Electronic Supplementary Material (ESI) for Soft Matter.


# Smart Low Molecular Weight Hydrogels with Dynamic Covalent Skeleton

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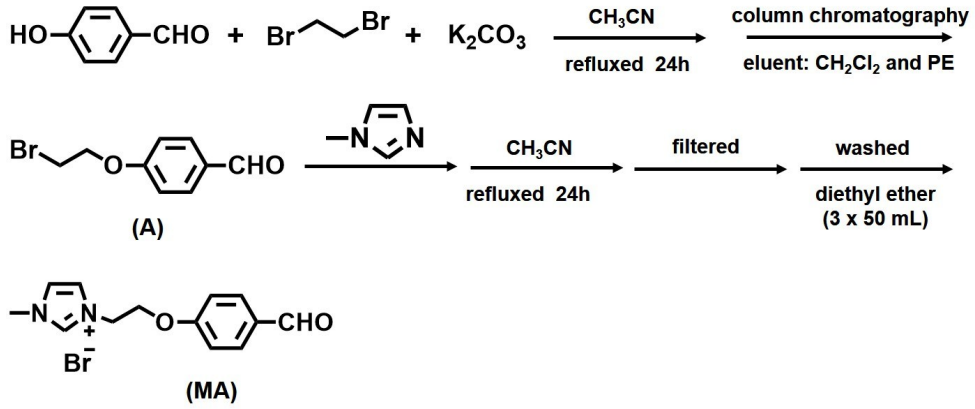
## Experimental section

### Synthesis of 3-(2-(4-formylphenoxy) ethyl)-1-methyl imidazolium bromide (MA).




Scheme S1. The synthesis route for MA.

The $^{1}H$ NMR (300 MHz, $CDCl_3$) of compound A: δH / ppm 3.67 (t, 2H), 4.38 (t, 2H), 7.04 (d, 2H), 7.89 (d, 2H), 9.90 (s, 1H). $^{13}C$ NMR (75.46 MHz, $CDCl_3$): δC / ppm 31.53, 68.57, 115.51, 130.43, 132.30, 163.27, 191.80. MS: ($[C_9H_9BrO_2+H]^+$) m/z = 228.9859, found m/z = 228.9836.

The $^{1}H$ NMR (300 MHz, $D_2O$) of MA: δH / ppm: 3.77 (s, 3H), 4.42 (t, 2H), 4.56 (t, 2H), 7.02 (d, 2H), 7.32 (s, 1H), 7.48 (s, 1H), 7.78 (d, 2H), 9.65 (s, 1H). $^{13}C$ NMR (75.46 MHz, $D_2O$): δC / ppm 35.80, 48.78, 66.27, 115.11, 122.73, 123.63, 129.73, 132.67, 163.22, 194.78. MS: ($[C_{11}H_{15}N_2O_2]^+$) m/z = 232.21, found m/z = 231.1162.

### Synthesis of 3, 3'-dithiobis (propionohydrazide) (DSPDZ).

$^{1}H$ NMR (300 MHz, DMSO) of DSPDZ: δH / ppm: 9.07 (s, 1H), 4.22 (s, 2H), 2.89 (t, 2H), 2.42 (t, 2H).

## Additional Results

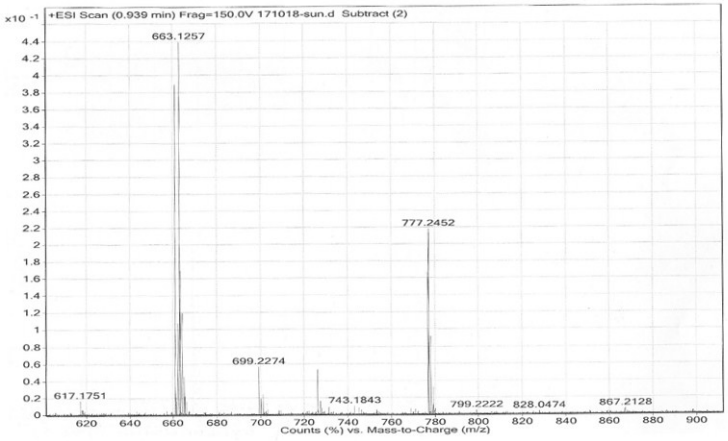



Fig. S1 ESI-MS profile of the low molecular weight supra-gelator (BMBS).

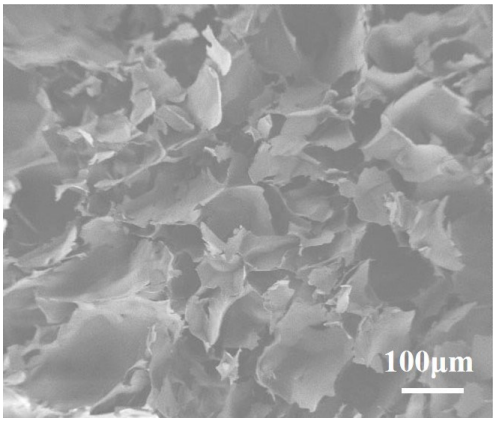
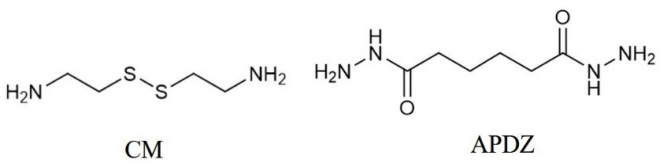



Fig. S2 SEM image of BMBS hydrogel prepared from MA (100 mM) and DSPDZ (50 mM).




Scheme S2. Chemical structures of CM and APDZ.

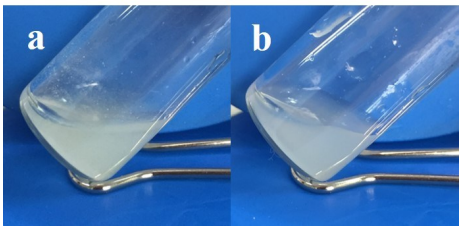



Fig. S3 Photographs of the solutions of MA and CM (a); APDZ (b).

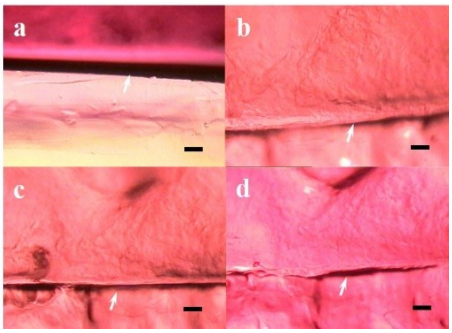



Fig. S4 Optical microscope images of the self-healing process of BMBS hydrogels (MA, 100 mM and DSPDZ, 50 mM). 1) 0, b) 3, c) 6 and d) 12 hours, respectively. White arrows indicate the positions of cut gaps on the hydrogel samples. Scar bars: 100 μm.

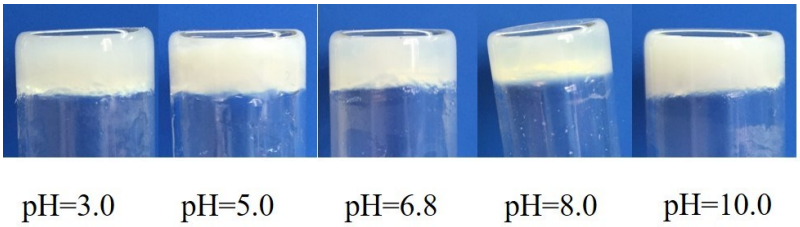



Fig. S5 Photographs of the resultant hydrogels by the precursor of MA and DSPDZ with different pH.

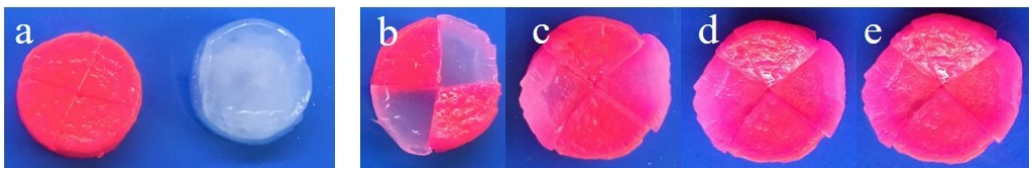



Fig. S6 Two disk-shaped hydrogels (the one on the left stained with

rhodamine B dye) were cut into 4 pieces and put together alternately. (b-e) Photos were taken after 0, 3, 6 and 12 hours.