Supporting information

Diffusion of Nanoparticles in Entangled Poly(vinyl alcohol) Solutions and Gels.

Kavindya K. Senanayake, Ehsan Akbari Fakhrabadi, Matthew W. Liberatore, and Ashis Mukhopadhyay

Fig. S1. Surface plasmon resonance (SPR) absorbance spectra of R=10 nm gold particles in water (closed circles) and in PVA solution (open circles) showed no shift in the peak wavelength indicating no association between the nanoparticles and PVA.

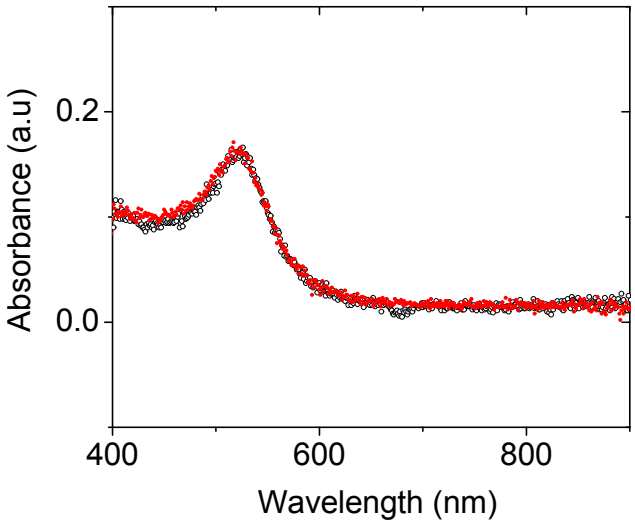

Fig. S2. Elastic and viscous modulus as a function of small amplitude angular frequency. Both moduli increase as the PVA volume fraction increases. The curves are for different volume fractions. Squares: 0.078; circles: 0.112; up triangles: 0.143; diamonds: 0.17; down triangles: 0.2.

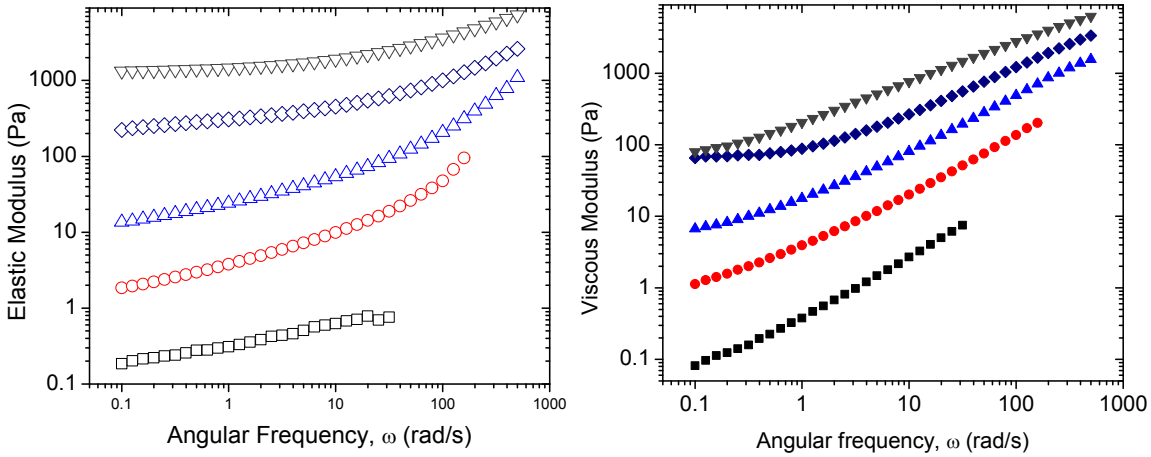

Fig. S3. Complex viscosity as a function of angular frequency shows shear thinning for all samples. The viscosity decreases due to the breakage of hydrogen bonding. The curves are for different volume fractions: Squares: 0.078; circles: 0.112; up triangles: 0.143; diamonds: 0.17; down triangles: 0.2. The solid lines are fitting with the power law model. The fitting parameters are listed in Table S1.

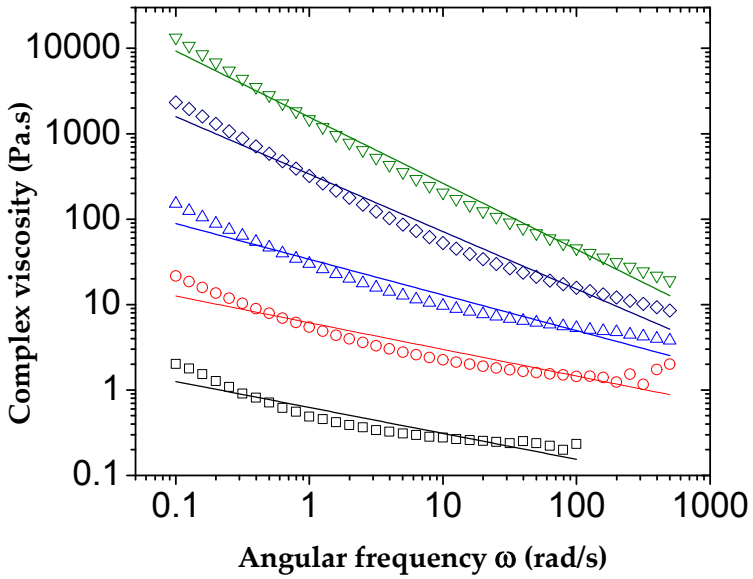

Fig. S4. G″(ω)/ω as a function of angular frequency (ω) for the two lowest concentration samples is shown. G″(ω)/ω is the viscosity at the low frequency limit. Squares: 0.078; circles: 0.112.

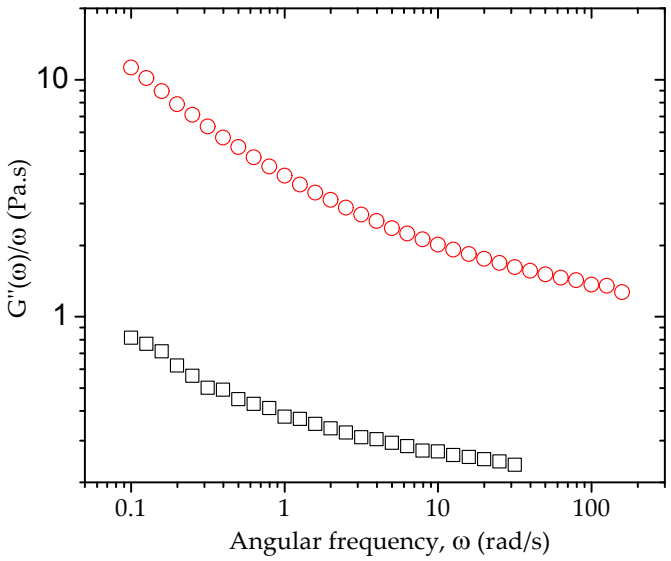

Fig. S5. Stretched exponential fittings of reduced diffusion coefficient, D/D_o vs. volume fraction. The particle sizes are as indicated. The inset shows the exponent (c) as a function of particle radius (R). Except for R=2.5 particles, the exponent for higher particle sizes is not consistent with good-solvent quality of PVA in water.

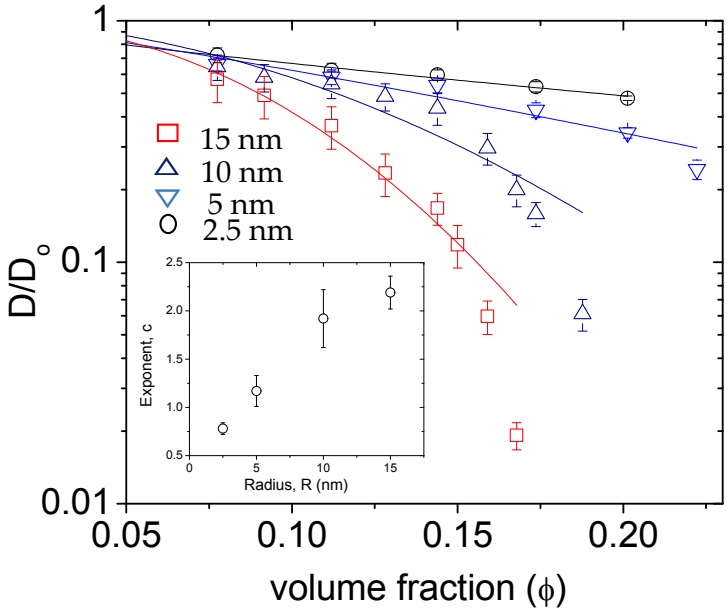

Fig. S6. The friction factor, ζ associated with the additional slowing down normalized by thermal energy is plotted as a function of terminal elastic modulus for R=10 nm (filled triangles) and 15 nm (squares).

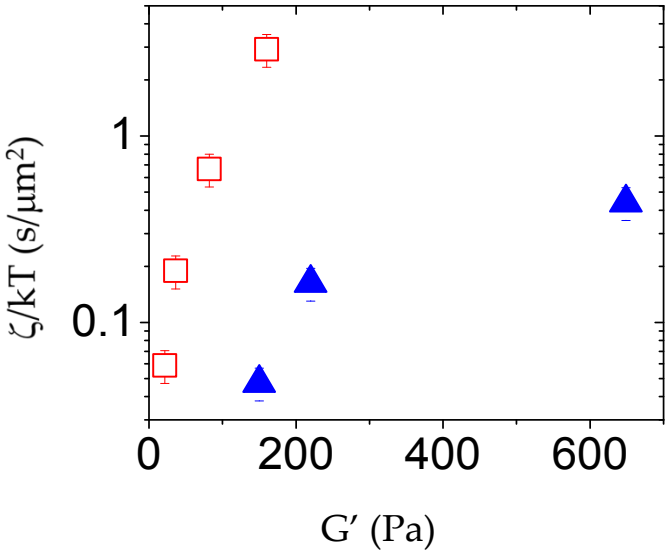

Table S1: Parameterization of complex viscosity graph in Fig. S3. The curves were fitted with a power law model: $\eta=k\omega^{n-1}$, where k is flow consistency index and n is flow behavior index. For shear thinning fluid, $n < 1$.

ϕ	k	n
0.078	0.63	0.70
0.112	6.3	0.63
0.143	34	0.58
0.17	340	0.33
0.2	1600	0.23
$R^2>0.8$		