Supporting Information for

Dual-faced borax mediated synthesis towards self-healable hydrogels merging dynamic covalent bonding and micellization

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Figure S1. $^1$H-NMR spectra (400 MHz) of P(DMA-co-EDA-co-IPA), i.e. P2, with different ratios of EDA: IPA in CDCl$_3$, respectively P2-1, P2-2, P2-3 and P2-4.
**Table S1** The molar ratios of EDA : IPA as determined by $^1$H-NMR spectra in Figure S1 for P2, respectively P2-1, P2-2, P2-3 and P2-4

| Copolymer | Feeding molar ratio (EDA:IPA) | Actual molar ratio$^a$ (EDA:IPA) |
|-----------|--------------------------------|-------------------------------|
| P2-1      | 60:40                          | 60:51 (1:0.86)                |
| P2-2      | 40:60                          | 40:67 (1:1.69)                |
| P2-3      | 30:70                          | 30:63 (1:2.11)                |
| P2-4      | 20:80                          | 20:100 (1:5.00)               |

$^a$ Determined by $^1$H-NMR spectra in Figure S1

**Table S2** Formulations for different specimens containing (P(DMA-co-EDA-co-DHA)) (P3) with different molar ratios of EDA : DHA (P3-1, P3-2, P3-3 and P3-4 are the deprotection products of P2-1, P2-2, P2-3 and P2-4, respectively) and their corresponding gelation time.

| Specimen | Copolymer | Acrylate: diol: SH: borax$^a$ | Solid Content | Gelation time |
|----------|-----------|-------------------------------|---------------|---------------|
| S3-1     | P3-1      | 1:0.86:1:0.17                 | 20%           | 30"           |
| S3-2     | P3-2      | 1:1.69:1:0.33                 | 20%           | 58"           |
| S3-3     | P3-3      | 1:2.11:1:0.42                 | 20%           | 1'50"         |
| S3-4     | P3-4      | 1:5.00:1:1                    | 20%           | No gelation   |

$^a$ Molar ratio between the acrylate and diol groups was determined by $^1$H-NMR spectra in Figure S1, and molar ratio of diol and borax was fixed at 5 : 1.
Scheme 1. The synthesis route of thiol-terminated Pluronic F127 (PF127-SH).

Figure S2. $^1$H-NMR spectra (400 MHz) thiol-terminated Pluronic F127 (PF127-SH) in CDCl$_3$ with detailed integral information.
**Figure S3.** FT-IR spectra of thiol-terminated Pluronic F127 (PF127-SH, upper yellow line) and Pluronic F127 (PF127, bottom blue line).

**Figure S4.** Photograph showing the shape recovery of the hydrogel sample: original sample (a); stretched to around 330%; (c) after releasing the load for 30 min.
Figure S5. Photograph showing the cut-and-heal tests on P(DMA-co-EDA-co-IPA) (P2, with designated molar ratio of EDA / IPA =30 : 70) based hydrogel. (a) disk-shaped samples with and without dye were prepared and cut into pieces; (b) two pieces were put into contact; (c) self-healing for 24 h; (d) the two segments failed to integrate into one after 24 h.