Electronic Supplementary Information (ESI)

Tough and recoverable nanocomposite double network hydrogels with combined physical and chemical interactions to clay nanorods

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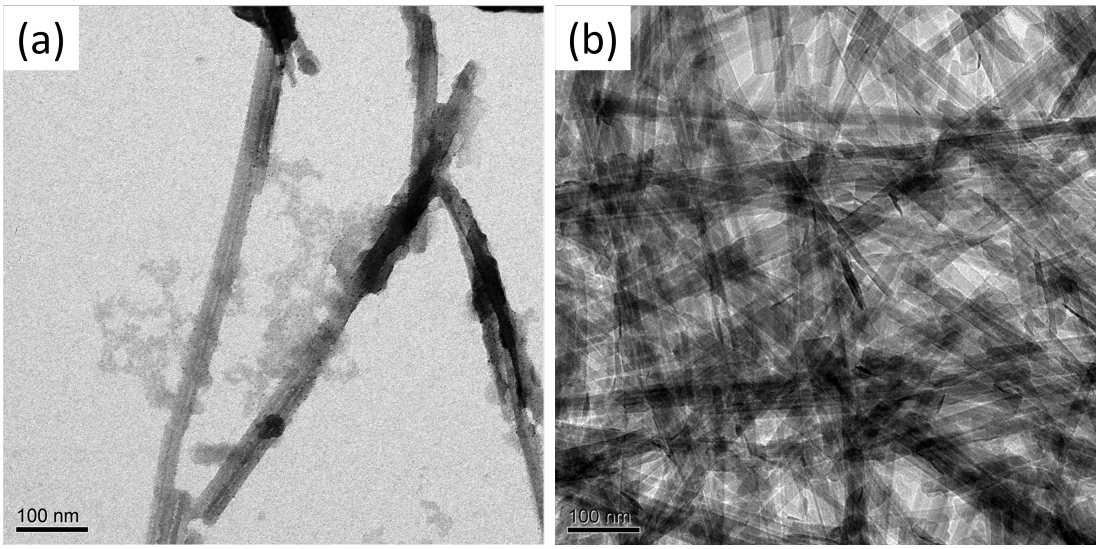

Fig. S1 Representative TEM images of (a) VTEOS modified attapulgite (ATP) nanorods, and (b) bare ATP nanorods.

Synthesis of ATP/AAm nanocomposite hydrogels

ATP/AAm nanocomposite hydrogels were prepared using initial solutions consisting of monomer acrylamide (AAm), attapulgite (ATP) clay, solvent (H_2O), initiator potassium peroxodisulfate (KPS), and catalyst tetramethylethylenediamine (TEMED). The molar ratio of monomer, initiator, and catalyst was 100: 0.426: 0.735,[1] the concentration of AAm is fixed at 3 M , the clay concentration is varied from 0.1 to 10 wt% with respect to AAm. First, an aqueous solution consisting of water (28.5 mL), clay (0.0064–0.64 g) and AAm (6.4 g) was prepared. Than catalyst TEMED (72μL) and initiator KPS (0.09g in 1.5 mL of H_2O) were added to the former solution with stirring in ice-water bath. Finally, free radical polymerization was allowed to proceed at 25 ºC for 8h.[2] For compare, AMPS was also polymerized with ATP in the same condition.

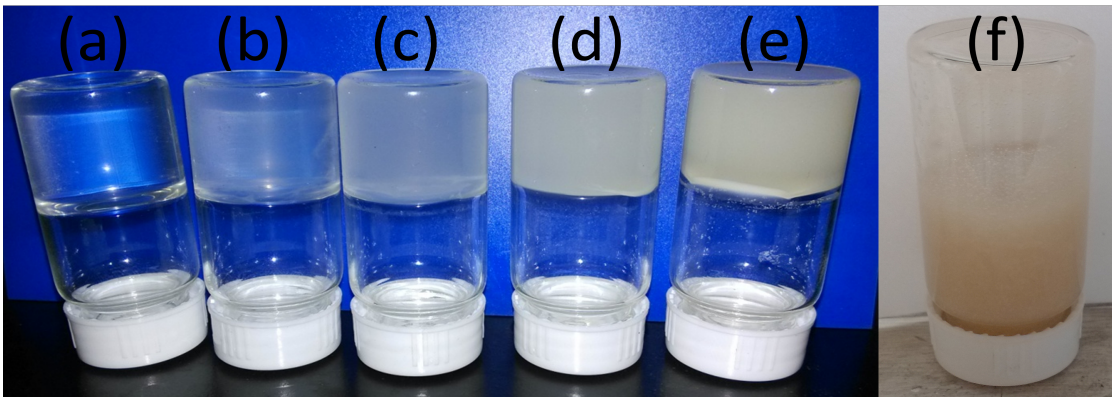

Fig. S2 ATP/AAm aqueous solution formed gel-like substances within 8 h at room temperature, from left to right the content of ATP is (a) 0.1, (b) 0.5, (c) 1, (d) 5, (e) 10 wt% with respect to AAm. (f) ATP/AMPS formed viscous fluid rather than gel under the same reaction conditions of ATP/AAm system, ATP is 5 wt% respect to the weight of AMPS.

References

1. K. Haraguchi, K. Murata and T. Takehisa, *Macromolecules*, 2011, **45**, 385-391.
2. M. Zhu, Y. Liu, B. Sun, W. Zhang, X. Liu, H. Yu, Y. Zhang, D. Kuckling and H. J. P. Adler, *Macromolecular rapid communications*, 2006, **27**, 1023-1028.