Electronic Supplementary Information: second virial determination for lysozyme solutions

Phase separation and dynamical arrest for particles interacting with mixed potentials - the case of globular proteins revisited

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The second virial coefficient for lysozyme solutions was measured using static light scattering experiments on concentration series of dilute solutions of lysozyme. The light scattering experiments were performed with a commercial goniometer system (ALV/DLS/SLS-5000F mono-mode fiber compact goniometer system with ALV-5000 fast correlator) at a wavelength of 514.5nm and a fixed scattering angle of 90^o, leading to a scattering vector $q = 0.0222\text{nm}^{-1}$. For small globular proteins such as lysozyme this procedure is accurate since the entire q-range accessible with light scattering is in the Rayleigh regime, where the scattered intensity is q-independent. The data were corrected for background (cell and solvent) and converted into absolute scattering intensities - the Rayleigh ratios - using toluene as a reference standard. The refractive indices necessary for calculating the contrast term, which is given by $K = \frac{(2\pi n_0 \frac{dn}{dc})^2}{N_A \lambda^4}$ with n_0 the index of refraction of the buffer, dn/dc the refractive index increment, and λ the wavelength of the scattered light in vacuum, were determined for all solutions with an Abbe refractometer by measuring at three different wavelengths and extrapolating the thus obtained values to 514.5nm. The resulting refractive index increment, dn/dc=0.194mL/g, was found to be temperature and salt independent within an error of 2%. Samples were centrifuged for 20 minutes at 6000g to get rid of any dust particles and carefully checked to avoid crystallization during the measurement. The resulting value for the molecular weight was in agreement with the literature value of 14.4kDa[1,2].

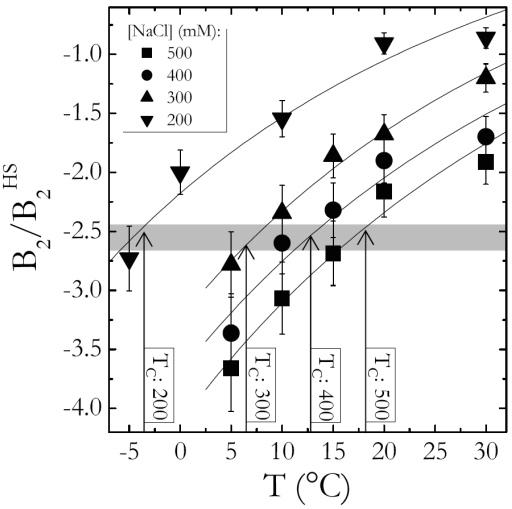

Fig. 1 Temperature dependence of the normalized second virial coefficient B_2/B_2^{HS} obtained from light scattering experiments for different ionic strengths. Lines are guides to the eye. Vertical dotted lines highlight the value of the critical temperature T_c for a given value of the ionic strength.

Figure 1 summarizes the results from our determination of the second virial coefficient B_2 as a function of temperature for four different values of the ionic strength. Here we used the relation $\frac{Kc}{R} = \frac{1}{M} + \frac{2N_A B_2}{M^2}c$, where K is the contrast term, c is the concentration, M is the molecular weight, and N_A is the Avogadro's number, to determine B_2 from the measured Rayleigh ratios R. Plotted in Fig. 1 are the values of the second virial coefficients obtained and normalized by their value for hard sphere, $B_2^{HS} = 2\pi\frac{(\sigma)^3}{3}$. Also shown are the values of the critical temperature T_c for the different salt concentrations. It is interesting to

note that for all salt concentrations investigated, the B_2/B_2^{HS} values at T_c are $B_2^* = -2.55 \pm 0.12$, identical within experimental errors irrespective of ionic strength.

References

1 V. G. Taratuta, A. Holschbach, G. M. Thurston, D. Blankschtein, and G. B. Benedek, J. Phys. Chem. **94**, 21402144 (1990).
2 M. L. Broide, T. M. Tominc, and M. D. Saxowsky, Phys. Rev. E **53**, 6325 (1996).