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Annemarie Nack, Julian Seifert, Christopher Passow and Joachim Wagner

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Hindered nematic alignment of hematite spindles in poly-N-isopropylacrylamide hydrogels: a Small Angle X-ray Scattering and Rheology study – Supplement

Annemarie Nack,[a]* Julian Seifert,[a] Christopher Passow[b] and Joachim Wagner[a]

[a]Institut für Chemie, Abteilung Physikalische Chemie, Universität Rostock, Albert-Einstein-Str. 3 a, 18055 Rostock, Germany, and [b]Deutsches Elektronen-Synchrotron (DESY), Notkestrasse 85, 22607 Hamburg, Germany. Correspondence e-mail: joachim.wagner@uni-rostock.de

1. Comparison of Boltzmann approch and phenomenological approach for the orientational distribution function

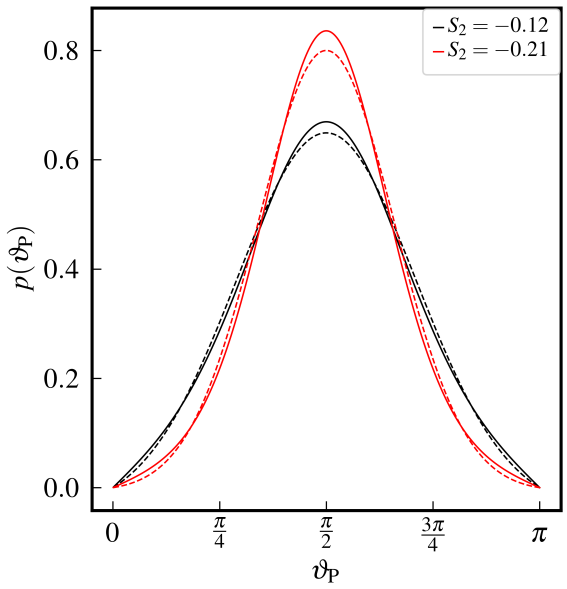

Figure S-1
Comparison of the phenomenological ODF (5) (solid lines) and a Boltzmann approach (2) with only a Zeeman contribution ($\Delta\chi = 0$, dashed lines) leading to identical order parameters $S_2 = -0.12$ and $S_2 = -0.21$, respectively. Due to the normalization, despite different angular dependencies, similar distribution functions result, which lead within experimental accuracy to identical scattering patterns.

2. Influence of a polydispersity of the aspect ratio to the scattering function of spindle-shaped particles

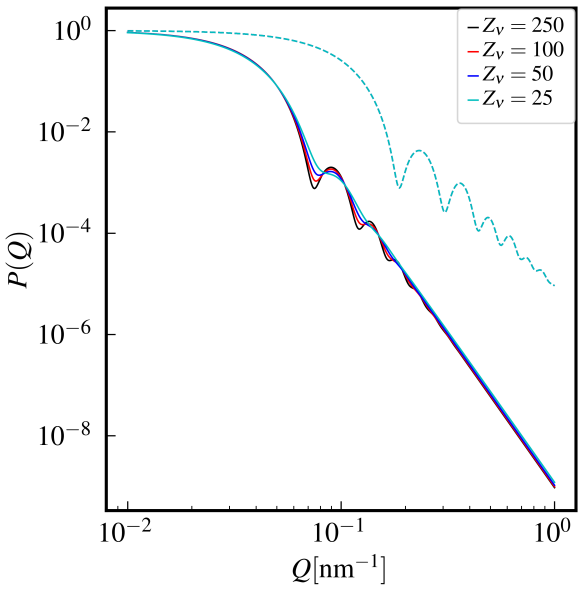

Figure S-2
Form factors of spindle shaped particles with an equatorial diameter of $\sigma_{eq} = 50$ nm with a polydispersity of equatorial radii of $p_\sigma = 0.05$ a mean aspect ratio $\nu_0 = 3$ and different polydispersities of aspect ratios p_ν. The direction of the scattering vector parallel to the particle axis ($\vartheta_Q = 0$) is represented by solid lines, while the direction perpendicular to the scattering vector ($\vartheta_Q = \pi/2$) is represented by dashed lines. The form factors for $\vartheta_Q = \pi/2$ are practically independend from the distribution of aspect ratios. The physical reason is that the aspect ratio does not significantly influence the distribution of column lengths along the short particle axis. The different asymptotic power laws of both directions are analyzed in (Märkert *et al.*, 2011).

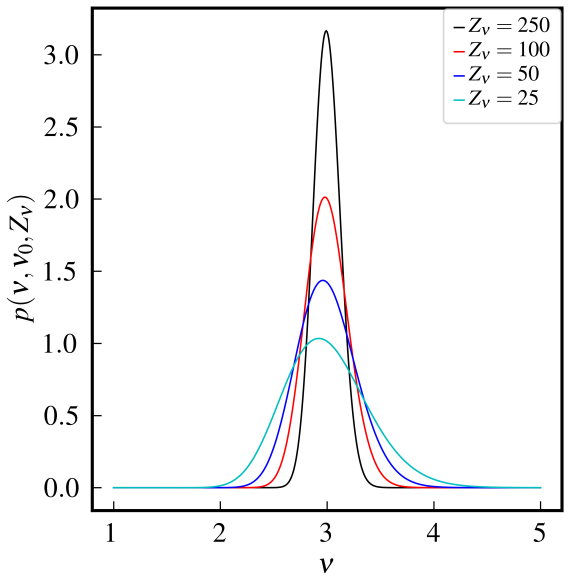

Figure S-3
Distribution of aspect ratios used to calculate the form factors in Fig. A2. The distribution functions are modified Schulz-Flory distributions normalized in $[1, \infty[$. The parameters Z_ν correspond to relative polydispersities of $p_\nu = 1/(Z_\nu + 1)^{1/2}$.

3. Scattering cross sections of composites with spindle-shaped hematite particle in pNIPAM hydrogels and pure pNIPAM hydrogels

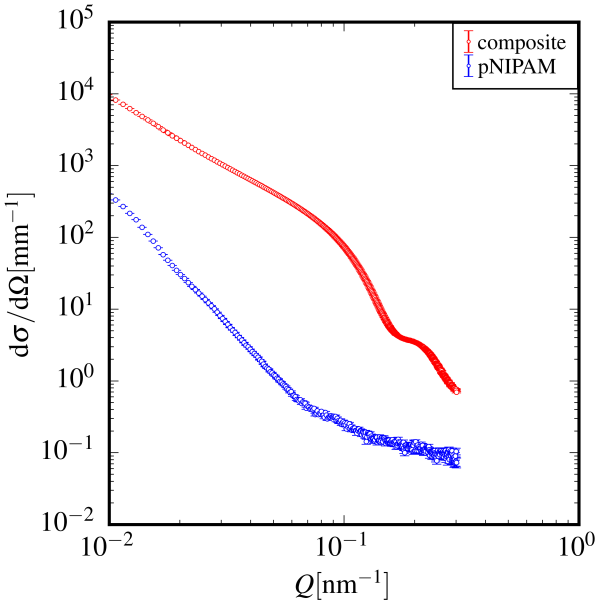

Figure S-4
Radial averaged scattering cross sections of a hematite-pNIPAM composite (red) and the corresponding pNIPAM matrix (blue) without external field. The intensities of both are corrected with the background of a water filled capillary. Despite the small volume fraction of hematite particles, the intensity scattered of the composite is around two orders of magnitude larger than that of the matrix.

References

Märkert, C., Fischer, B. & Wagner, J. (2011). *J. Appl. Crystal.* **44**(3), 441–447.
URL: *http://dx.doi.org/10.1107/S0021889811009617*