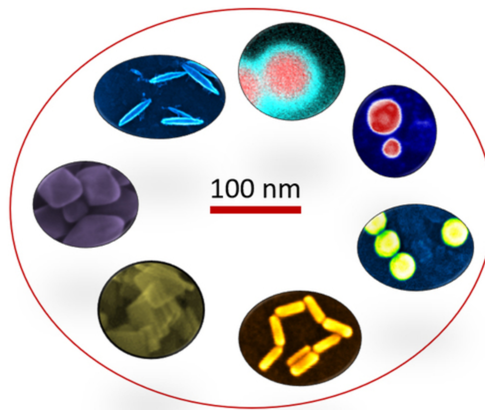
Newly developed methodical approaches with an emphasis on correlative analysis of morphology and chemistry of nanomaterials will be presented. Correlative imaging by STEM-in-SEM with high-resolution SEM and EDS, and further with AFM, or with the new technique TKD (Transmission Kikuchi Diffraction) will be explained on various examples of nanostructures, both as starting materials and as embedded/functionalized nanoparticles in products [1]. The unique analytical benefits of the Auger electron probe as a veritable nano-tool for the surface chemistry will be highlighted. Examples of hybrid analysis of the bulk of nanomaterials by X-ray Spectroscopy and the highest surface-sensitive methods XPS and ToF-SIMS as advanced surface characterization methods available in the Competence Centre nano@BAM [2] will be offered. Particularly for the spatially resolved analysis of the chemistry of nanostructures, such in-depth and lateral gradients of chemistry within mesoporous thin layers, or the completeness of the shells of core-shell nanoparticles, the latter methods are inherent.



Other dedicated developments like approaches for the quantitative determination of the porosity of thin mesoporous layers by electron probe microanalysis (EPMA) with SEM or for the quantitative determination of the roughness of particle surface by electron microscopy will be also presented.

[1] V.-D. Hodoroaba, W. E. S. Unger, A. G. Shard, *Characterization of Nanoparticles*, Elsevier, **2020**.
[2] www.bam.de/Content/EN/Standard-Articles/Topics/Materials/nano/nanocharacterization.html