

Electronic supplementary information (ESI)

Hydrogen-bonded and ionic crosslinked high strength hydrogels exhibiting Ca²⁺-triggered shape memory and volume shrinkage for cell detachment

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Calculation of equilibrium swelling ratio (ESR)

The ESRs of hydrogels were calculated in terms of the following formula:

$$ESR = \frac{m_{wet} - m_{dry}}{m_{dry}} \times 100 \%$$

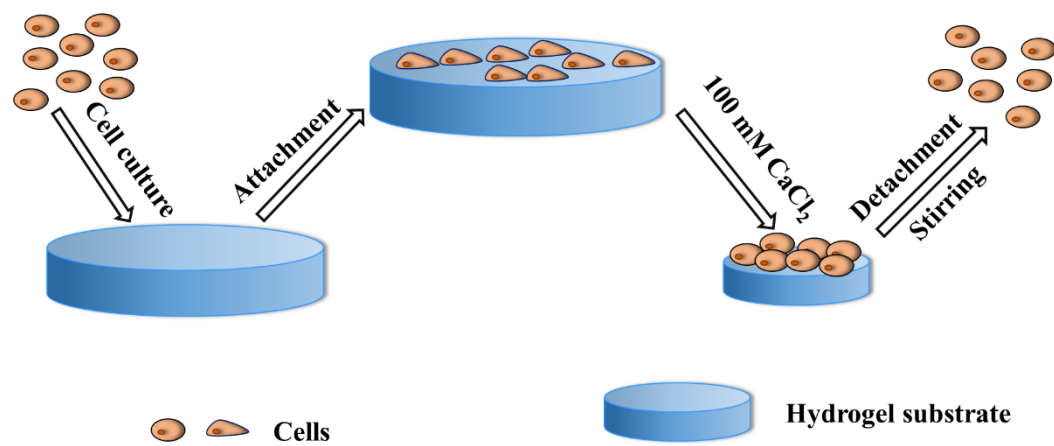
Where m_{wet} and m_{dry} represent the wet weight in their respective solutions and dry weight of hydrogel samples, respectively.

Table S1. Mechanical properties of PVDT-PEGDA-PBS and PVDT-PEGDA-Ca-100 hydrogels.

Sample ID	Tensile Strength (kPa)	Elongation at Break (%)	Young's Modulus (kPa)
PVDT-PBS	1443.0±342.1	413.1±40.5	9641.0±112.1
PVDT-Ca-100	1455.0±142.1	456.2±43.1	9668.1±21.2

Table S2. Mechanical properties of PVDT-PAA-10 hydrogels in different media

Sample ID	Tensile Strength (kPa)	Elongation at Break (%)	Young's Modulus (kPa)
PVDT-PAA-10-PBS	512.0±12.1	262.1±7.5	731.3±66.1
PVDT-PAA-10-Ca-50	954.1±109.6	396.4±50.5	1694.5±37.4
PVDT-PAA-10-Ca-100	1214.1±185.4	526.5±25.5	1707.7±142.3
PVDT-PAA-10-Ca-500	1252.1±139.0	521.3±19.9	1733.2±76.1



Scheme S1. Schematic mechanism of calcium-ion triggered unharmed cell detachment.

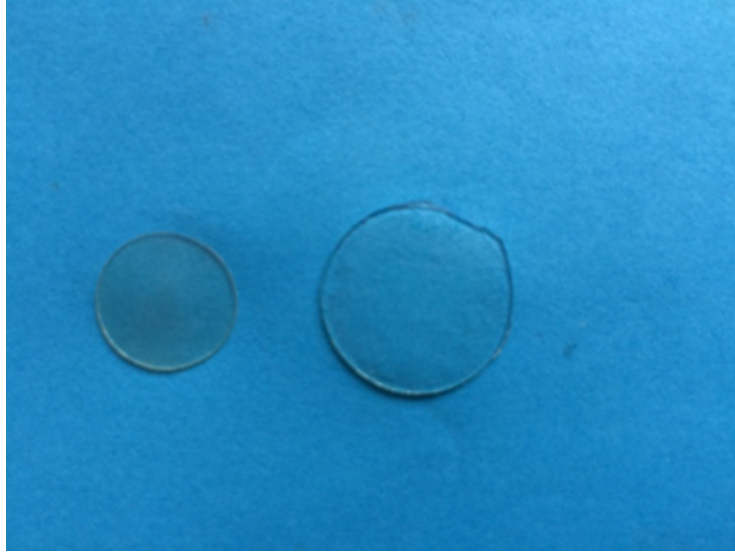


Fig. S1. Swelling state of PVDT-PEGDA-PBS hydrogel immersed in neutral PBS (pH = 7.4, left) and acidic PBS (pH = 3, right)

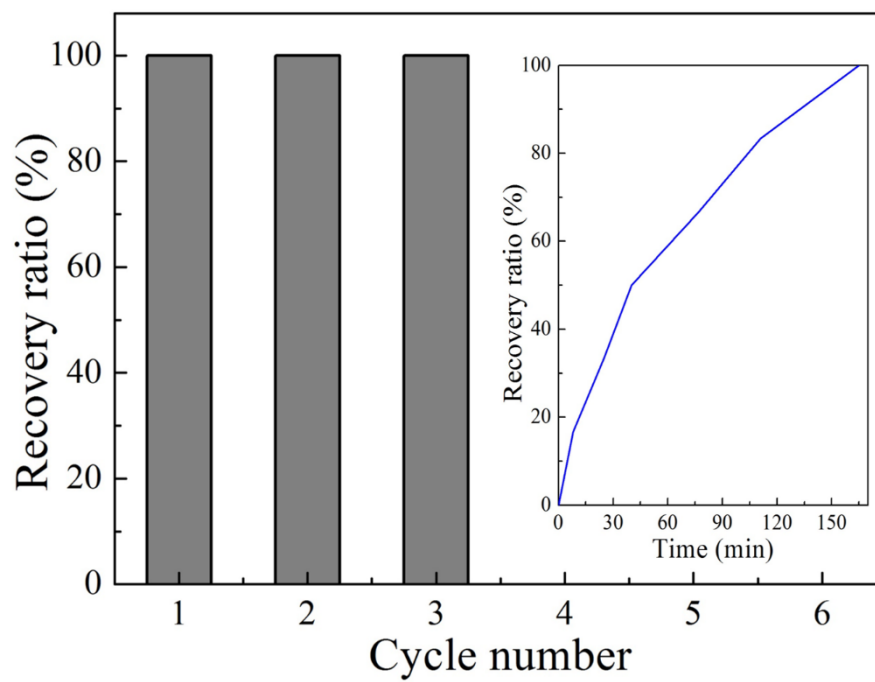


Fig. S2. Recovery ratio in three cycles at 37 °C in shape memory quantitative assay.

The inset is the magnification of first cycle.

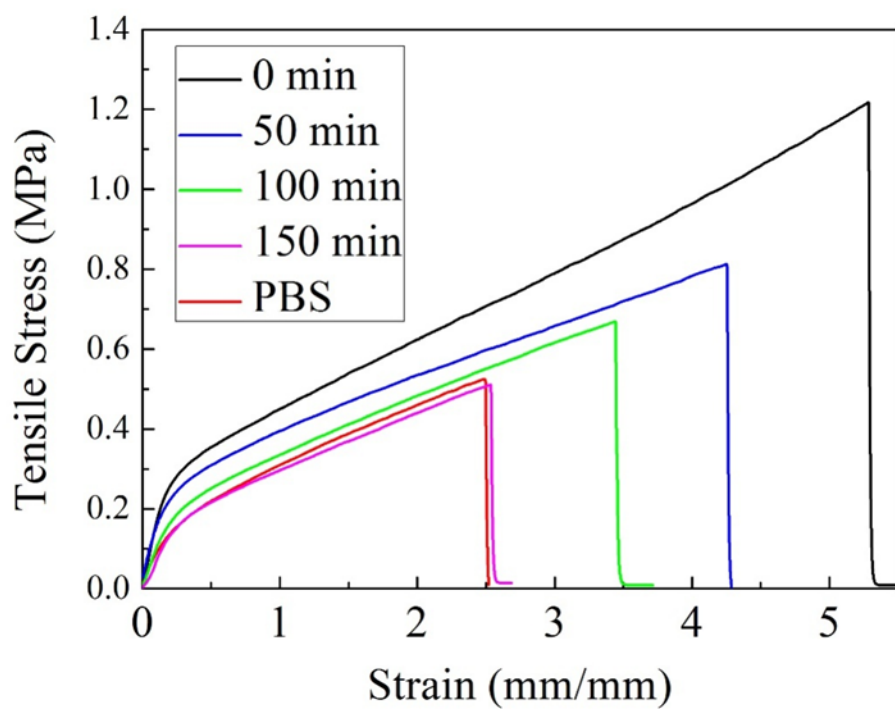


Fig. S3. Stress-strain curves of PVDT-PAA-10-Ca-100 hydrogels immersed in 50mmol L⁻¹ EDTA·2Na solution for different times.

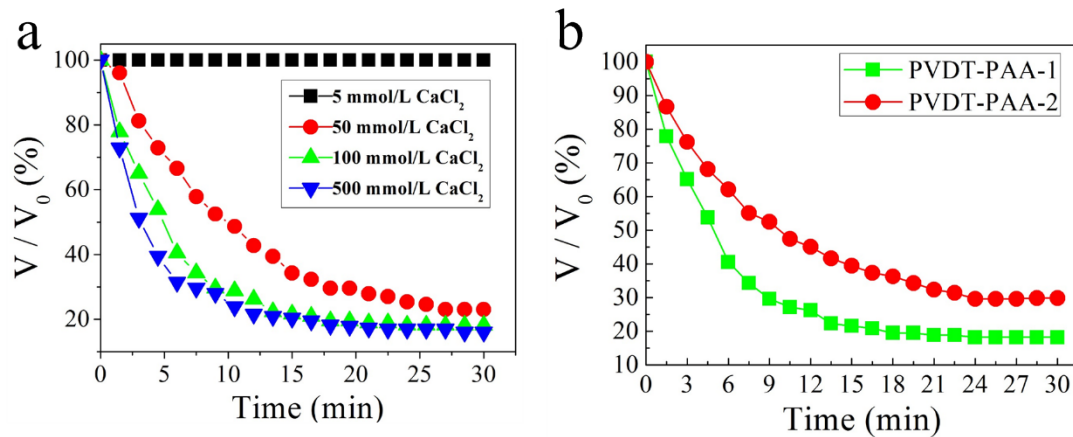


Fig. S4. (a) Volume change speed of PVDT-PAA-1-PBS hydrogels in different concentrations of calcium chloride solutions. (b) The volume change speed of PVDT-PAA-1-PBS and PVDT-PAA-2-PBS hydrogels in 100 mmol L⁻¹ calcium ion solution.

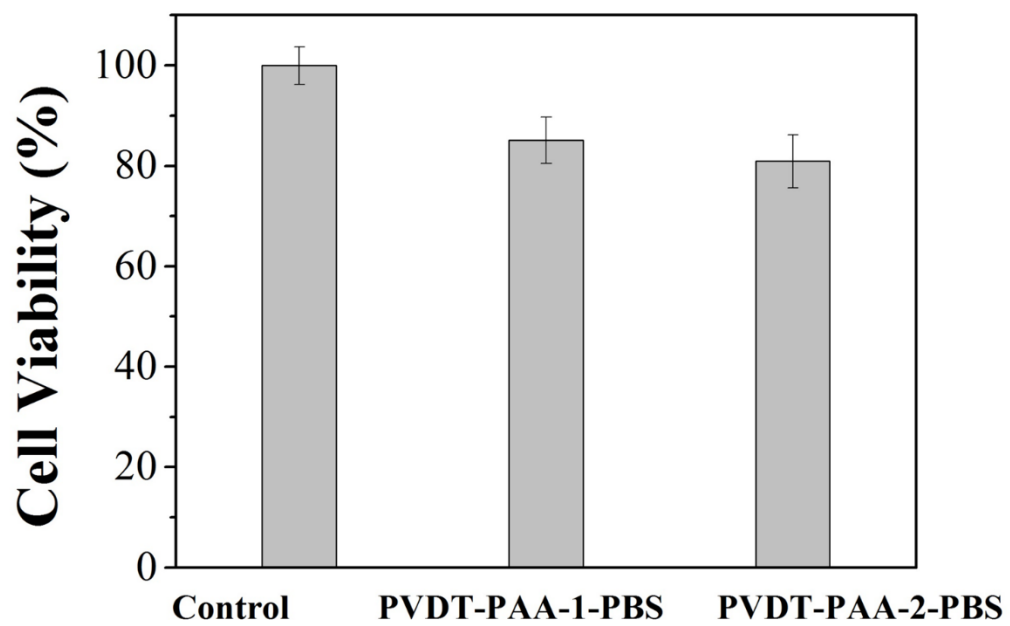


Fig. S5. Viability of L929 cells on PVDT-PAA-1-PBS and PVDT-PAA-2-PBS hydrogels.

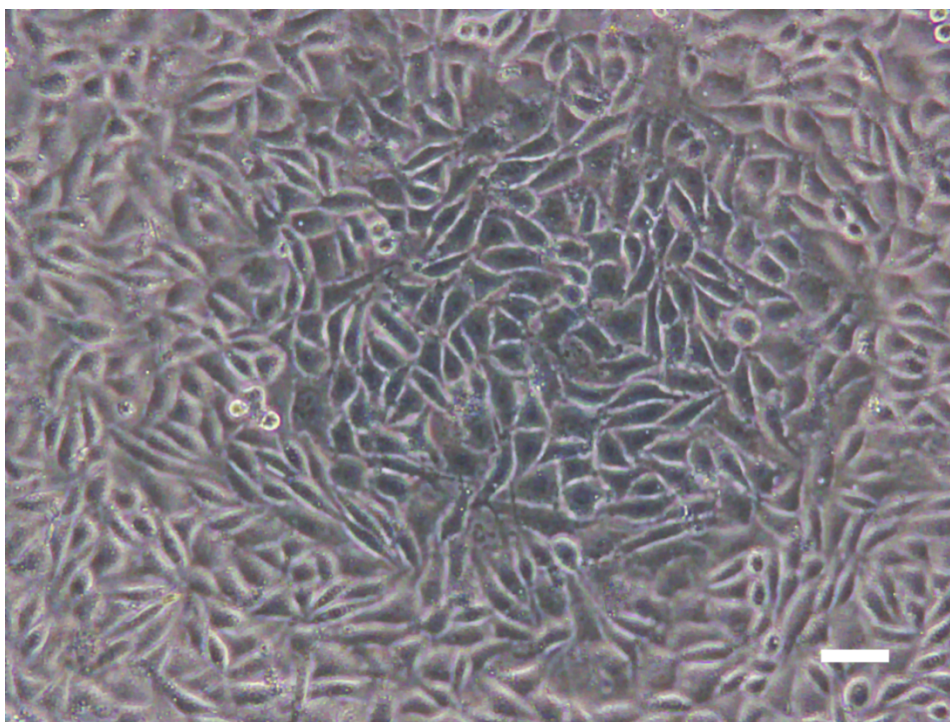


Fig. S6. Phase contrast microscopy image of the re-cultured L929 cells detached from PVDT-PAA-1-PBS hydrogel substrate. (Scale bar: 100 μm)