Supplemental Information

Adjustable and Ultrafast Light-Cured Hyaluronic Acid Hydrogel: Promoting Biocompatibility and Cell Growth

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A comparison of the ^{1}H NMR spectra of HA and HAMA revealed that the hyaluronic acid after methacrylation increased the peaks of 6.1, 5.6 and 1.85 ppm, that indicating the success of methacrylation (**Figure S1**). The methylation degree of the methacrylate was calculated from the relative intensities of protons of methacrylic acid (peak of 1.9 ppm) and methyl protons in hyaluronic acid. The results of nuclear magnetic resonance showed that the degree of methacrylic acid of hyaluronic acid was 32%.

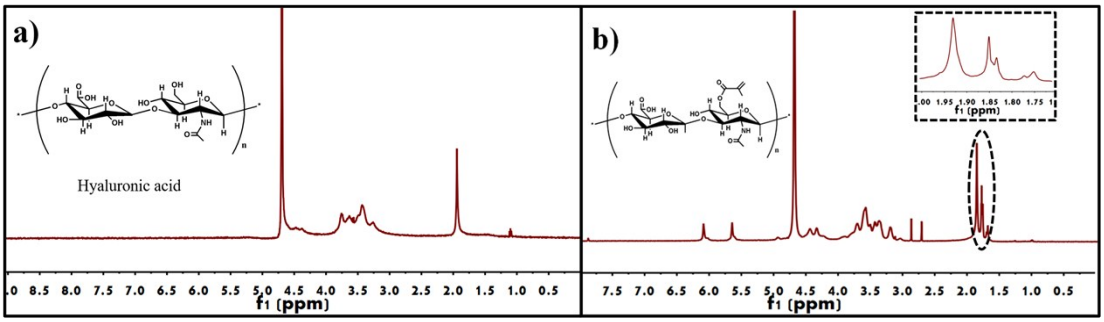

FIGURE S1. ^{1}H NMR spectrum of a) hyaluronic acid (HA); b) methacrylated hyaluronic acid (HAMA). The enlarged portion of the dotted frame indicates the peaks that increases due to the action of methacrylate.

Using methanol as solvent, we analyzed PE(NAC)$_4$ by ESI-MS. As shown in **Figure S2**, the highest m/z of PE(NAC)$_4$ appears at 672.1, while the molecular weight of the target product is 716, and the molecular weight of the product grafted with three arms is 571. We believe that under the high energy electron bombardment, the target product loses a carboxylate ion, so m/z is reduced by 44, which proves the existence of PE(NAC)$_4$.

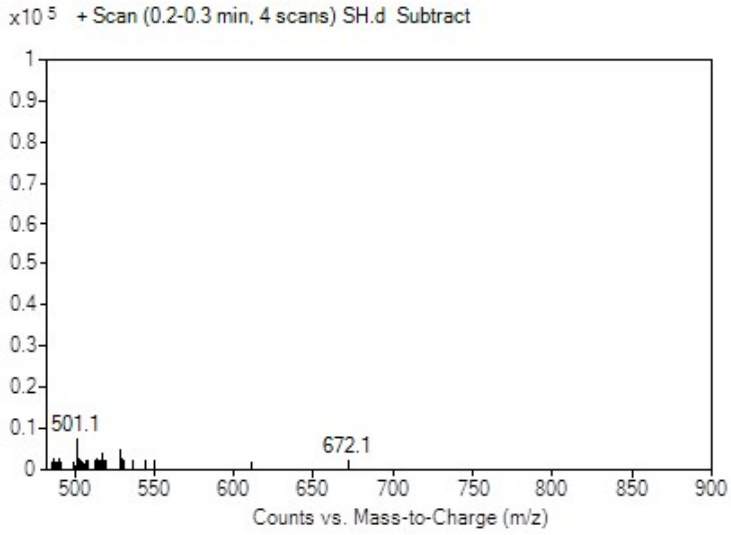

FIGURE S2. ESI-MS spectrum of PE(NAC)$_4$.

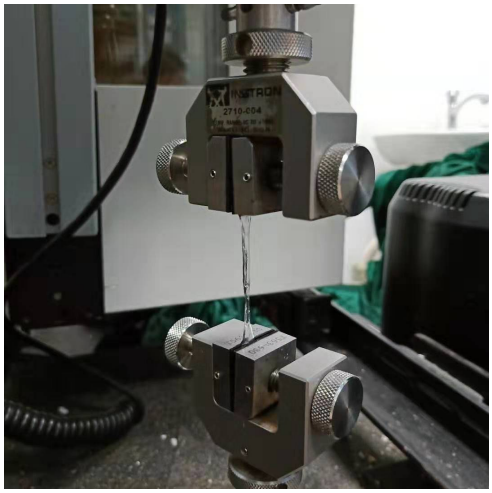

FIGURE S3. Photography of the tensile test of HAMA/PE $(NAC)_4$-1% hydrogel.

As shown in **Figure S3**, the maximum compressive stress of HAMA/PE$(NAC)_4$-0.5% and HAMA/PE$(NAC)_4$-1% were 40.85 kPa and 44.96 kPa, respectively. The maximum compressive stress of HAMA/PE$(NAC)_4$-5% was as high as 69.28 kPa, which was about 160 % of the other two samples. Furthermore, the elastic modulus of the samples with low crosslinking agent content were 119.5 kPa and 133.83 kPa, respectively. The HAMA/PE$(NAC)_4$-5% reached 454.44 kPa, which was increased by 260 % compared to the other two samples. Unlike the modulus, the strain at break of HAMA/PE$(NAC)_4$-0.5% was 45 %, HAMA/PE$(NAC)_4$-1% was 55 %, and HAMA/PE$(NAC)_4$-5% was 65%. It increased as the degree of crosslinking increased. These comprehensive descriptions indicated that the sample with a high degree of crosslinking had high pressure resistance. Most importantly, the rapid cure characteristics and storage modulus of HAMA/PE$(NAC)_4$ hydrogel met the range of human soft tissue, which making it particularly attractive for tissue regenerative medicine.

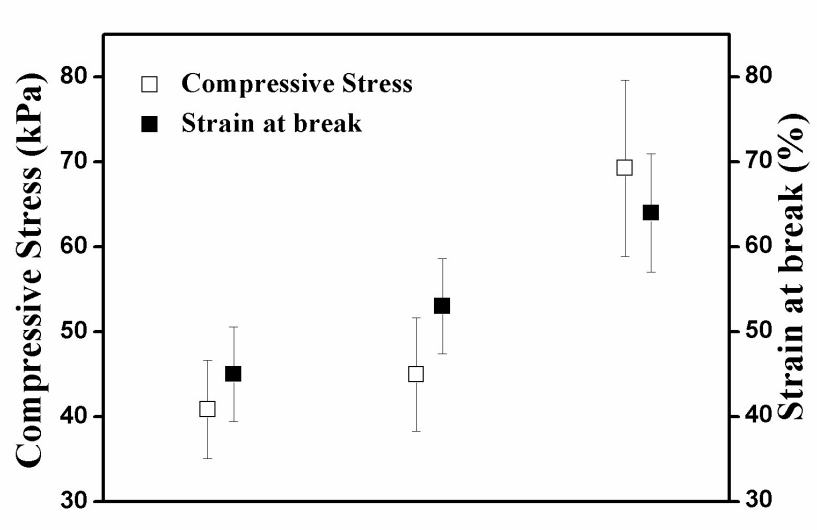

FIGURE S4. Maximum compressive strength and strain at break of HAMA/PE(NAC)$_4$ hydrogel (0.5%, 1%, and 5%) (n=3).