Supporting information

Interfacially designed magnetic nanoparticles as Fenton-like catalyst for efficient chemical cleaning of polyamide nanofiltration membranes

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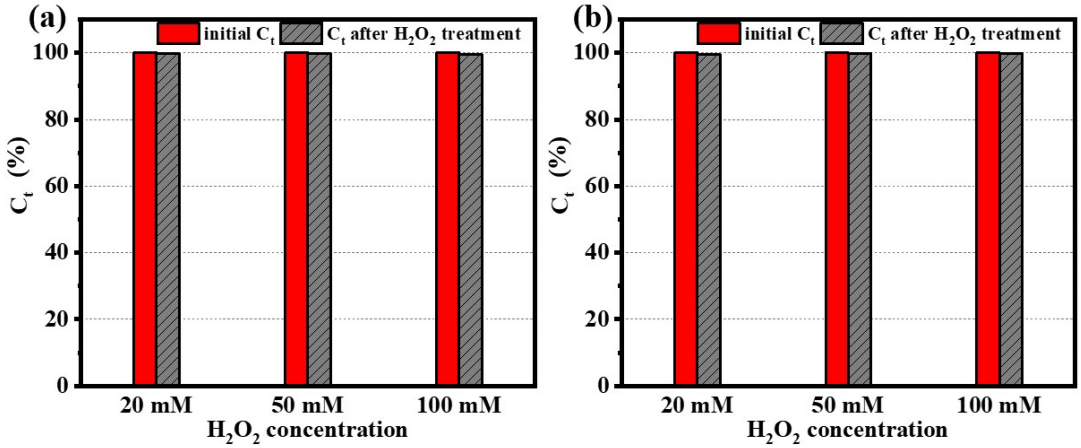

Fig. S1 Dye decolorization by hydrogen peroxide at pH 6 (a) and pH 11 (b) respectively. Decolorization conditions: the decolorization experiments were carried out by adding hydrogen peroxide into dye solution at pH 6/11 and 25 °C.

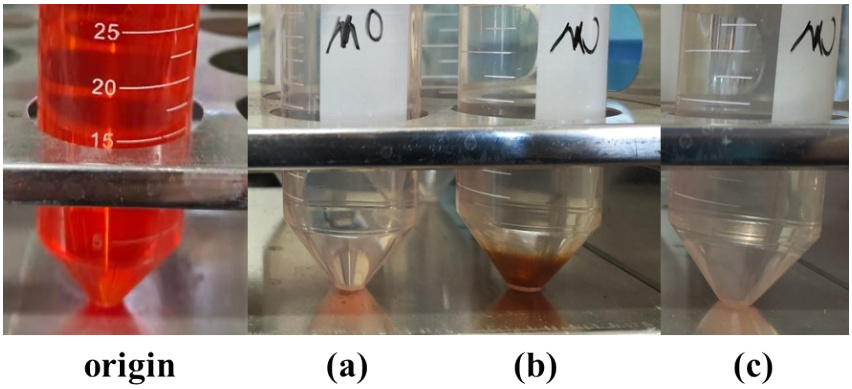

Fig. S2 Dye decolorization by Fenton agent (0.7 mM hydrogen peroxide, 50 mg/L ferrous sulfate) at pH 3(a), pH 6 (b). (c) The precipitate disappeared after adjusting the pH to 3

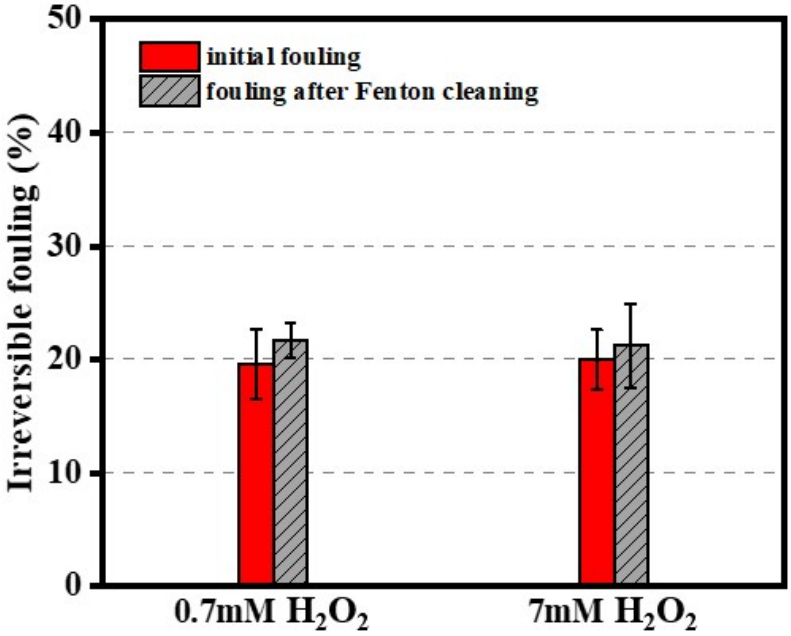

Fig. S3 Fouling removal efficiency of Fenton agent soaking at 35 °C for 30min

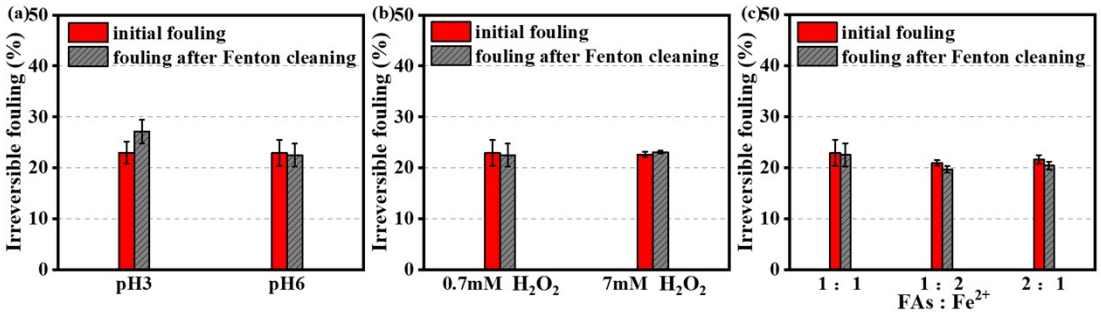

Fig. S4 Influence of pH (a) and hydrogen peroxide concentration (b) on the cleaning efficiency of Fenton agent (50 mg/L FAs, 0.7 mM hydrogen peroxide, and 50 mg/L ferrous sulfate). (c)

Influence of FAs and ferrous sulfate ratio (50 mg/L:50 mg/L, 50 mg/L:100 mg/L, 100 mg/L:50 mg/L) on Fenton cleaning efficiency (0.7 mM hydrogen peroxide)

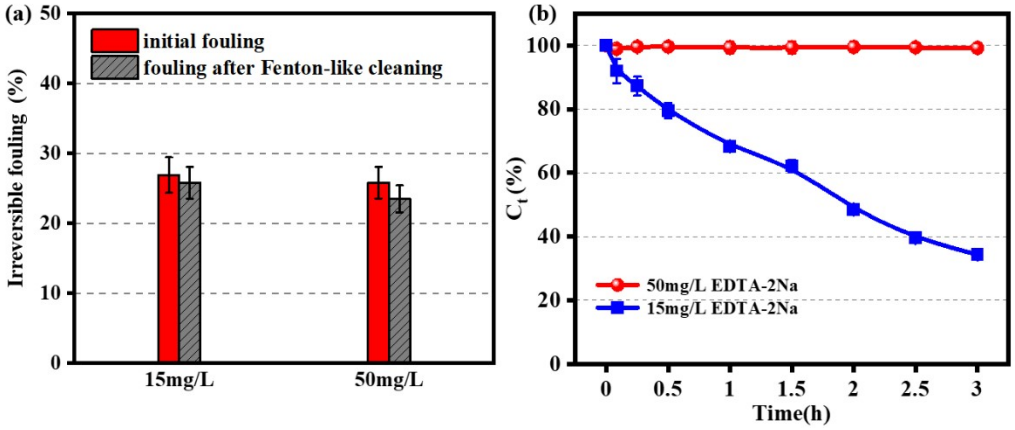

Fig. S5 Cleaning efficiency of Fenton agent (15/50 mg/L EDTA-2Na, 0.7 mM hydrogen peroxide, 50 mg/L ferrous sulfate) on membrane fouling at pH 3 (a), decolorization performance of Fenton agent (15/50 mg/L EDTA-2Na, 0.7 mM hydrogen peroxide, 50 mg/L ferrous sulfate), PH 3) on 20 mg/L MO solution at 25 °C (b).

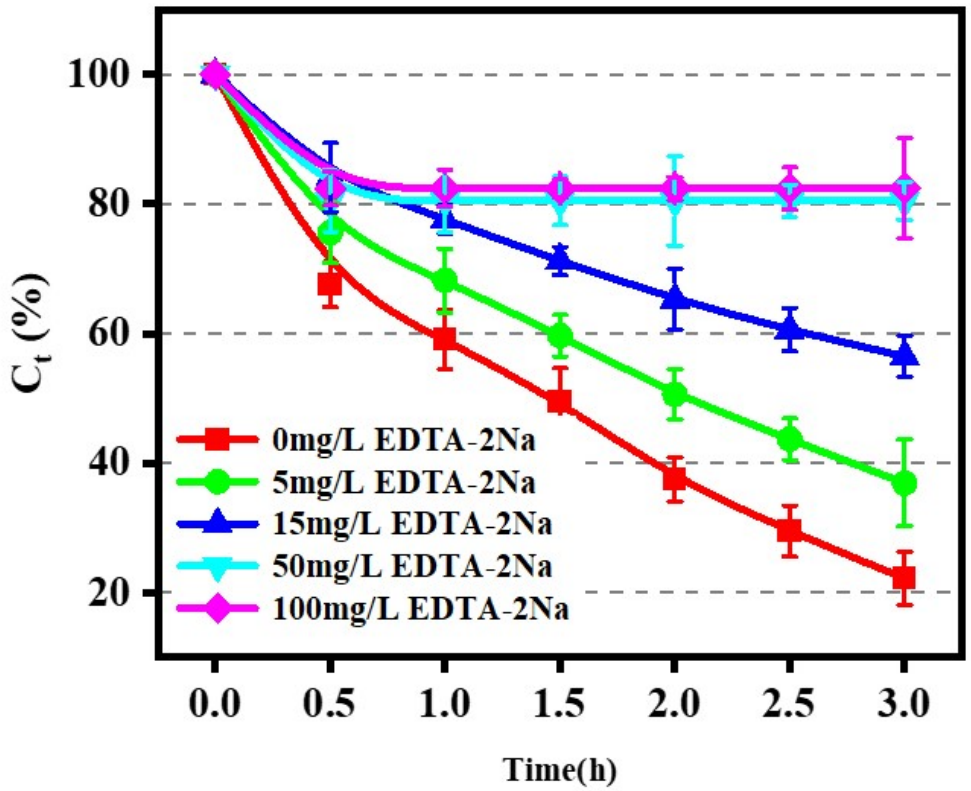

Fig. S6 Influence of EDTA-2Na concentration on decolorization rate of Fenton-like agent. Decolorization conditions: The decolorization experiment was carried out by using Fenton-like agent containing 0.7 mM hydrogen peroxide and 10 g/L Fe_3O_4 at 25 °C

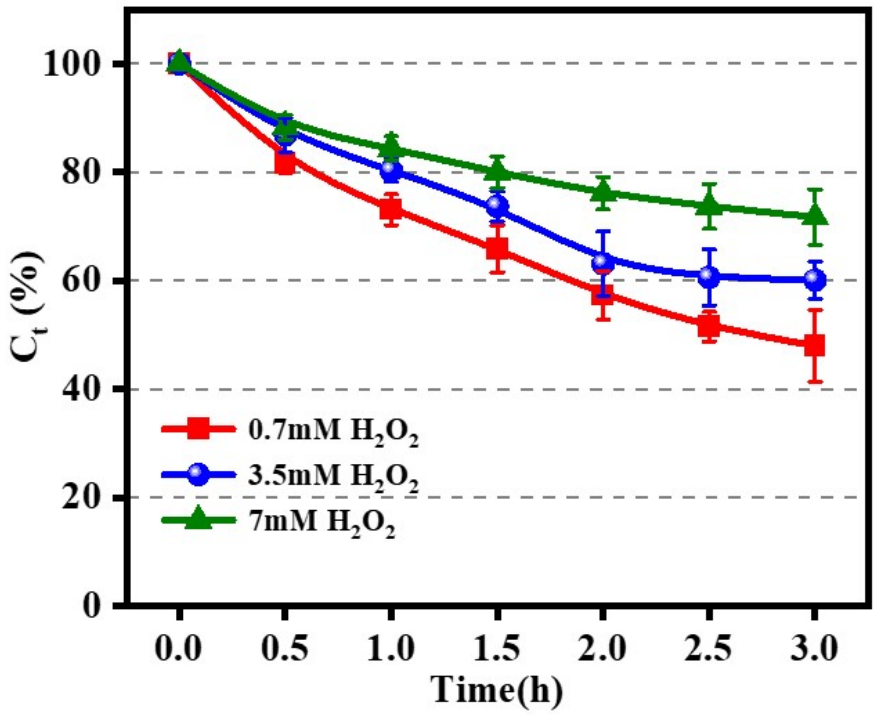

Fig. S7 Influence of hydrogen peroxide concentration (pH3, 10 g/L Fe_3O_4) on decolorization performance with EDTA-2Na.

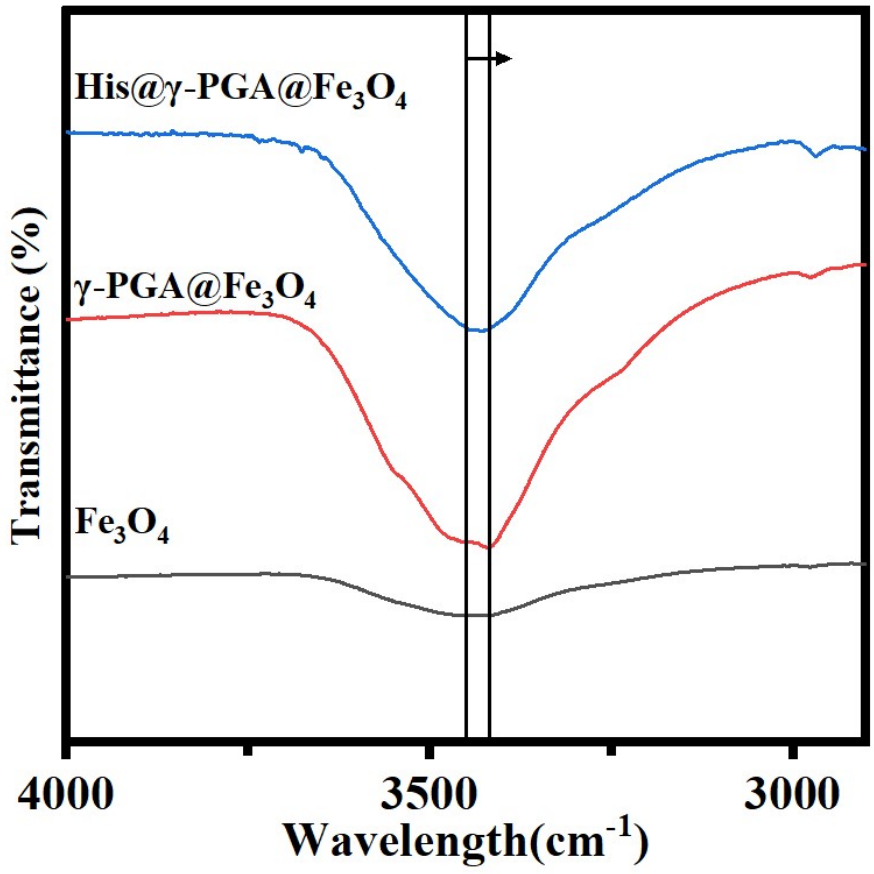

Fig. S8 the peak shifts of the hydroxyl peaks characterized by ATR spectroscopy.

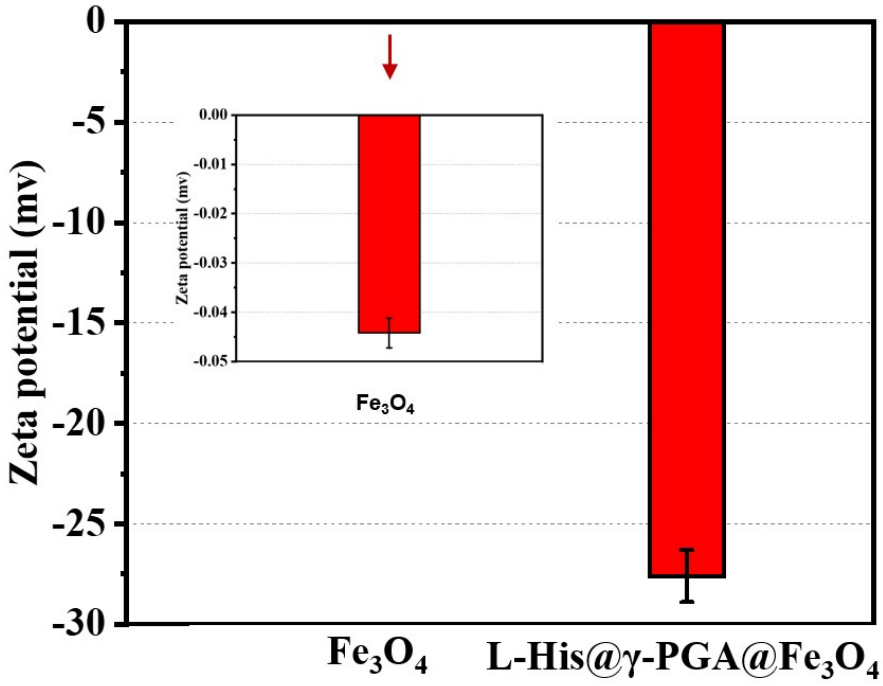

Fig. S9 Zeta potential measurement of Fe_3O_4 and L-His@γ-PGA@Fe_3O_4 nanoparticles at pH 3

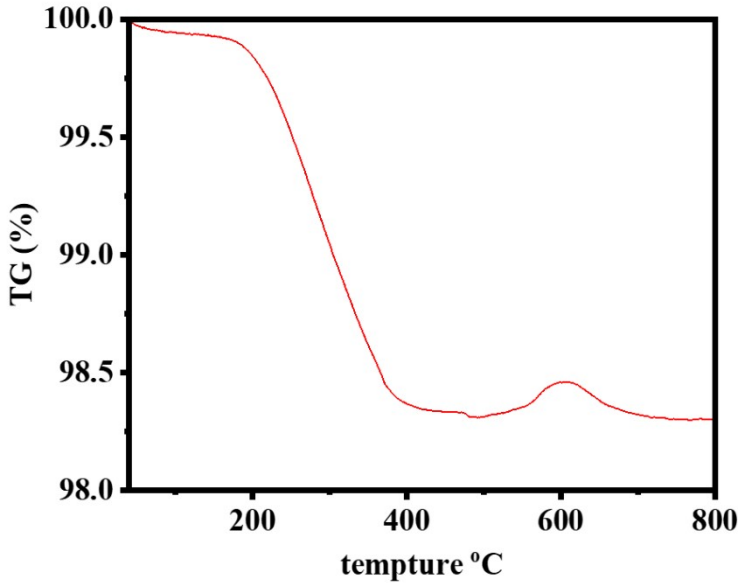

Fig. S10 thermogravimetric/differential thermal analysis of L-His@γ-PGA@Fe_3O_4 nanoparticles

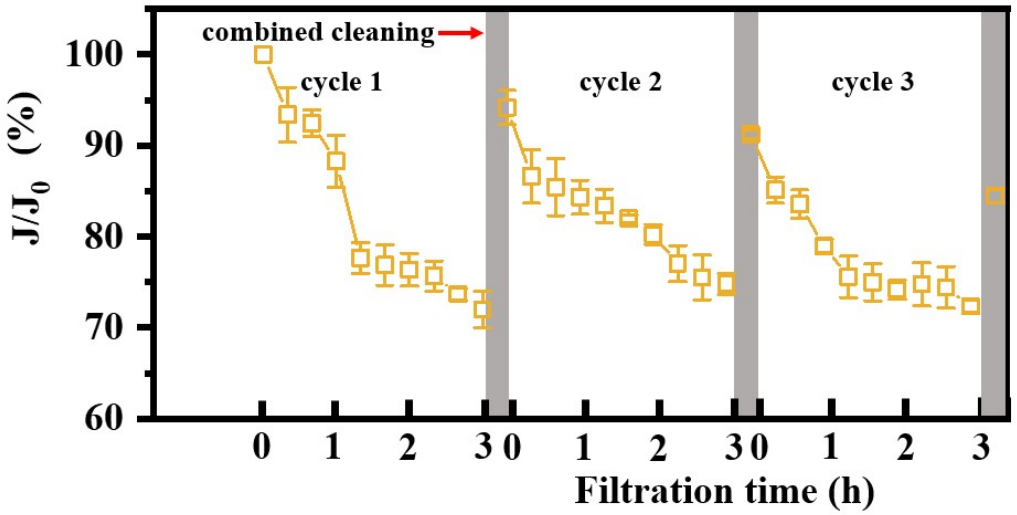

Fig. S11 Membrane fouling-cleaning cycles using combined cleaning strategy. The fouling/cleaning operation was carried out at 3 bar, 10 L/h and 25°C.

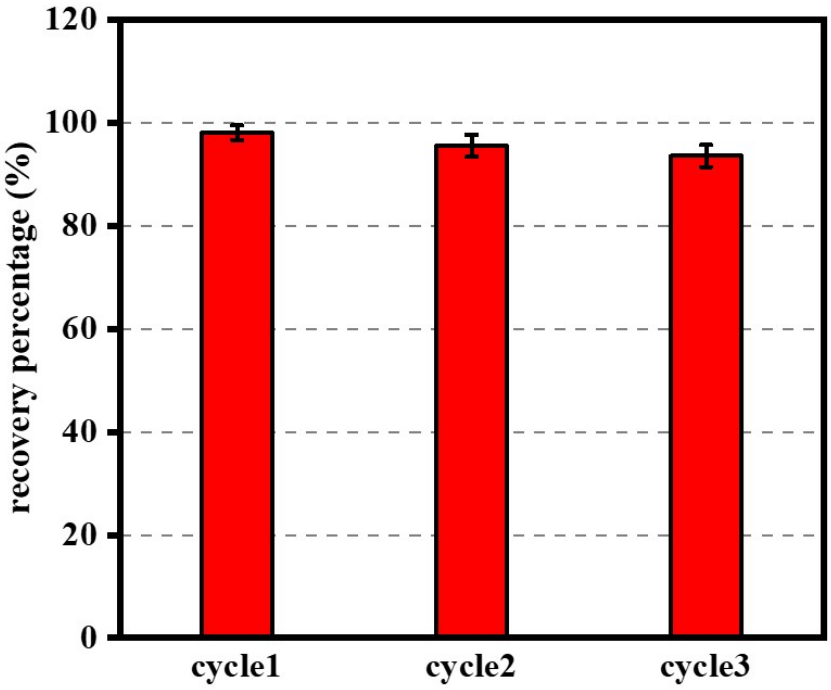

Fig. S12 Recovery percentage of catalysts during membrane fouling-cleaning cycles using combined cleaning strategy.