SUPPORTING INFORMATION

Thermoresponsive composite hydrogels with aligned macroporous structure by ice-templated assembly

Hao Bai,*,† Alessandro Polini,† Benjamin Delattre,† Antoni P. Tomsia†

†Materials Sciences Division, Lawrence Berkeley National Laboratory, Berkeley, California 94720, United States

*E-mail: hbai@lbl.gov

Table S1. Composition of the solutions with the same amount of monomer (1 mol/L) and initiator (0.02 mol/L), but with different amounts of clay (5, 10, and 15 $\times 10^{-2}$ mol/L).

	NIPAAm (mol/L)	Clay (mol/L)	DEOP (mol/L)	Water (wt %)	NIPAAm (wt %)	Clay (wt %)	Clay/(Clay+polymer)
NC-5	1	0.05	0.02	86.55	9.79	3.30	0.25
NC-10	1	0.1	0.02	83.78	9.48	6.39	0.40
NC-15	1	0.15	0.02	81.19	9.19	9.28	0.50

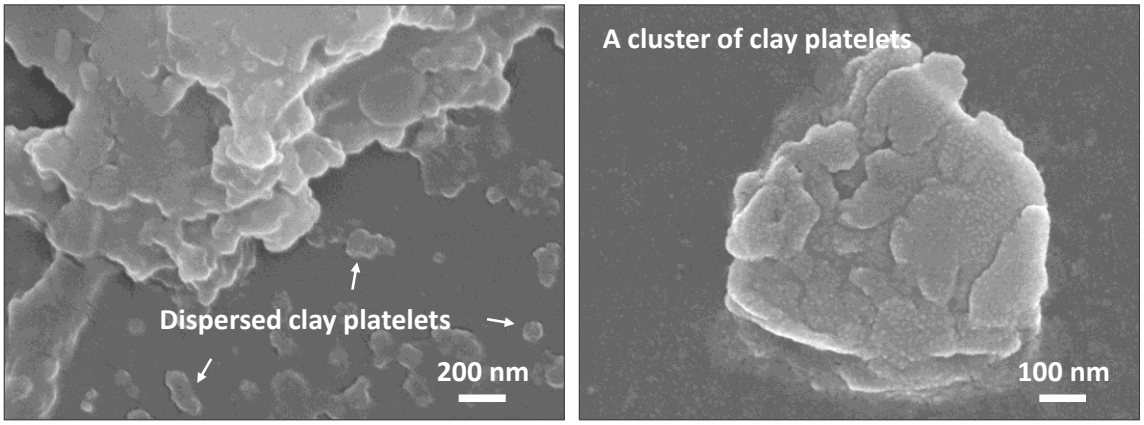

Figure S1. SEM images of clay platelets that have a diameter of ~ 100 nm, and a thickness of ~ 1 nm.

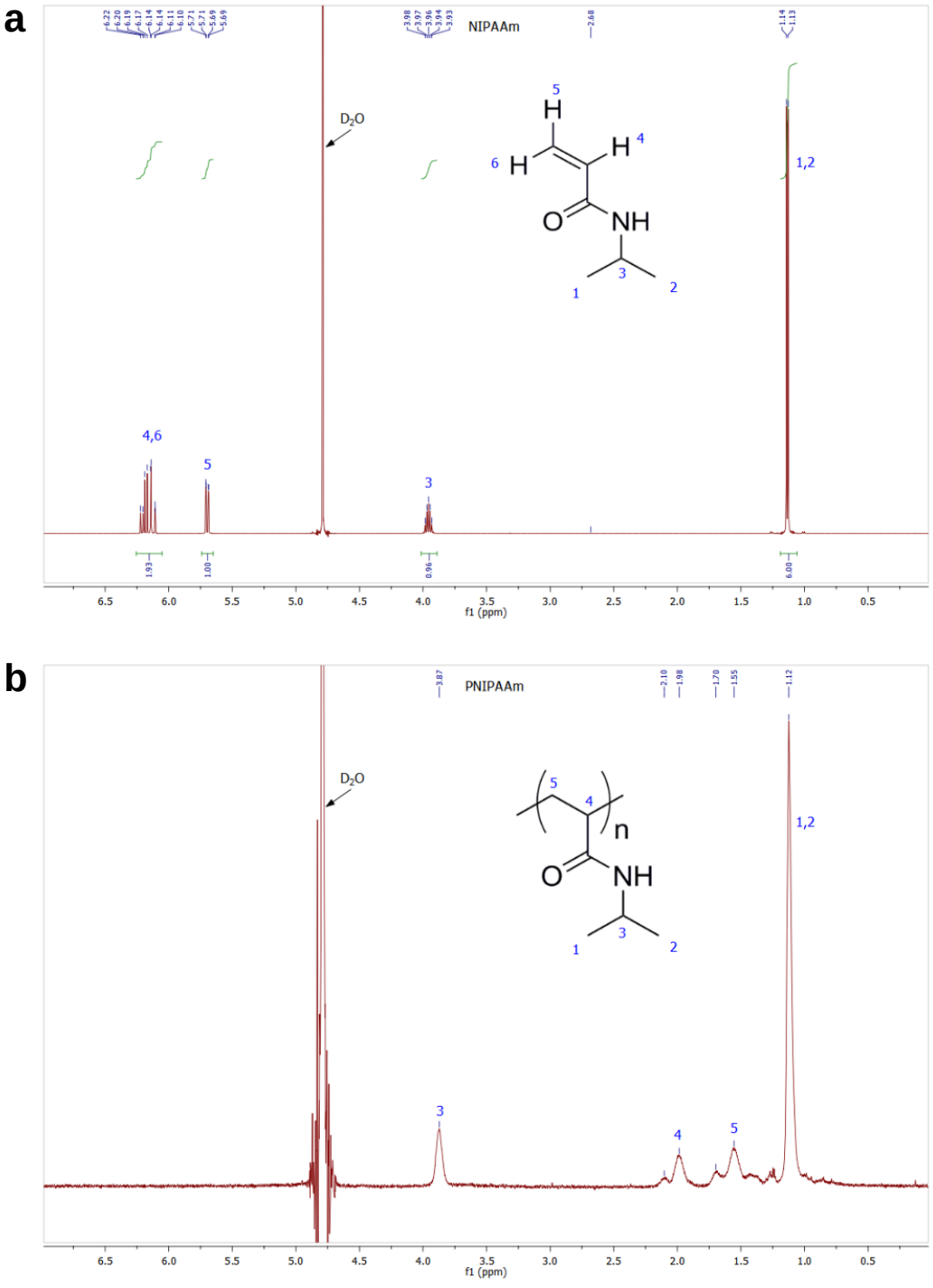

Figure S2. ^{1}H NMR spectra of (a) NIPAAm and (b) PNIPAAm, which shows full conversion of monomer.

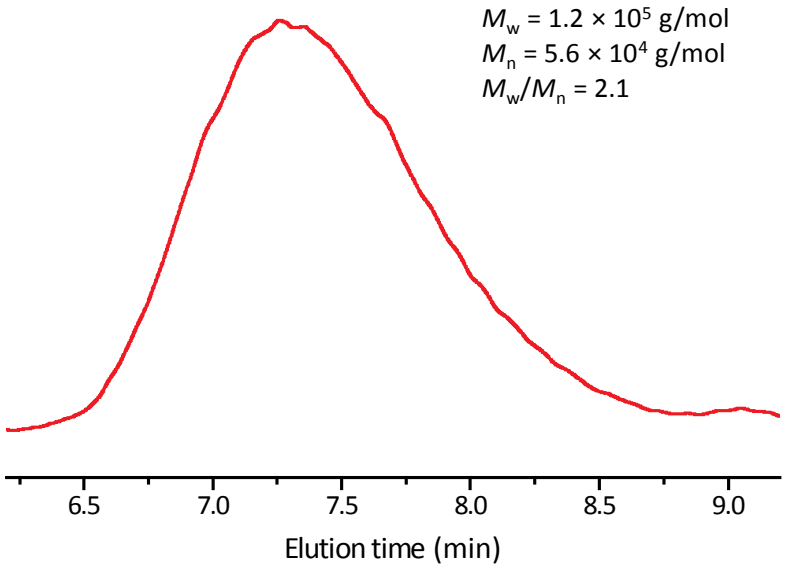

Figure S3. Gel permeation chromatography (GPC) measurement of PNIPAAm extracted through removing clay platelets.

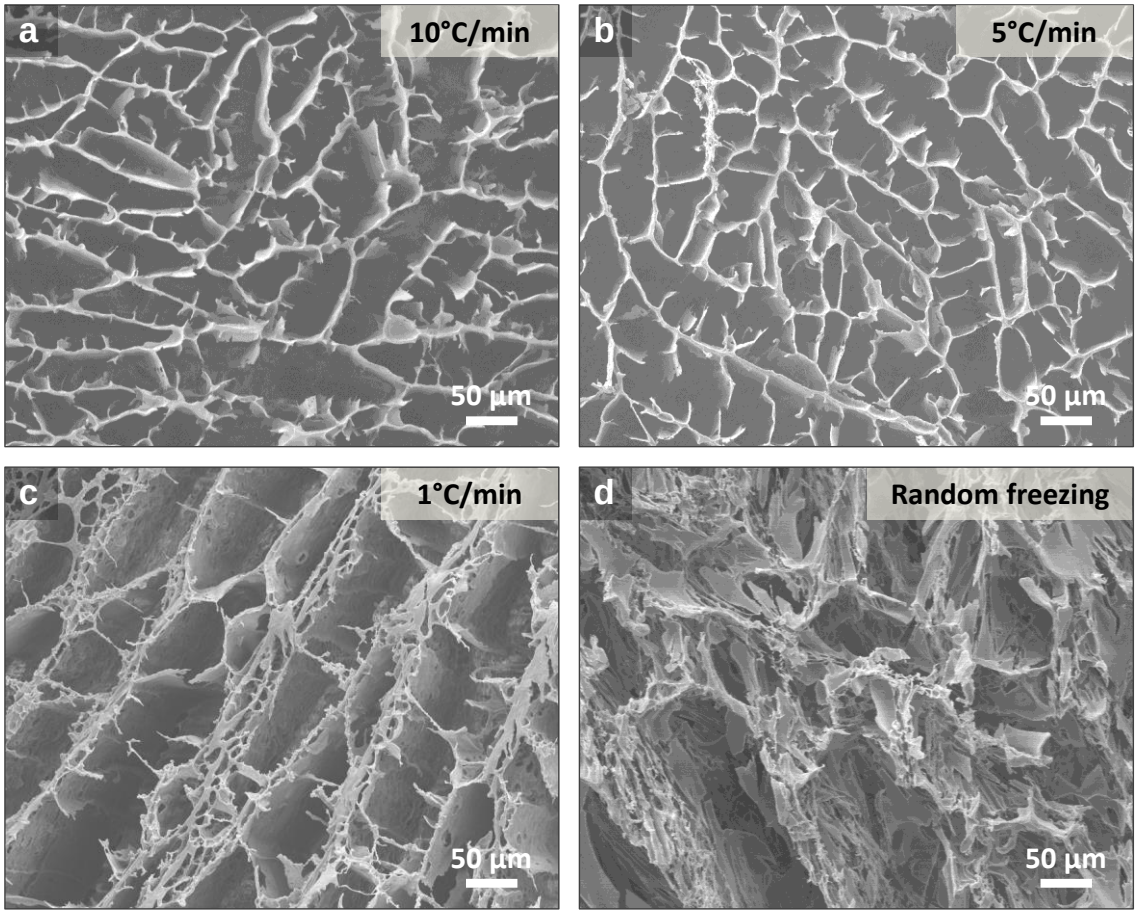

Figure S4. SEM images of the samples (before polymerization) prepared by freeze-casting at a cooling rate of a) 10, b) 5, and c) 1 ℃/min, or d) random freezing. Pore size is shown to increase with decreasing cooling rate.

Table S2. Mechanical properties (both parallel and perpendicular to the freezing direction) of NC-10 hydrogels fabricated by freeze-casting at different cooling rates and random freezing. Modulus was calculated from the period of stretch $\lambda = 0 \sim 0.5$, and fracture energy is calculated from the area under the stress-strain curve.

	Modulus (kPa)	Tensile strength (kPa)	Stretch (mm/mm)	Fracture energy (J/m^2)
NC-10, Parallel, Random	45.6 ± 21.8	14.8 ± 4.1	6.9 ± 0.5	144.9 ± 157.9
NC-10, Parallel, 10°C/min	53.2 ± 16.2	114.5 ± 16.9	8.8 ± 2.1	4124.1 ± 2503.4
NC-10, Parallel, 5°C/min	41.2 ± 17.1	106.3 ± 19.8	11.2 ± 2.41	5092 ± 1732.4
NC-10, Parallel, 1°C/min	38.1 ± 7.7	79.4 ± 22.9	10.2 ± 1.7	4212.9 ± 1118.4
NC-10, Perpendicular, Random	42.6 ± 3.7	23.1 ± 3.9	9.2 ± 0.5	1094.4 ± 320.3
NC-10, Perpendicular, 10°C/min	41.1 ± 7.3	11.3 ± 0.3	5.9 ± 0.6	217.7 ± 20.4
NC-10, Perpendicular, 5°C/min	24 ± 0.4	18.2 ± 6.3	12.1 ± 0.2	450.9 ± 164.2
NC-10, Perpendicular, 1°C/min	21.9 ± 20.4	20.9 ± 2.8	17.5 ± 1.5	1553.7 ± 386.9