Supplementary information

Shape memory hydrogel induced by the interactions between metal ions and phosphate

Because of the association of the –OH of the IPPA around the Fe^{3+} ions, the H-O bonds become longer. As a result, the peak of P-OH at 1106 cm^{-1} becomes stronger and broader after adding Fe^{3+}, and the peak moves to right side for 2 cm^{-1}.

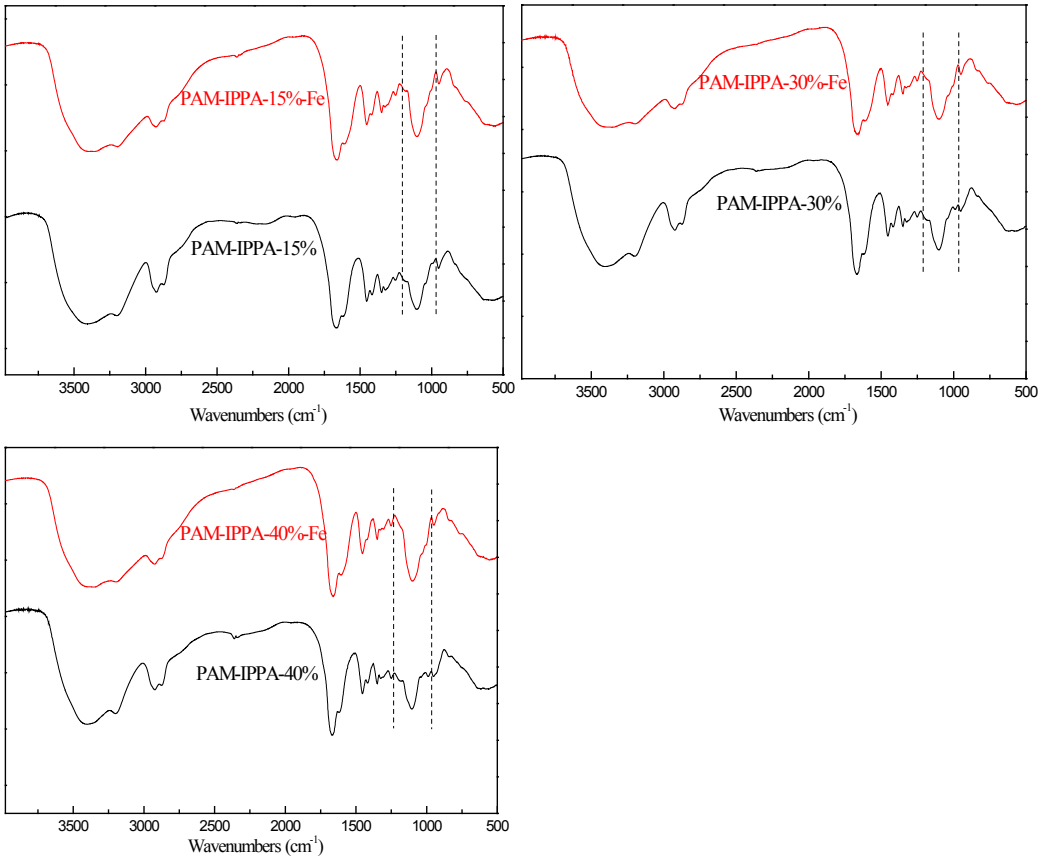

Fig. S1 *ATR-FTIR spectra of copolymers before and after immersed in $FeCl_3$*

Before immersed in Fe^{3+} solution, the sample disks prepared in molds were all of 1000 μm of thickness. After immersed in $FeCl_3$ solution, disks swelled in different degrees. *Fig. S2* shows G' and G" of hydrogels at the gap of 1000 and 1400 μm after immersed in Fe^{3+}. There are some differences of the results at the gap of 1000 and 1400μm. However, it had little influence on the results of overall trend.

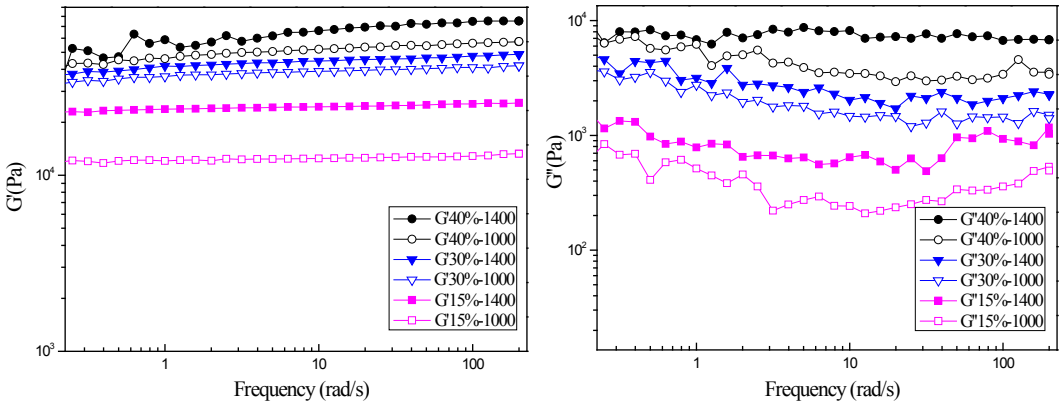

Fig.S2 *G' and G" of hydrogels at 1400 and 1000 μm after immersed in* Fe^{3+}

As shown in Fig. S3, when the bended hydrogel immersed in alkaline water solution, the hydrogel can recover to its original shape because of the precipitation of the Fe^{3+} ions. However, it can not be bended again after immersed in acid solution.

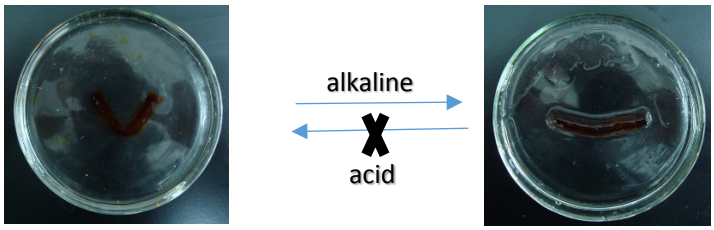

Fig. S3 *The influence of the different pH*

Hydrogel sample was prepared and immersed in distilled water to swell. After 2 days, the sample swelled to a soft hydrogel disk with a diameter of 55 mm, and then it was immersed in the 0.1mM of Fe^{3+} solution. As time passed, the hydrogel shrunk, and the diameter was 25 mm after 3 days. Of course it showed that it could recover to its original volume as the complexing of the Fe^{3+} with the EDTA, and it was reversible. The size of the volume of the hydrogel depended on the time of being in solution.

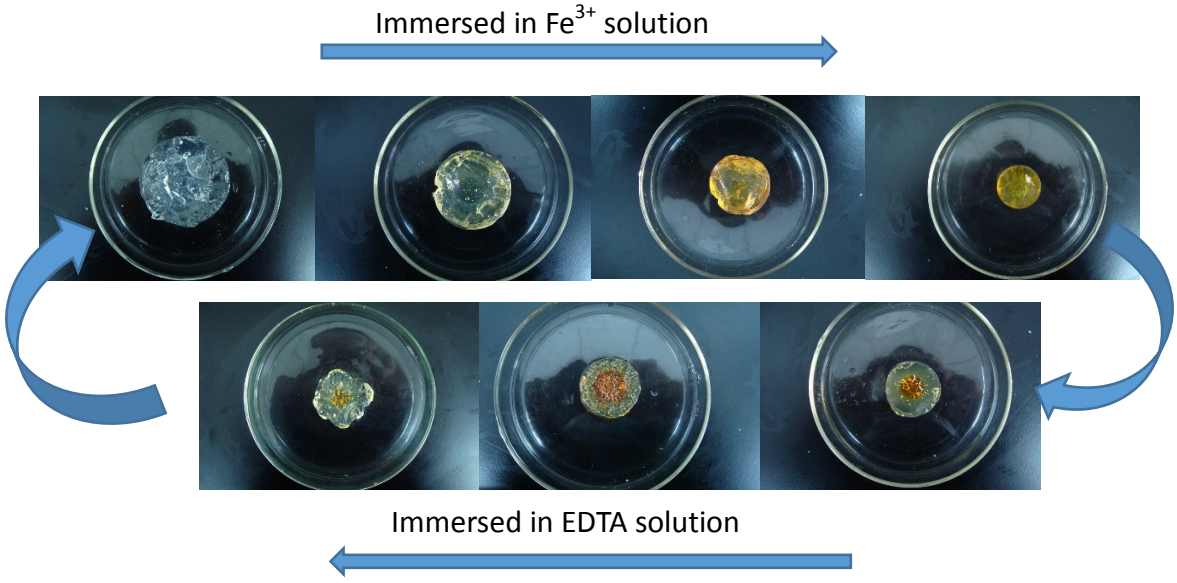

Fig. S4 *Reversible swell-shrink ability of the hydrogel*