Supporting information for: Thermal dynamics of pulsed-laser excited gold nanorods in suspension

Anton Plech,[*,†] Shyjumon Ibrahimkutty,[†,¶] Stefan Reich,[†] and Gemma Newby[‡]

†*Institute for Photon Science and Synchrotron Radiation, KIT Karlsruhe, Germany*

‡*ESRF, BP 220, F-38043 Grenoble*

¶*current affiliation: MPI for Solid State Science, Stuttgart, Germany*

E-mail: anton.plech@kit.edu

Supplementary materials

Gold nanorods synthesis

Nanorods have been synthesized according to the recipe by Ye et al.,.[1] A suspension of 0.5 mM gold hydrochloride (Chempur) was mixed with 9.5 g CTAB (Roth) at 50 °C. After addition of 7.8 ml silver nitrate (10 mM, Aldrich) and 1.8 ml chloric acid (30 %) and 1.7 ml sodium ascorbate (50 mM) the solution was stirred until getting clear at 30 °C. Upon rapid addition of the seeds (5ml CTAB of 200 mM with 5 ml gold hydrochloride, 1 mM reduced by 0.6 ml $NaBH_4$ (12 mM))and rapid stirring for 2 minutes the PE bottle was transferred to a heat bath (30 °C) and reacted for 15 hours. Further addition of sodium ascorbate increased the extinction and led to a blue shift of the SPR, which indicated a reduction of the aspect ratio by overgrowth.

The final suspension was centrifuged twice by replacing the supernatant by ultrapure water (Millipore Systems).

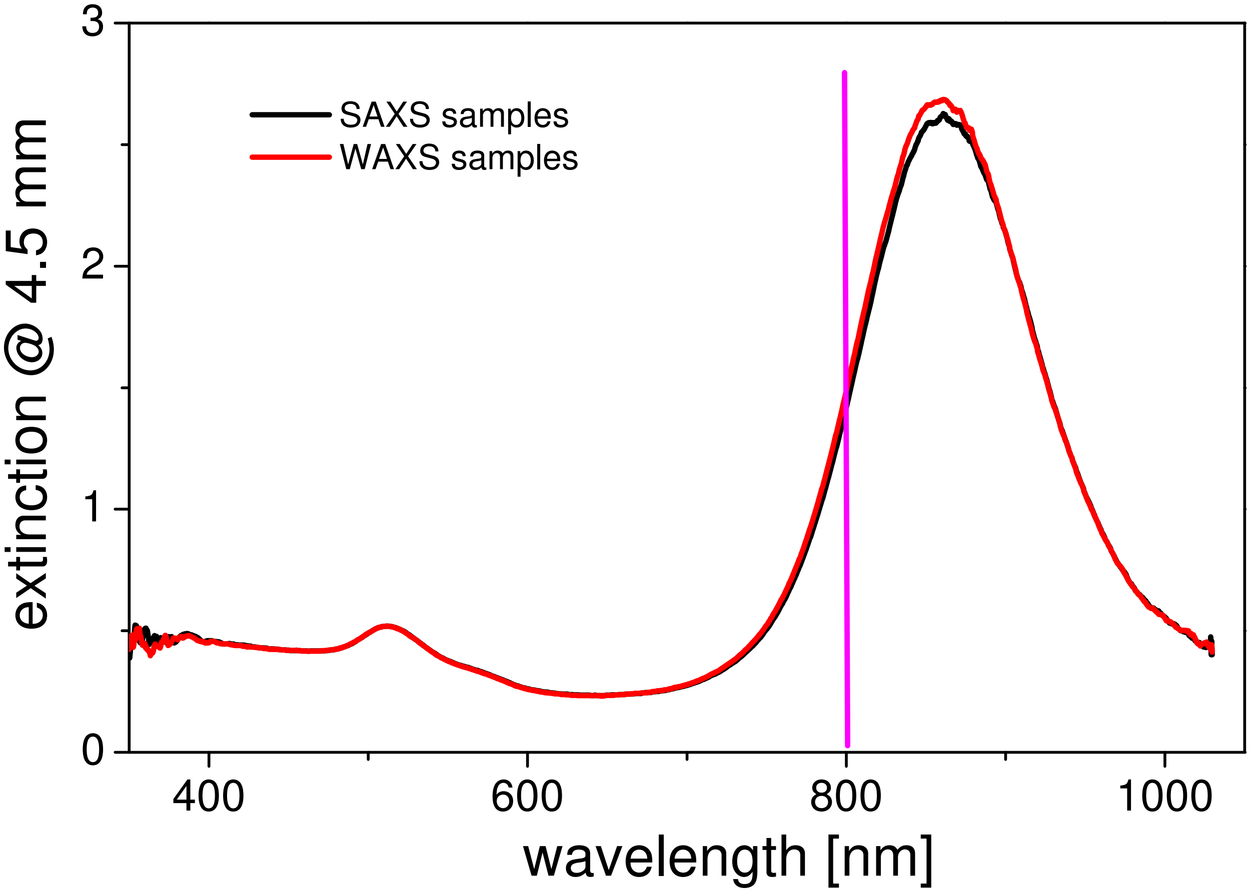

Figure 1: (Supplement) Optical Extinction of the centrifuged nanorods suspensions for a cuvette thichness of 4.5 mm. The vertical line marks the laser wavelength

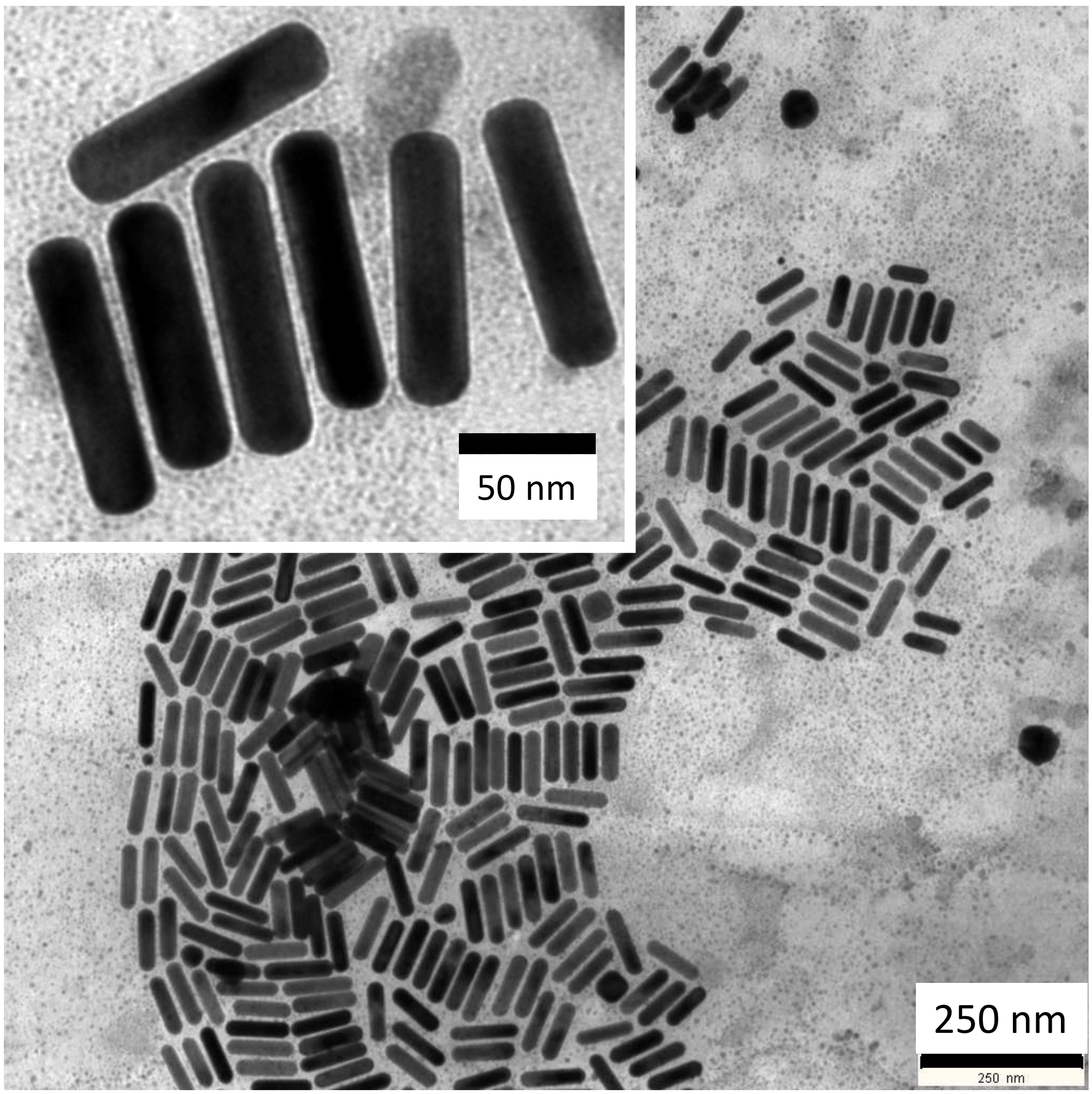

Figure 2: (Supplement) TEM images of SAXS samples.

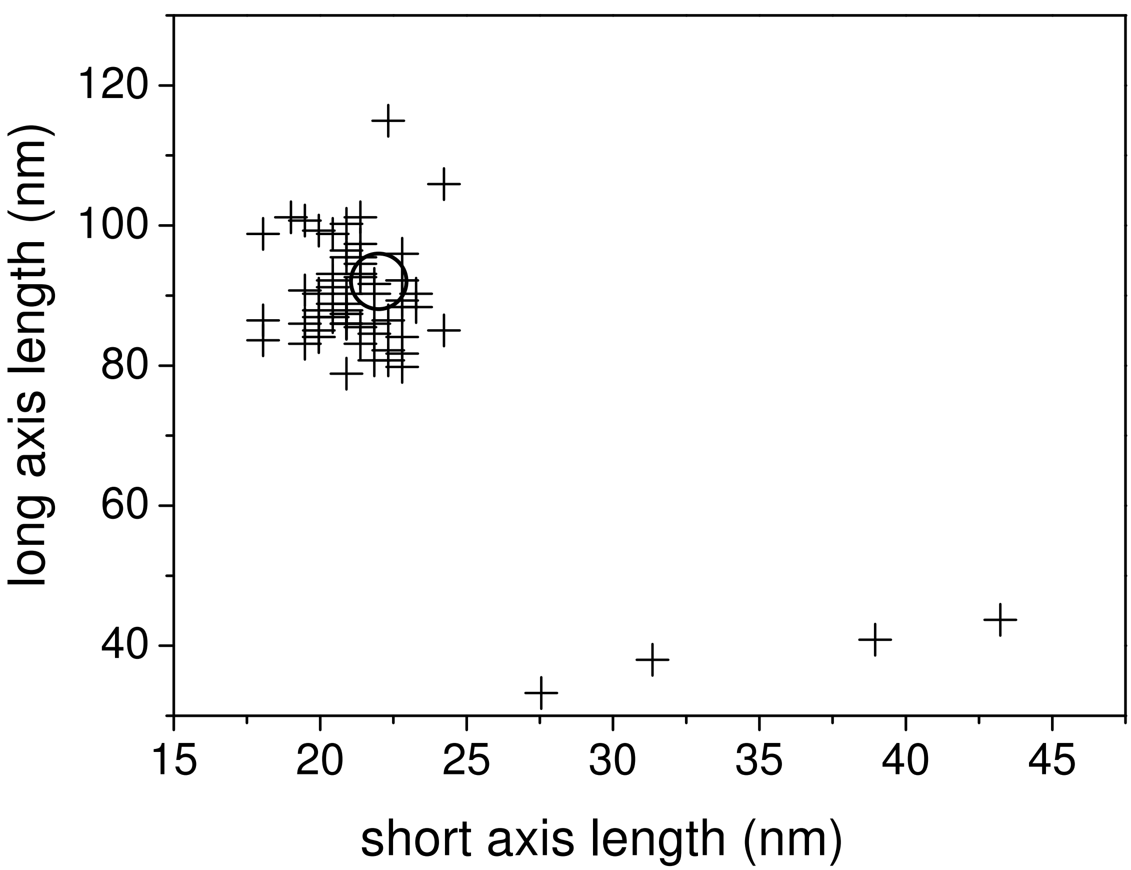

Figure 3: (Supplement) Size analysis of SAXS samples. Size of long and short axis of several TEM images were analysed by ImageJ[2] and compared to the result from SAXS analysis (open circle).

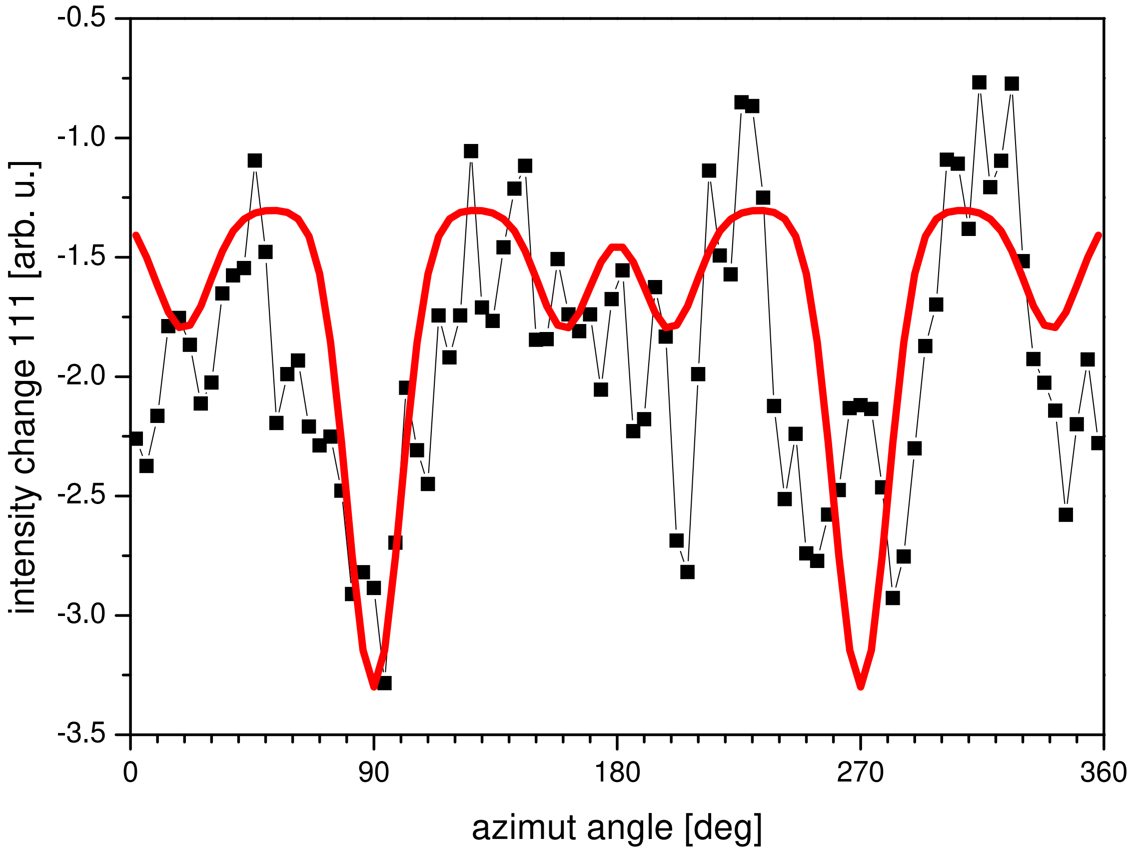

Figure 4: Supplement: Azimuthal reduction of powder ring intensity of the (111) ring (90 degrees represents the parallel direction). The full line represents a model with single crystalline rods oriented along a ¡111¿ direction parallel to the long axis.

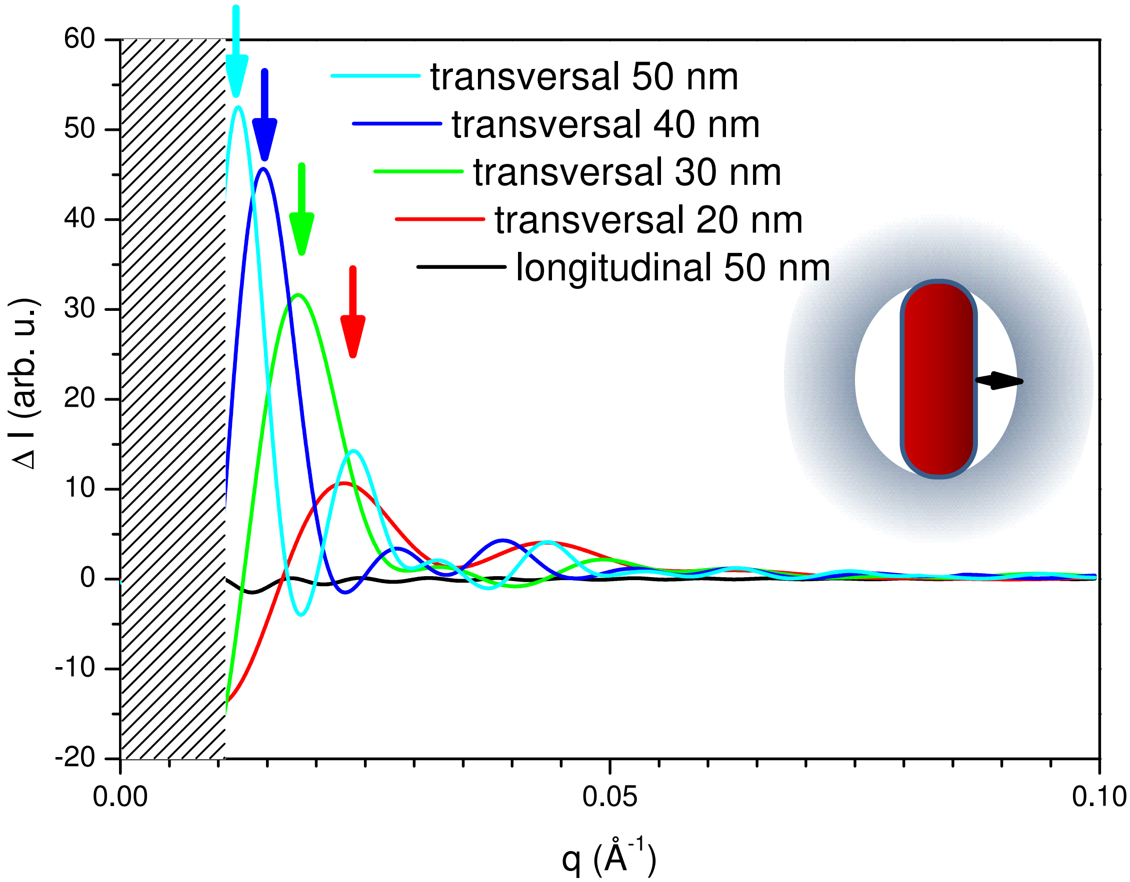

Figure 5: (Supplement) SAXS simulation of the difference intensity ($\Delta S \cdot q^2$) for a vapor bubble growing around an excited nanorod with preferential growth in the transversal direction (bubble gets more spherical). While the radial change of SAXS intensity parallel to the rod axis is negligible, the transversal change shows a characteristic maximum that shifts towards smaller scattering vector q for larger bubble. The hatched region is not accessible because of the beam stop.

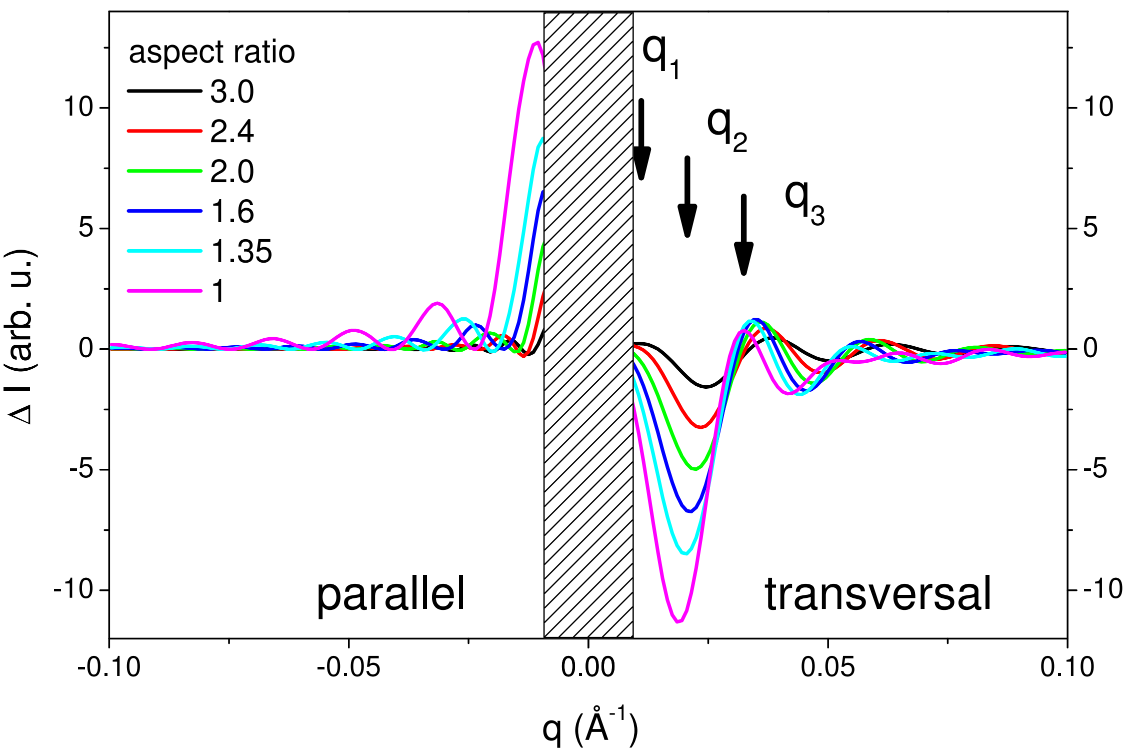

Figure 6: (Supplement) SAXS simulation of the difference intensity ($\Delta S \cdot q^2$) for for a gradual transformation of a nanorod into a sphere via prolate ellipsoidal intermediate states characterized by the aspect ratio. The parallel direction is plotted for pseudo-negative q values, the transversal direction for positive q values. The arrows mark the characteristic q positions that are indicative of the trasnformation: q_1 signal rise due to a shift of the radius of gyration to lower q values, q_2 depletion of the initial transversal rod scattering and q_3 rise of the signal of final spherical particles.

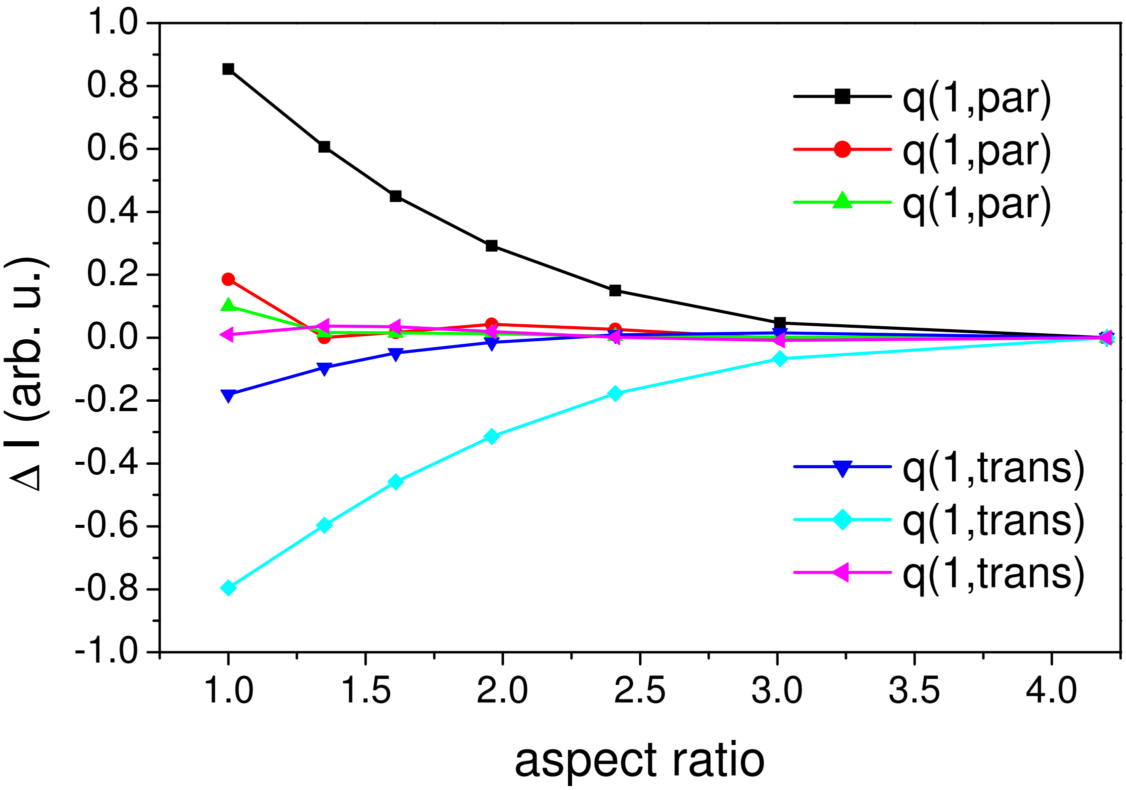

Figure 7: (Supplement) Simulation of difference scattering at the selected q values in fig. 6. The strongest change on aspect ratio is seen on $q_{1,p}$ and $q_{2,t}$.

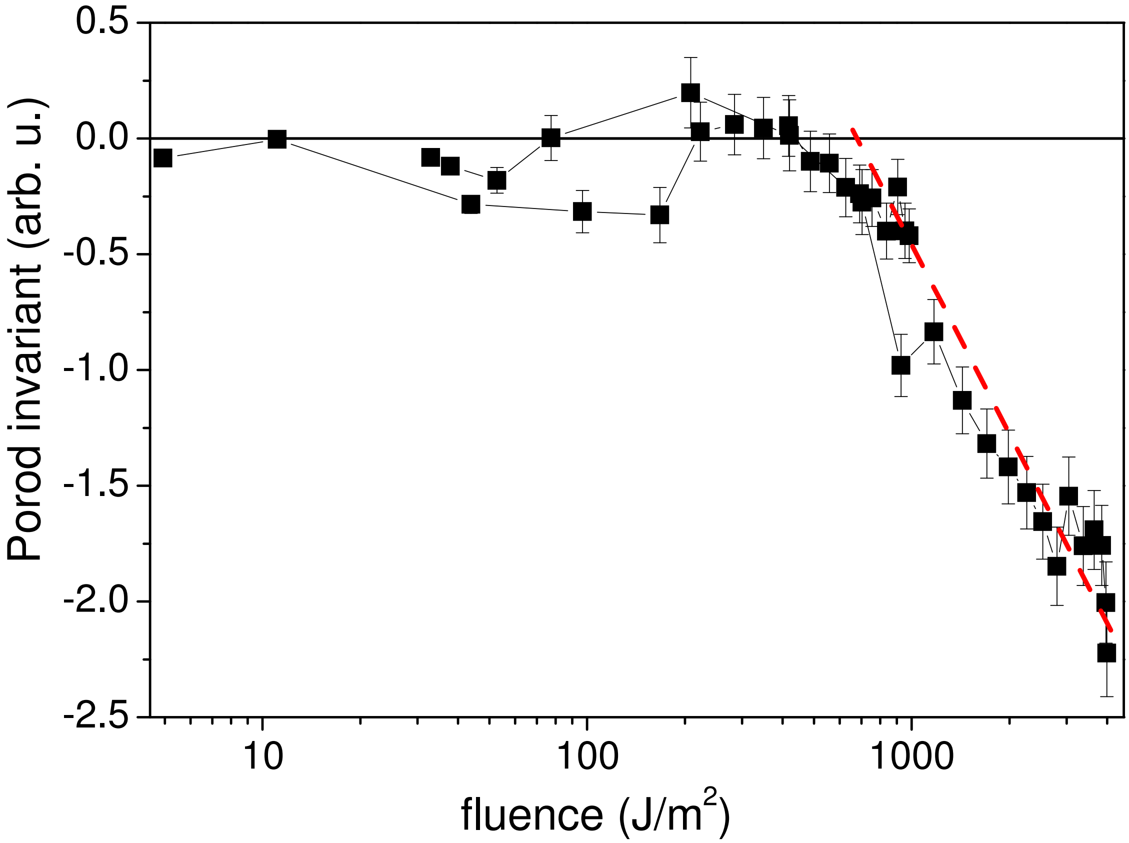

Figure 8: (Supplement) Invariant P= $\int_0^\infty \Delta$ S(q)$\cdot$q^2 dq of the SAXS difference scattering as function of fluence at 0.5 μs delay. The dashed line indicated the size reduction.

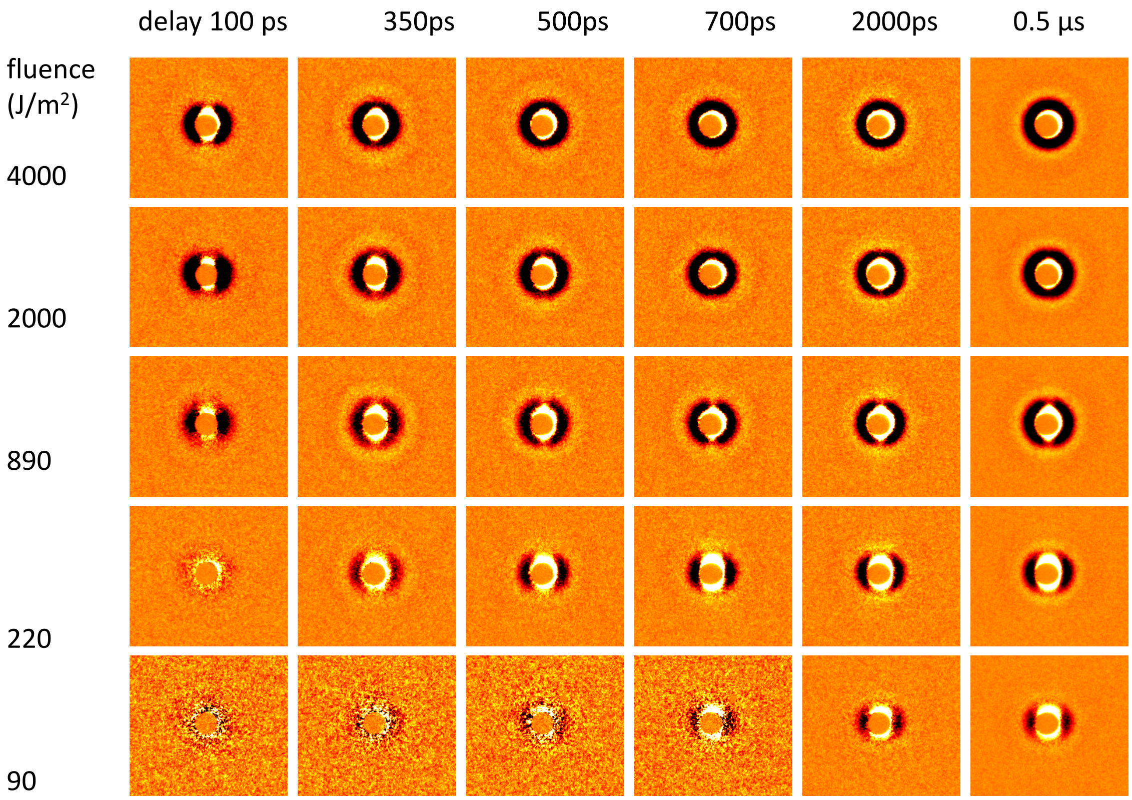

Figure 9: Supplement: SAXS difference intensity images as function of the delay 100 ps, 350 ps, 500 ps, 750 ps, 2 ns and 0.5 μs(horizontal) and laser fluence 90, 220, 890, 2000 and 4000 J/m^2.

References

(1) Ye, X.; Zheng, C.; Chen, J.; Gao, Y.; Murray, C. B. *Nano Lett.* **2013**, *13*, 765.

(2) ImageJ - Image Processing and Analysis in Java. http://imagej.nih.gov/ij/index.html; National Institutes of Health, USA.