AEROSOL MEASUREMENTS AND MODELLING AT CZECH METROLOGY INSTITUTE,INTRODUCTION OF AEROMET PROJECT

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INTRODUCTION

This contribution will introduce a broad spectrum of activities concerning aerosol particle(s) measurements at Czech Metrology Institute (CMI). The first part of the presentation will describe current research topics on aerosols:

- Nanometrology instrumentation, especially Atomic Force Microscopy (AFM) measurements of regular and non-regular aerosol particles, data evaluation in Gwyddion software, modelling of particles, e.g. creation of virtual images and simulations of AFM measurements;
- Research focused on light scattering experiments of individual particles and outputs from software for modelling of light scattering on spherical particles;
- Employment of 3D printed parts for aerosol measurements, introduction of 3D printed enclosure for cheap particle sensor;
- Notes on ISO 21501 standard.

The second part of the presentation will introduce AEROMET project in general and activities of CMI within this project, especially numerical support for X-ray standing wave based measurements and development of GPU based geometrical optics solver for X-ray standing wave calculations and preprocessor for creating complex and more realistic particle geometries.

EXPERIMENTAL SETUP

Samples for AFM measurements were particles dispersed on microscope slide in water that was later evaporated. Particles used are following: (i) polymer spherical particles, (ii) gold nanorods, (iii) pollen particles. AFM measurements were performed using Bruker Icon instrument, experiment mode: PeakForce QNM in Air, used probe: ScanAssystAir. The measured data were evaluated using Gwyddion software (http://gwyddion.net).
FDTD solver Gsvit (http://gsvit.net) was used for near-field optics phenomena calculations.

RESULTS AND CONCLUSIONS

thresholding, low value   thresholding, high value   watershed, default operation   watershed + height filtering
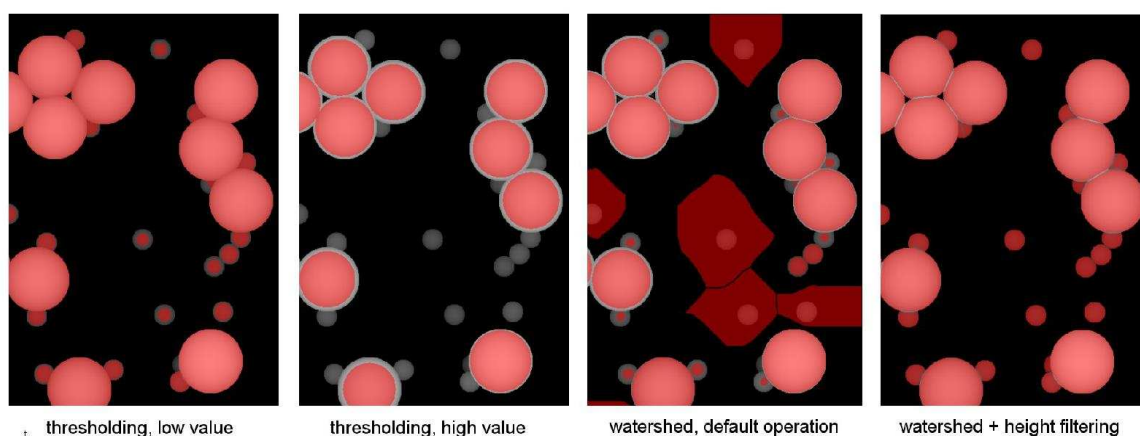
Fig. 1: Example of numerical simulation output and analysis of polydisperse particles: various options for segmentation.

Results of measured AFM data of spherical and non-spherical particles evaluated in Gwyddion software will be presented. Outputs of AFM data processing and their evaluation will be presented for comparison with real AFM measurements as well (see four images in Fig. 1 as an example of polydisperse particles modelling).

ACKNOWLEDGEMENT

REFERENCES

AEROMET PROJECT official webpage: http://www.aerometproject.com/
Open Source FDTD Solver http://gsvit.net
Gwyddion Free SPM analysis Software http://gwyddion.net