

## Supporting Information (SI)

### Robust, Anti-biofouling 2D Nanogel Films from Poly(*N*-vinyl caprolactam-*co*-vinylimidazole) Polymers

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## Cross-linking of PNVCCL to form nanogels

	PNVCL1	PNVCL2	PNVCL3	PNVCL4	PNVCL5
1,2-Dibromoethane	1	1.5	2.5	3.5	4.5
1,3-Dibromopropane	1	1.5	2.5	3.5	4.5
1,4-Dibromobutane	1	2	3.25	4.5	6
1,5-Dibromopentane	1	2	3.25	4.5	6
1,6-Dibromohexane	1	2	3.25	4.5	6
1,7-Dibromoheptane	1.25	2.5	4.25	5.75	7.5
1,8-Dibromooctane	1.25	2.5	4.25	5.75	7.5

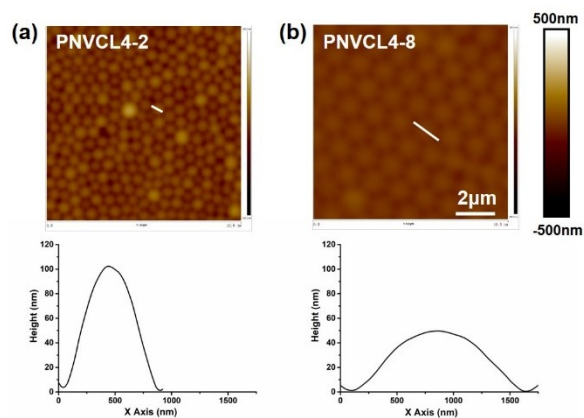
**Table S1.** Cross-linker quantities used in polymerization reactions ( $\mu\text{L}$ ).

## Surface elemental composition of PNVCCL nanogels

	PNVCL4-2	PNVCL4-3	PNVCL4-4	PNVCL4-5	PNVCL4-6	PNVCL4-7	PNVCL4-8
C	67.96	69.32	67.52	68.72	69.25	68.66	68.05
N	13.91	13.77	14.69	14.25	14.99	13.86	14.54
O	15.25	14.1	15	14.28	13.11	14.97	14.91
Br	2.88	2.81	2.79	2.75	2.65	2.51	2.5

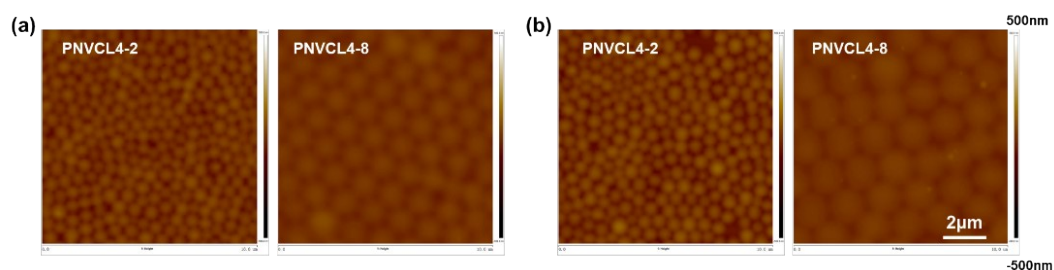
**Table S2.** Surface elemental composition of PNVCCL nanogels (At %).

## Deformability of PNVCCL nanogels from AFM images



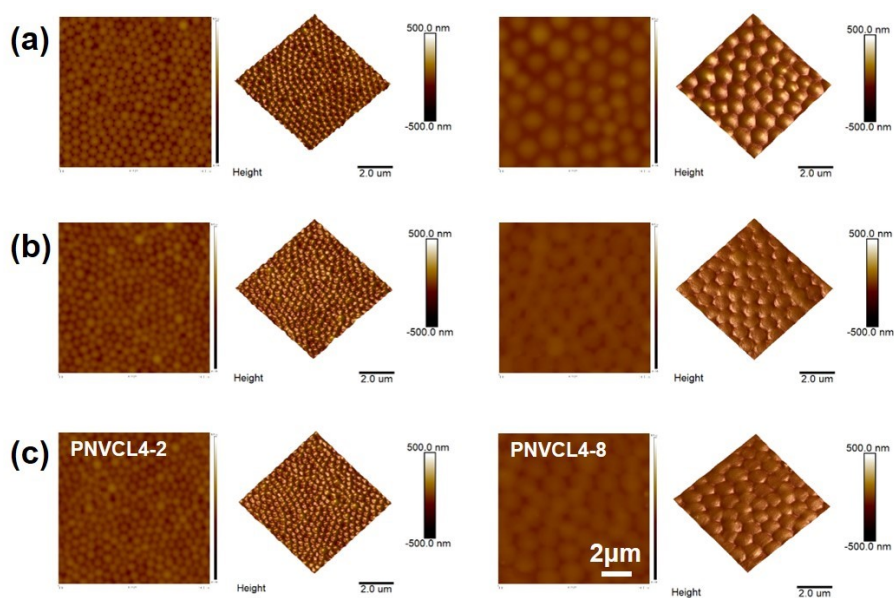
**Fig. S1** Height and width of nanogels as determined by AFM.

*Film formation of PNVCL nanogels formed at different concentration*



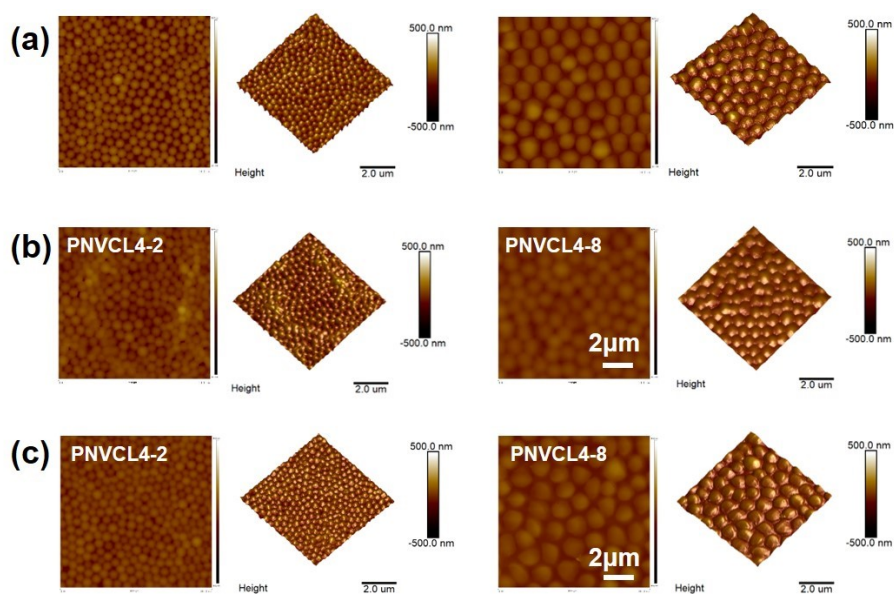
**Fig. S2** AFM images of PNVCL nanogel films formed at different concentrations. (a) 0.2 mg/mL. (b) 0.1 mg/mL.

*PNVCL nanogel films under different neutral salt solution conditions (pH=7.4)*



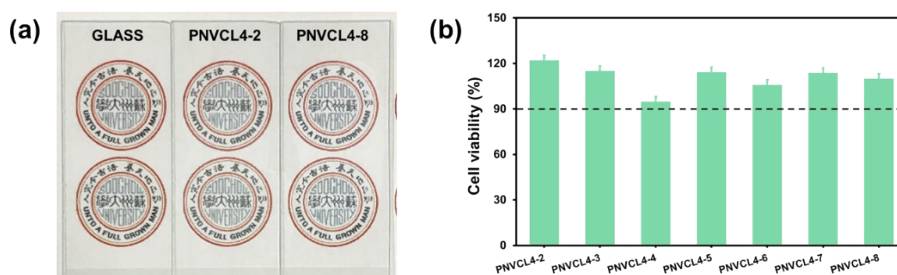
**Fig. S3** AFM images of PNVCL nanogel films under different neutral salt solution conditions (pH=7.4). (a) PBS solution. (b) Tris solution. (c) HEPES solution.

### *PNVCL nanogel films in various solutions*



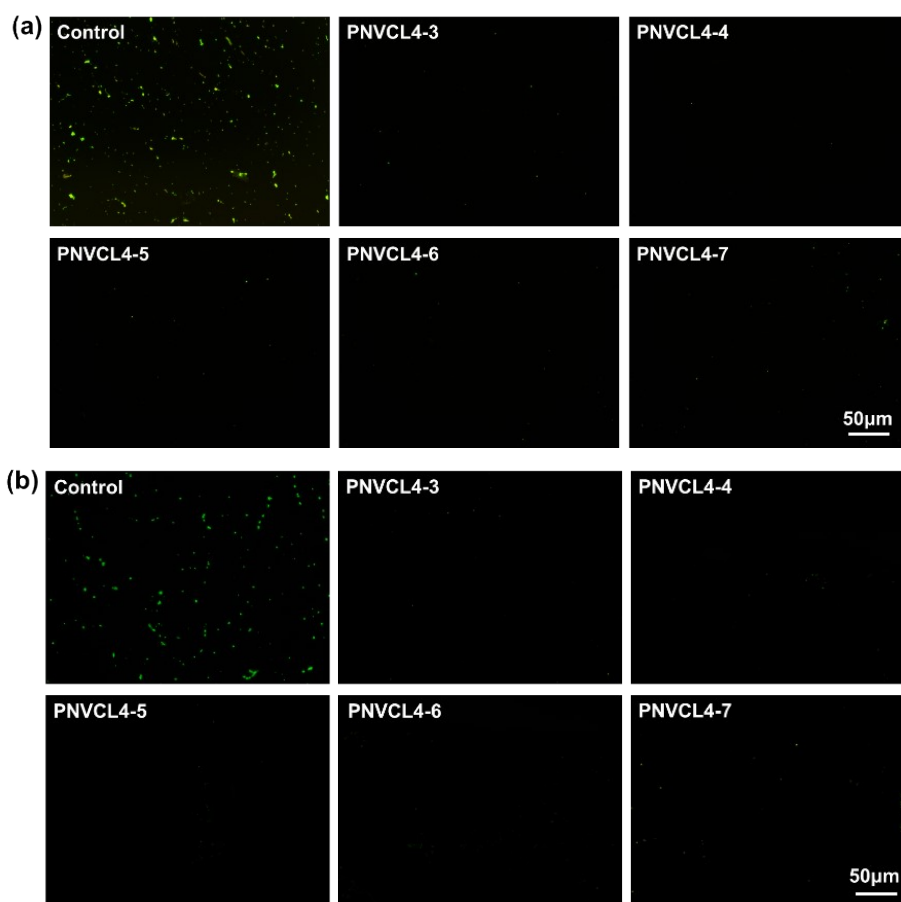
**Fig. S4** Atomic force microscope images of PNVCL nanogel films in contact with: (a) ethanol solution. (b) urea solution. (c) SDS solution.

### *Light transmission and Cytotoxicity of PNVCL nanogel films*



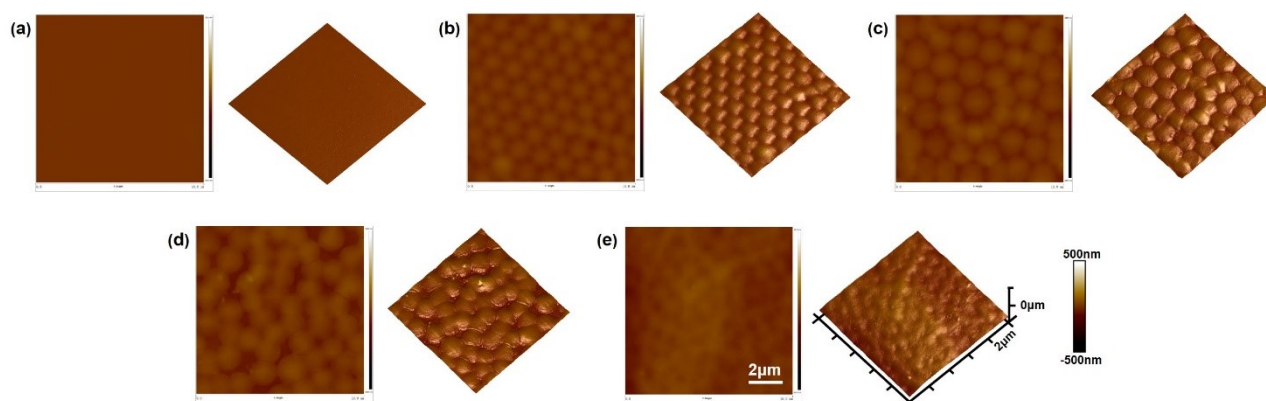
**Fig. S5.** (a) Light transmission of PNVCL nanogel films on glass surface. (b) Cytotoxicity of PNVCL nanogel solution.

## Bacterial adhesion different films



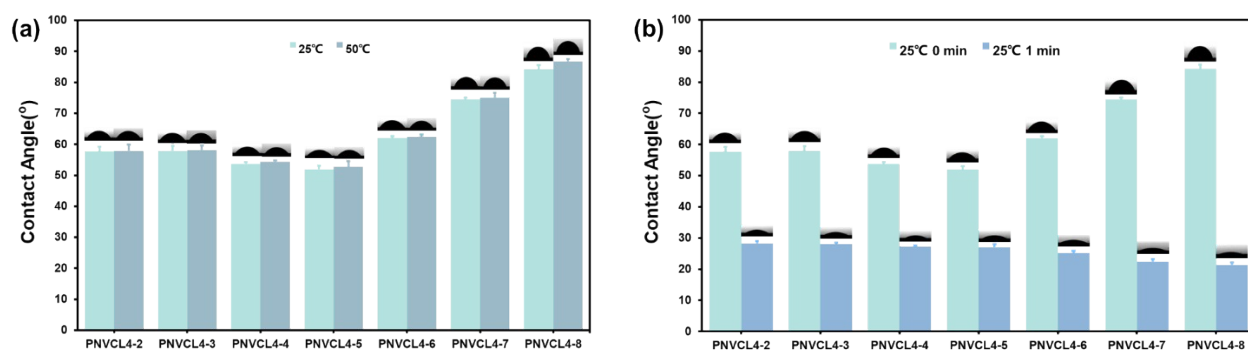
**Fig. S6.** Fluorescent microscope images of fluorescent bacteria (*E. coli* (a) and *S. aureus* (b)) adherent to control substrate, and PNVCL4-3 to PNVCL4-7.

## Adaptability of nanogel films to different substrates.



**Fig. S7** AFM images of PNVCL4-8 nanogel films on different substrates: (a) unmodified surfaces (b) silicon wafer, (c) gold, (d) PDMS. (e) PU.

*Water contact angles of PNVCL nanogel films.*



**Fig. S8** Water contact angles of PNVCL nanogel films. (a) at different temperatures: 25°C and 50°C; (b) at different times: 0 min and 1 min.