Supporting Information

Figure S1 To illustrate the effect of the hydration force on the particle stability against the intense shear flow, we use our colloidal system as an example to have calculated the total interaction potential (U/k_BT), which include the attractive van der Waals (U_a), the long-range repulsive electrostatic (U_r), and the short-range repulsive hydration (U_h) potentials, as a function of the surface distance between two particles (h), where U_a is expressed by the Lennard-Jones potential:

$$U_a = 4\varepsilon\left[\left(\sigma/h\right)^{12} - \left(\sigma/h\right)^{6}\right]$$

with $\varepsilon = 4\times10^{-18}$ J and $\sigma = 3\times10^{-10}$ m, so that it accounts also for the short-range Born repulsion. For U_r, we use the modified Hogg-Healy-Fuersteneau expression:

$$U_R = \frac{4\pi\varepsilon_r\varepsilon_o a^2\psi^2}{r}\ln\left[1+\exp(-\kappa h)\right]$$

where ε_r (=78.5) is the relative dielectric constant of water, ε_o ($=8.85\times10^{-12}$ C^2/J/m) the permittivity of vacuum, ψ the surface potential, replaced by the zeta potential (=0.053 V), and $1/\kappa$ ($=5\times10^{-9}$ m) the Debye length. For U_h, we apply the exponential form commonly used in the literature:

$$U_h = \pi a F_0 \delta^2 \exp(-h/\delta_0)$$

where F_0 is the hydration force constant and δ_0($=3\times10^{-10}$ m) is the characteristic decay length. The exponential form of U_h has been justified by both experiments and numerical simulations.[1,2] It is seen that the short-range repulsion increases sharply as the hydration force increases.

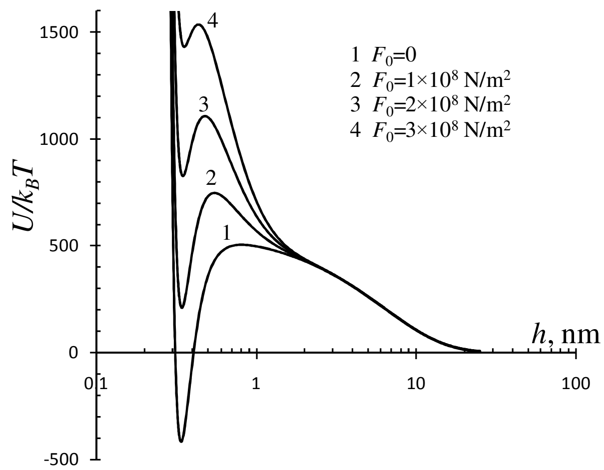


Figure S2 The state of the latexes after passing through the z-MC at different temperatures and particle volume fractions. The broken line indicates at each temperature the transition from liquid-like to solid-like state as the particle volume fraction ϕ increases. Γ=1.60×10^{-6} mol/m^2.

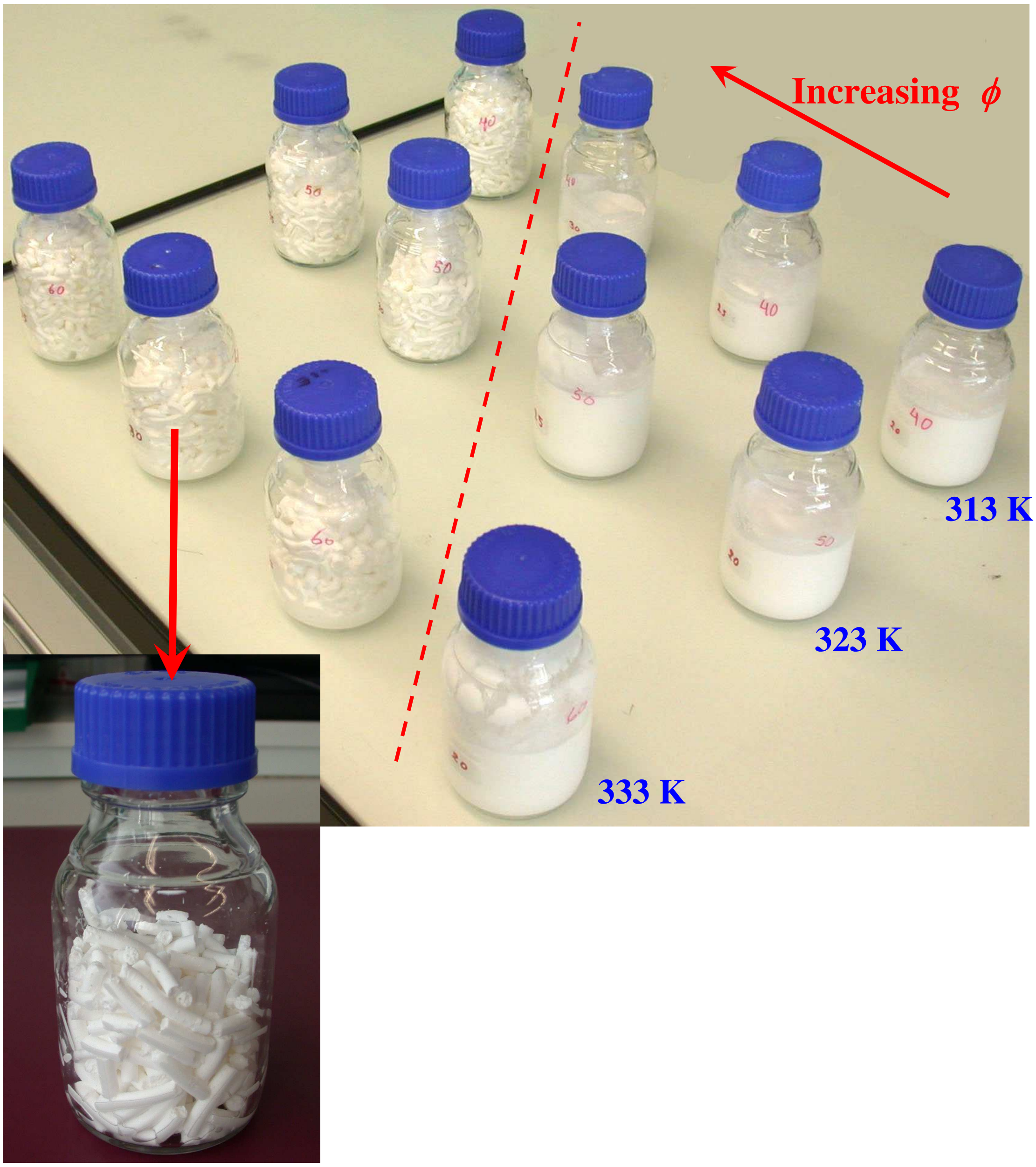


Figure S3 Calibration curve to correlate the value of the measured turbidity τ from the SALS to the particle volume fraction ϕ.

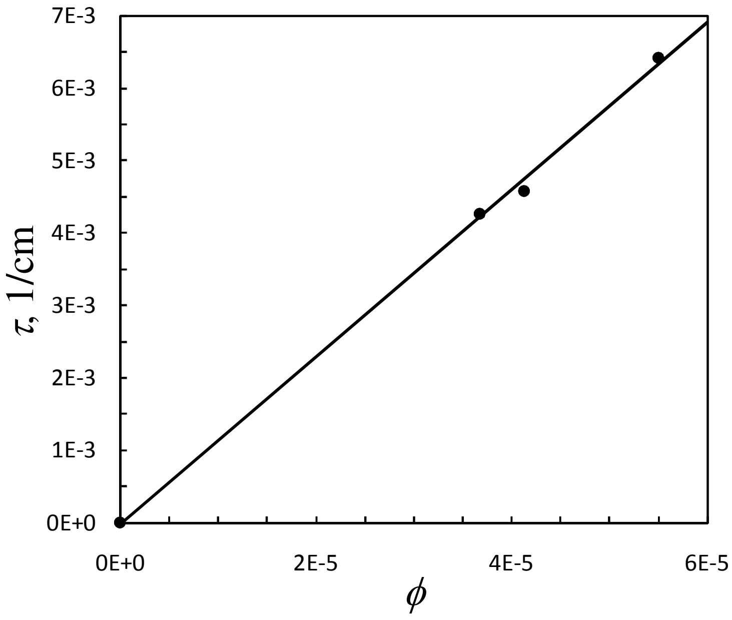
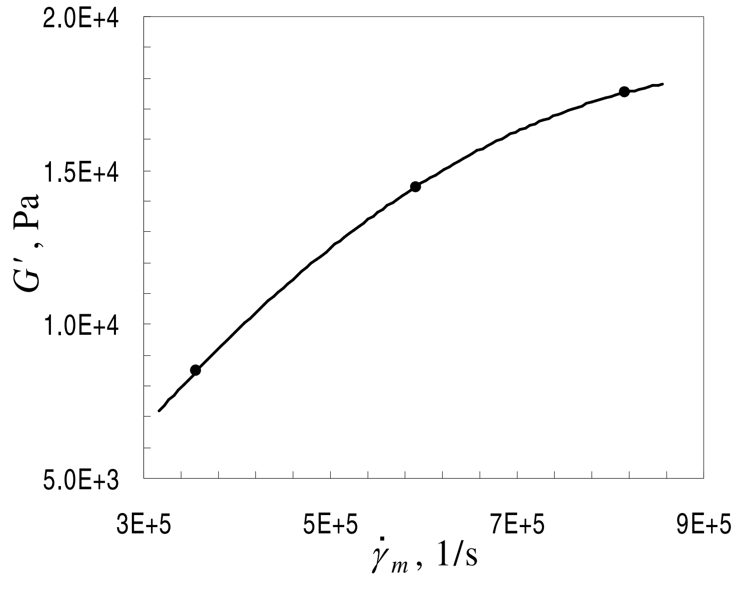


Figure S4 The storage modulus of the gels G' generated in the z-MC as a function of the shear rate $\dot{\gamma}_m$ used in the microchannel. ϕ=0.264; $\Gamma=1.38\times10^{-6}$ mol/m^2; T=313 K.



References

(1) Marcelja, S. *Nature* **1997**, *385*, 689-690.

(2) Raviv, U.; Klein, J. *Science* **2002**, *297*, 1540-1543.