Supplementary information for

Spatiotemporal Evolution of Heterogeneous Structures in Agarose Gels Revealed by Particle Tracking

Naoya Yanagisawa[1,†], Takemi Hara[1,†], Miho Yanagisawa[*,1,2,3]

[1] Komaba Institute for Science, Graduate School of Arts and Sciences, The University of Tokyo, 3-8-1 Komaba, Meguro, Tokyo 153-8902, Japan

[2] Graduate School of Science, The University of Tokyo, Hongo 7-3-1, Bunkyo, Tokyo 113-0033, Japan

[3] Center for Complex Systems Biology, Universal Biology Institute, The University of Tokyo, Komaba 3-8-1, Meguro, Tokyo 153-8902, Japan

[†] H. T. and N. Y contributed equally to this paper.

*Corresponding authors
E-mail: myanagisawa@g.ecc.u-tokyo.ac.jp

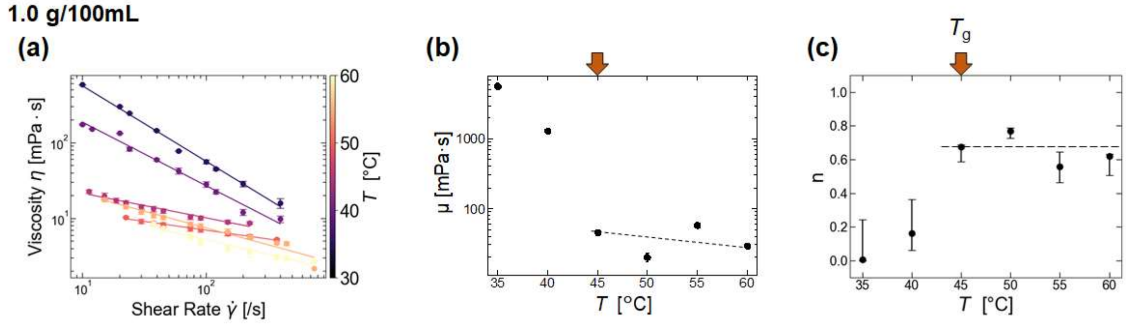

Figure S1. Temperature dependence of the solution viscosity for 1.0 g/100 mL agarose. (a) Shear rate $\dot{\gamma}$ dependence on solution viscosity η. The error bars are standard errors (SE) in the time variation of viscosity at the constant $\dot{\gamma}$. Solid lines are the fitting with a power low, Eq. (1). (b, c) Temperature dependence of the viscosity coefficient μ (b) and exponent n (c) derived by this fitting. Error bars and closed points indicate the conditions of fitting error $R^2 > 0.9$ and maximum R^2, respectively. The red arrows indicate the temperature of 45 °C, where the temperature dependencies of μ and n change during the cooling process. The dotted and broken lines show the exponential fitting and the average n value for $T \geq 45$ °C, respectively.

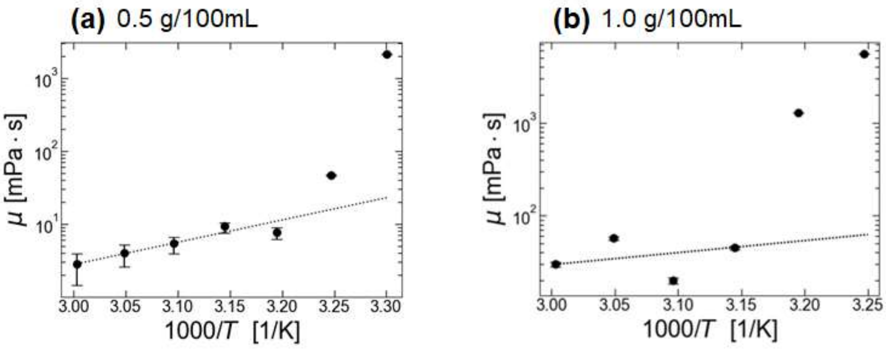

Figure S2. Temperature dependence of the viscosity coefficient μ for (a) 0.5 g/ 100 mL and (b) 1.0 g/ 100 mL agarose solutions. The dotted lines in (a) and (b) show the exponential fits in the region of $1000/T \leq 3.2$ and 3.15 K^{-1}, respectively.

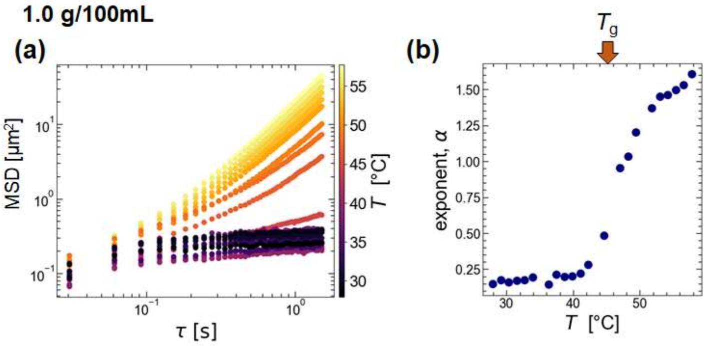

Figure S3. Colloidal diffusion in a 1.0 g/100 mL agarose solution. (a) Mean square displacement (MSD) of colloids during a slow quench from 80 °C to 25 °C at a rate of 0.3 °C/min. (b) The exponent α, derived from the fitting with MSD ~ τ^{α} over the entire time scale (0.03~2 sec), is plotted against T. The red arrow indicates T_g = 45 °C.

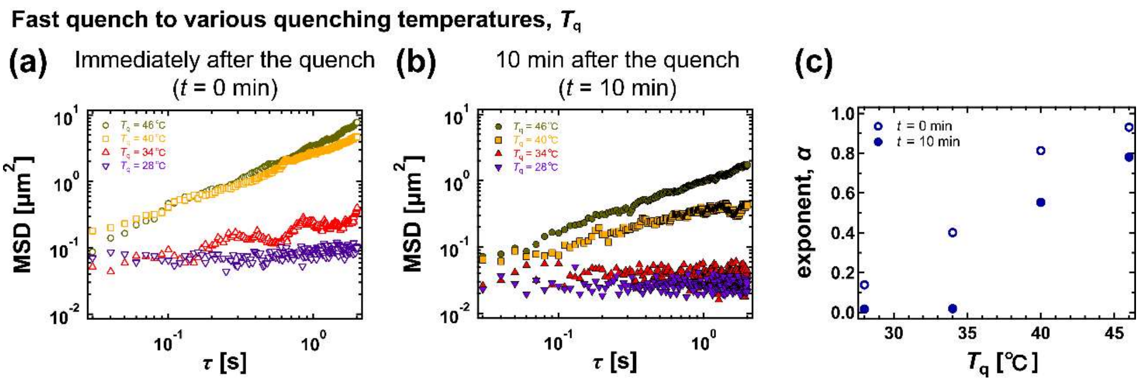

Figure S4. Colloidal diffusion in a 0.5 g/100 mL agarose solution after rapid quenching to various temperatures, T_q (28, 34, 40, 46 °C) above and below T_g (= 40 °C) and T_p (= 35 °C). (a, b) Mean square displacement (MSD) of multiple colloids immediately after the quench (a, t = 0 min) and 10 min after (b, t = 10 min). The color indicates different T_q values: T_q = 28 (purple), 34 (red), 40 (yellow), 46 °C (green). (c) From the fitting of the MSD ~ τ^{α} over the entire time scale (0.03~2 sec), the exponent α is plotted against T_q. The open blue and closed circles indicate the α values at t = 0 min and 10 min, respectively.

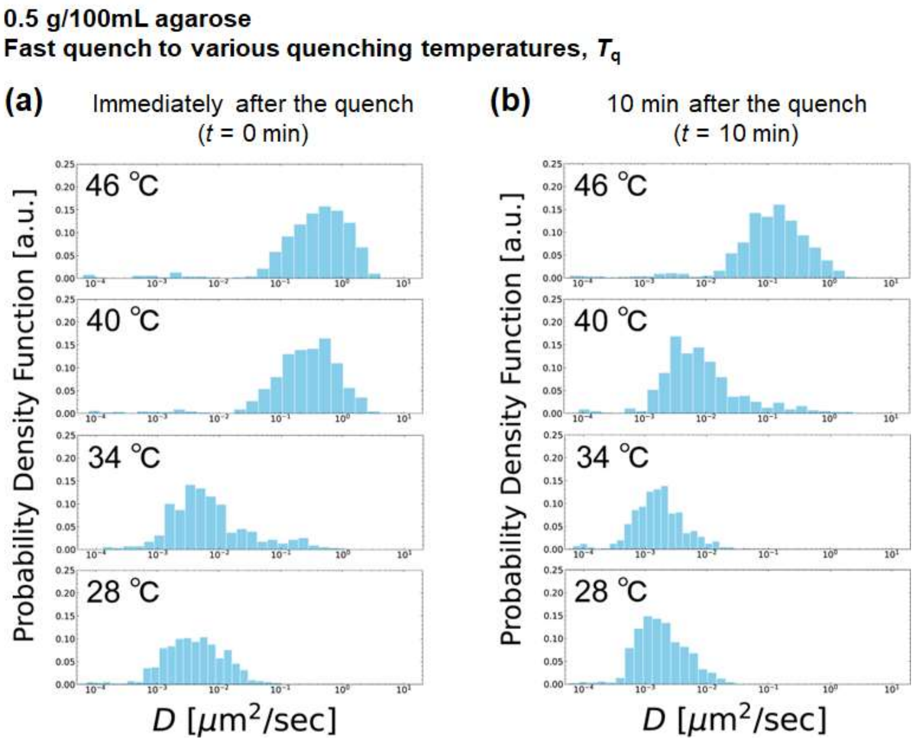

Figure S5. Histogram of time-averaged D obtained from MSD (Fig. S4) with τ ~1.0 s (a) immediately after the fast quench from 80 °C to various T_q (28, 34, 40, 46 °C) and (b) 10 minutes after the quench.

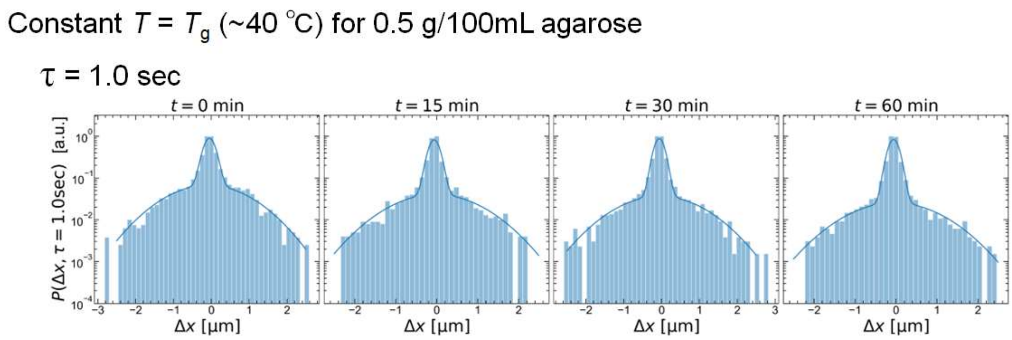

Figure S6. Van Hove correlation function, P, at a lag time of τ = 1.0 s. The temperature is maintained to be 40 °C (~T_g) after the slow quench from 80 °C. The solid line shows the fitting line with the double Gaussian distribution. The number of data points is approximately 10,000.

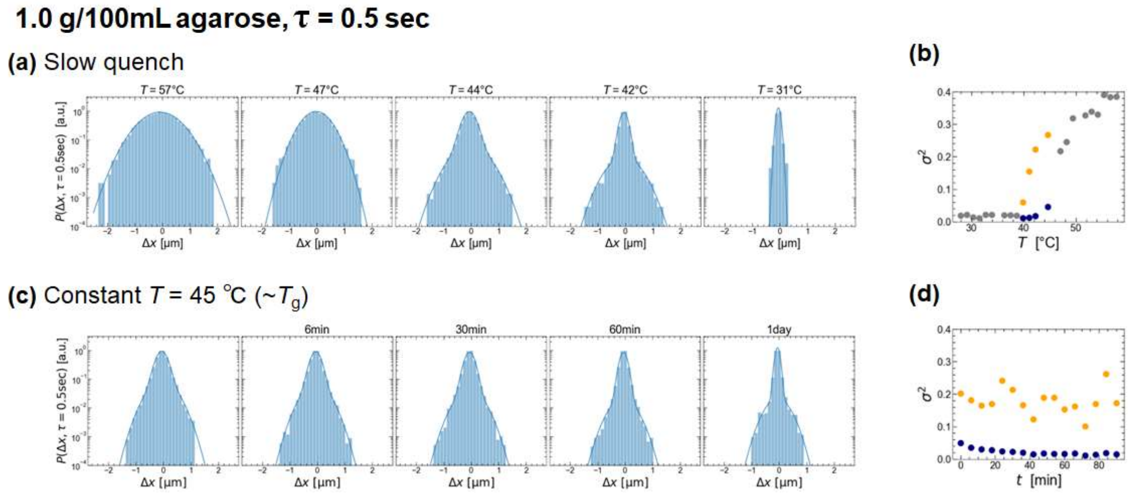

Figure S7. (a, c) Van Hove correlation function, P, at a lag time of τ = 0.5 sec for agarose 1.0 g/100 mL with T_g = 45 °C and T_p = 40 °C. The temperature is regulated as (a) a slow quench from 80 to 29 °C (< T_p) with 0.3 °C/min or (c) maintained to be 45 °C (= T_g). (b, d) Temperature and time dependence of the distribution variance σ^2 obtained from their fitting in (a, c) using either the single (gray) or double (orange and blue) Gaussian distribution. The number of data points is (a-d) 7,000–12,000.

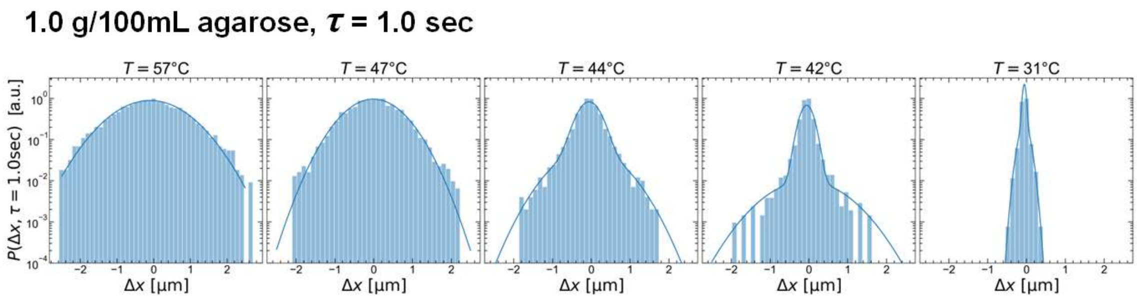

Figure S8. Van Hove correlation function, P, at a lag time of τ = 1.0 s for agarose 1.0 g/100 mL with T_g = 45 °C and T_p = 40 °C. The temperature is regulated as a slow quench from 80 to 29 °C (< T_p) with 0.3 °C/min. The solid line shows the fitting line by using the single ($T > T_g$ and $T < T_p$) or double ($T_p \leq T \leq T_g$) Gaussian distribution. The number of data points is 3,500–6,000.