Electronic Supplementary Material (ESI) for RSC Advances.

Supporting Information

Restorable, high-strength poly(N-isopropylacrylamide) hydrogels constructed through chitosan-based dual macro-cross-linkers with rapid response to temperature jump

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Synthesis and characterization of methacryloylchitosan

The employed methacryloylchitosan (MACS) was synthesized as follows. Chitosan was dissolved in aqueous solution of MAA by an equivalent -NH_2 to -COOH, yielding a transparent solution on one side for later use. On the other side, equal moles of MAA, EDC and NHS were mixed with distilled water in a three-necked round-bottom glass flask under 0 °C. The solution was stirred for 1 h at 0 °C, followed by dropping of the afore-prepared chitosan solution. Finally, the reaction system was kept stirring at 0 °C for 30 min and 24 h at 10 °C continually. After the reaction, the reaction mixture was filtered; MACS was precipitated and washed several times with ethanol, then dried for further use. After the reaction, the product was precipitated from the reaction mixture with ethanol, and washed several times with ethanol to remove the impurities further.

The obtained MACS was freeze-dried further for 24 h and then embedded in KBr disks. The infrared spectrogram was recorded on a Nicolet 5700 spectrometer.

Results and Discussion

Supporting Figures

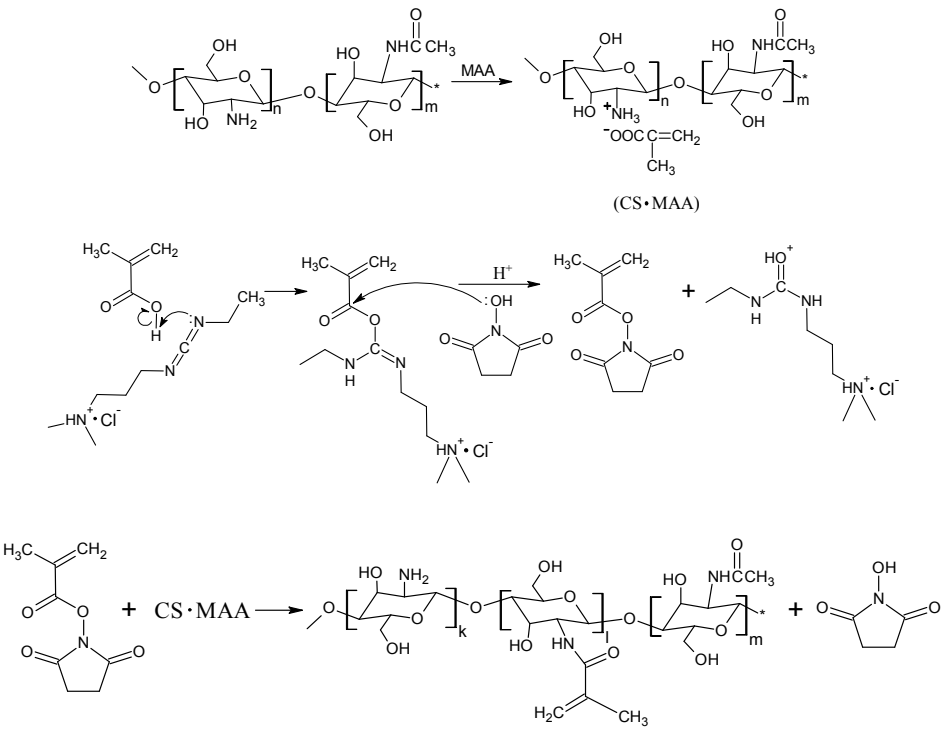

Fig. SI1 Main reactions occurred during the synthesis of MACS

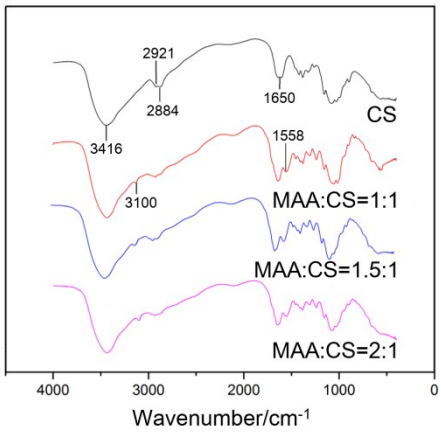

Fig. SI2 IR spectrograms of CS and MACS synthesized under different molar ratio of MAA to CS

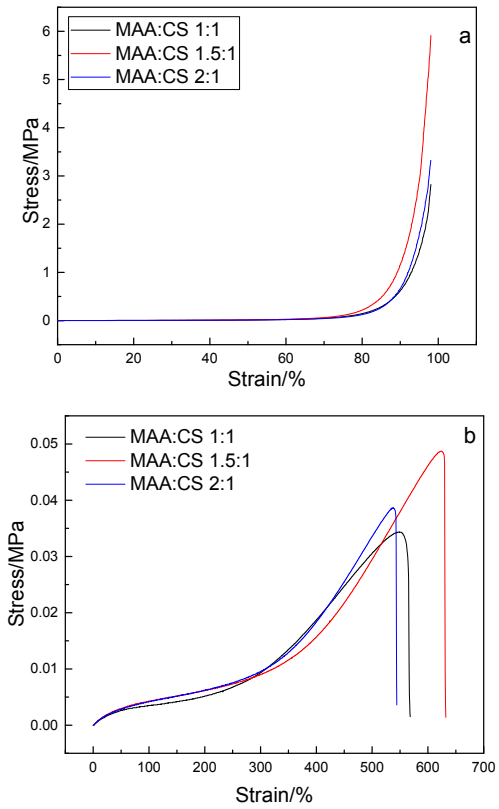

Fig. SI3 Compressive (a) and tensile (b) stress-strain curves of hydrogels prepared using MACS synthesized under different molar ratio of MAA to chitosan

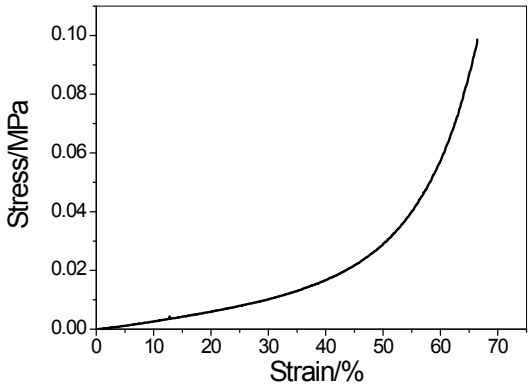

Fig. SI4 Compressive stress-strain curves of pNIPAM hydrogel cross-linked by N,N'-methylenebisacrylamide (BIS) (Solids content 20 wt%, KPS 0.22 mol%, BIS 5.2 wt% to NIPAM)

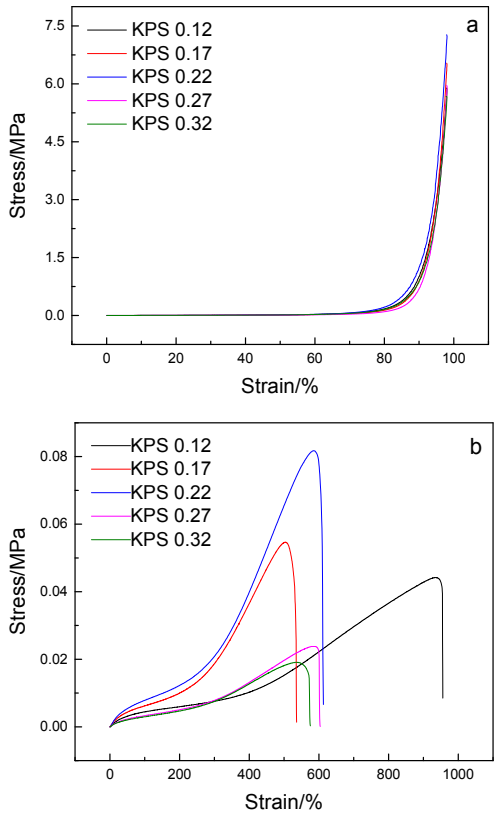

Fig. SI5 Compressive (a) and tensile (b) stress-strain curves of hydrogels prepared under the initiation of different amount of KPS