



Quantitative characterization of synthetic amorphous silica nanomaterials dispersed in different media by transmission electron microscopy



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Quantitative characterization of synthetic amorphous silica aggregates and agglomerates

A quantitative method based on TEM is developed by studying SAS NM dispersed in water in their most disperse form. The SAS NM are prepared using the generic NANOGENOTOX dispersion protocol which was developed for preparation of general batch dispersions for *in vitro* and *in vivo* toxicity testing. Application of the method allowed characterization of SAS NM in different media, used for *in vitro* and *in vivo* toxicity testing.

Sample preparation

Four different media were tested, illustrated in Figure 1:

- Distilled Water
- Phosphate buffered Saline (PBS)
- PBS containing 10 vol% of fetal calf serum (FCS)
- Water containing 0,05 % bovine serum albumin (BSA)

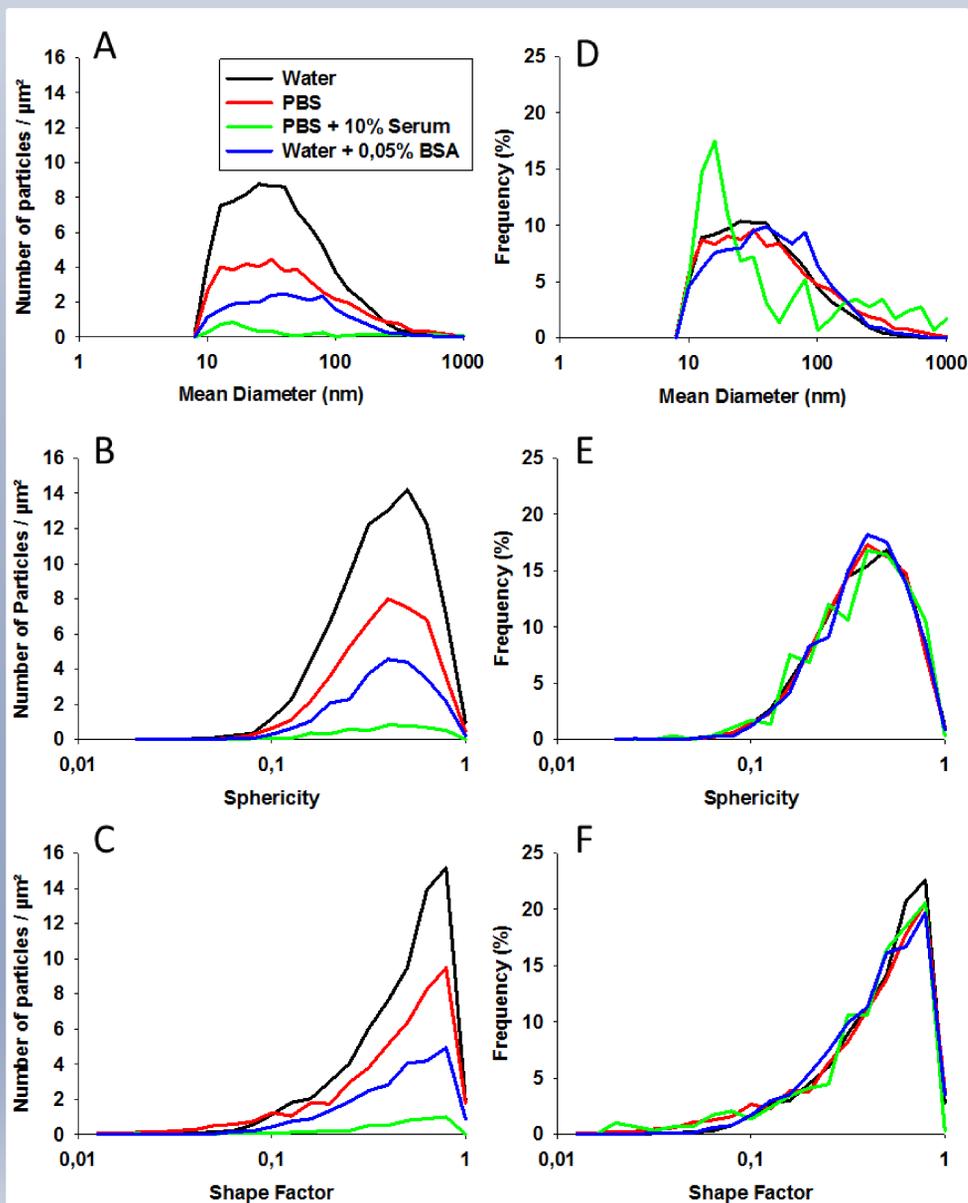


Figure 2. Number of particles / μm^2 (A,B,C) and the frequency in % (D,E,F) of SAS prepared in distilled water (Black), PBS (Red), PBS with 10% FCS (Green) and in double distilled water with 0,05% BSA (Blue) based on their mean diameter (A,D); sphericity (B,E) and shape factor (C,F).

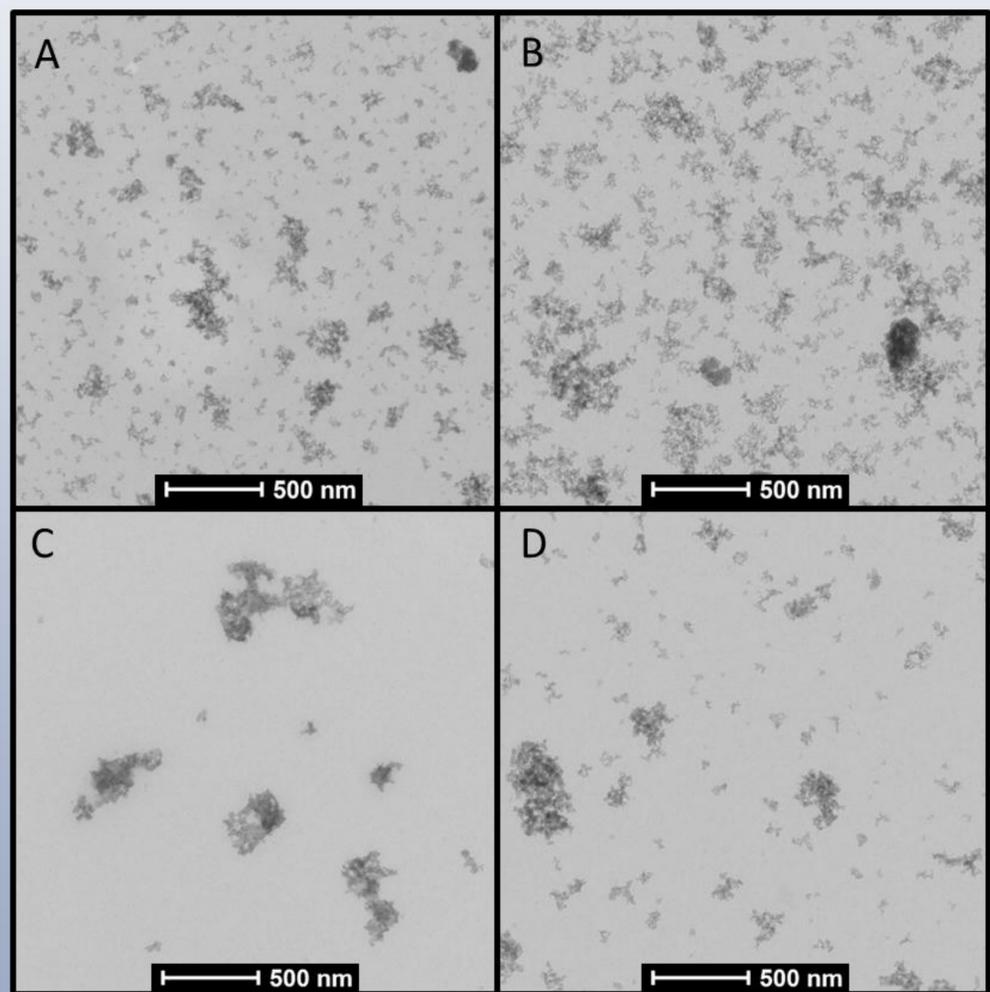


Figure 1. Representative TEM micrographs of SAS prepared in double distilled water (A), PBS (B), PBS with 10% Bovine serum (C) and in double distilled water with 0,05% BSA (D). Bar 500 nm.

Characterization by semi-automatic image analysis

Quantitative measurements:

- Size represented by 'Mean diameter'
- Shape represented by 'Sphericity'
- Surface topology represented by 'Shape factor'

Graphs in Figure 2 clearly show that:

- The number of particles per grid area decreases with adding proteins and salts in the dispersion medium.
- The strongest agglomeration was observed for the combination of PBS and FCS
- There is a small shift in the frequency based size distribution while the frequency based distributions for sphericity and shape factor remain unchanged.

Conclusion

A combination of TEM imaging and semi-automatic image analysis contributes to a detailed characterisation of dispersed NM in different media

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