Supporting information

Fig. s1. Image of the MDSHSs separated from the solution by a magnet.

The kinetic study of adsorption process provides an important basis for adsorption efficiency. A pseudo-second-order kinetic model was used to analyze the kinetic data,

$$\frac{t}{q_t} = \frac{1}{K_2 q_e^2} + \frac{t}{q_e} \quad (1)$$

where q_t and q_e are MB absorbed at time t (min) and equilibrium, respectively. K_2 is the rate constant of the pseudo-second-order adsorption (g/mg min). Fig. s2A shown a plot of t/q_t versus t. Table 1 summarizes the calculated q_e, K_2 and corresponding linear regression correlation coefficient (R^2) values. The results show that the q_e calculated is in good agreement with that obtained by the experiment. At different concentrations, the R^2 are close to 1, indicating the pseudo-second-order model is suitable for the description of MB adsorption.

After adsorption at room temperature (pH 7.21) for 30 min, the adsorption isotherm of MB in MDSHSs was obtained. The Langmuir isotherm model was used to study the adsorption.

$$\frac{C_e}{q_e} = \frac{C_e}{q_{max}} + \frac{1}{q_{max} K_L} \quad (2)$$

Where C_e is the equilibrium concentration (mg / L); q_{max} and K_L are the maximum MB adsorption capacity (257.07 mg/g) and Affinity parameter (0.030 L/mg) related to the Langmuir constant. As shown in Fig. s2B, the correlation coefficient for fitting the straight line is 0.9773 indicated that the adsorption is single-layer. In Table 2, we compared the adsorption capacity of MB by different adsorbents in literatures, indicating that MDSHSs show advantages in adsorption rate and capacity.

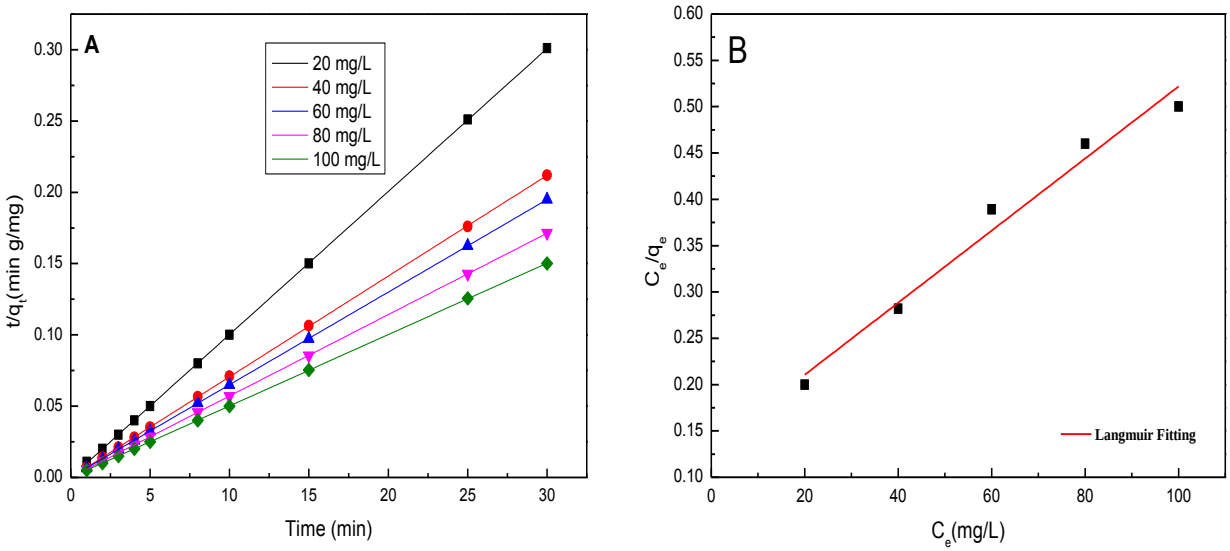

Fig. s2. Pseudo-second-order kinetics plots of MB adsorption on MDSHSs (A), plots based on Langmuir isotherm model (B).

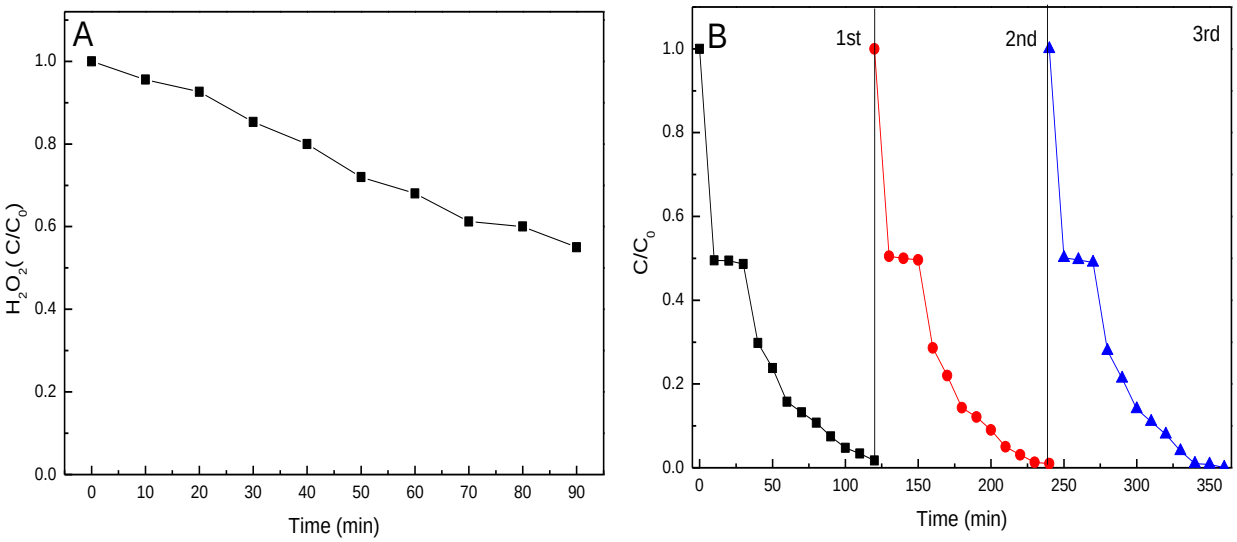

Fig. s3. (A) H_2O_2 concentration changing with the Fenton reaction under 60 mg/L MB solution, 0.2 g/L of MDSHSs, pH = 7.21 and 4.0 mL of H_2O_2; (B) the MB degradation with the residual H_2O_2 from (A) under 60 mg/L MB solution, 0.2 g/L of MDSHSs, pH = 7.21 and 1.8 mL of H_2O_2 (4.0 × 45%).

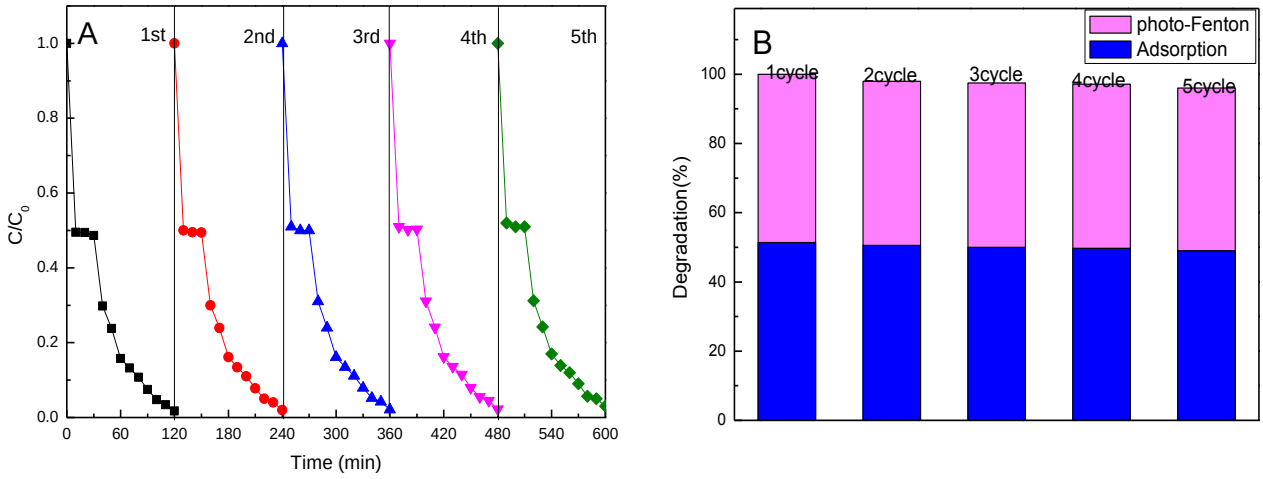

Fig. s4. Reuse performance of MDSHSs for adsorption and photo-Fenton of MB (A) and (B).

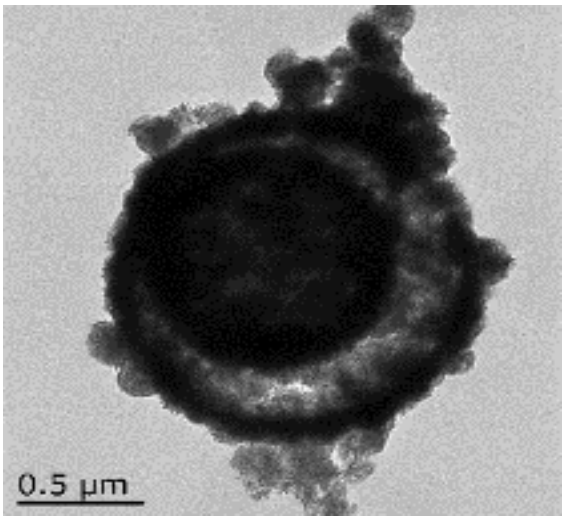

Fig. s5. A TEM image of the MDSHSs after 5 cycles.