

Supporting information

Layer-by-Layer Oxidation for Decreasing the Size of Detonation Nanodiamond

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Accuracy of SAXS measurements of particle size distributions of ND powders

To investigate the applicability of the derived SAXS method for calculating particle size distributions of ND powders, preliminary studies were performed. To account for measurement errors (e.g. fluctuating beam intensity, statistical errors, other influences), a sample of ND was prepared once and characterized 35 times. Figure S1 shows all obtained data points overlaid (red squares) and the black dotted line representing the average of all data points collected. In addition, the resulting standard deviations of all 35 measurements (black diamonds) were plotted. The collected data shows almost no fluctuation, also indicated by the small relative standard deviations.

To check the influence of sample inhomogeneity and sample preparation, four different samples of the same batch of ND were prepared and characterized. The results of these measurements are given in Figure S2, together with the average (dotted line) and the standard deviation (black diamonds). The data clearly shows slight fluctuations in intensity and curvature between the different samples.

The influence on the derived particle size distributions cannot be deduced directly from the scattering data. Figure S3 gives the resulting particle size distributions for the four measurements (color lines) together with the average (black). With high precision, the peak maxima of the distributions arise at the same position, around 4.3 nm resulting in a very low standard deviation σ of 0.032 nm. Additionally, the width of the peaks is also similar. Thus, the applied SAXS method can accurately monitor particle size changes of ND, especially if the maxima of the particle size distribution are compared.

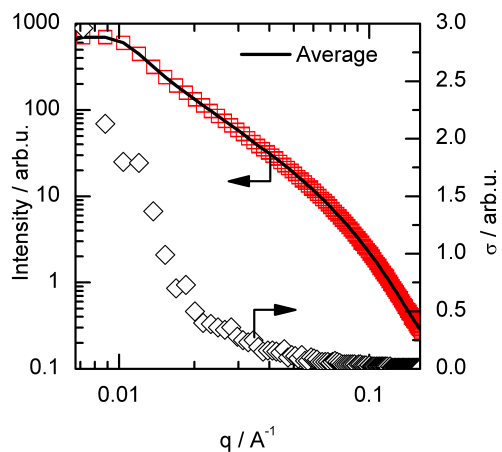


Figure S1: Intensity over q plot for 35 measurements of the same spot (red squares) and the resulting average (black dotted line) as well as the calculated standard deviation (black diamonds).

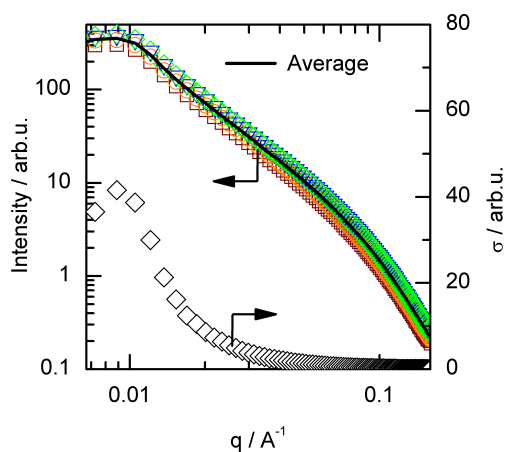


Figure S2: Intensity over q plot for four reproducibility measurements of the same batch of ND.

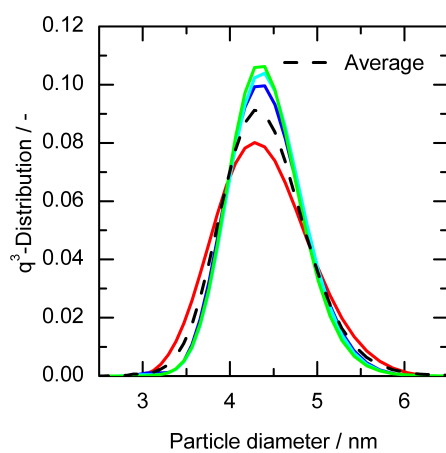


Figure S3: Resulting particle size distribution for four reproduction measurements of the same batch of ND.