Synthesis of Polyaniline Micro/nanospheres by a Copper (II)-Catalyzed Self-Assembly Method with Superior Adsorption Capacity of Organic Dye from Aqueous Solution

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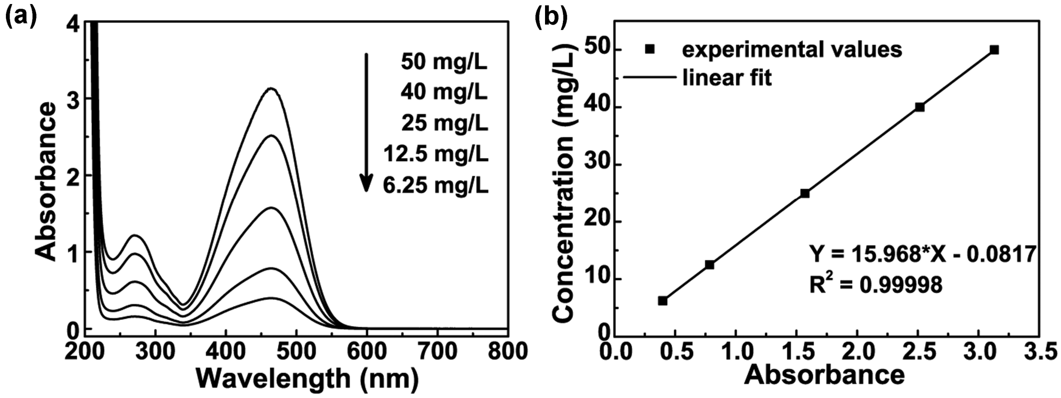

Fig. S1 (a) UV-vis spectra of standard methyl orange (MO) aqueous solutions with different concentrations; (b) the relation between the concentration of MO aqueous solutions and absorbance at 464 nm, the line represents the linear fit of the experimental values. (In the obtained equation Y=15.968*X-0.0817, X and Y correspond to the absorbance and concentration, respectively; R^2 represents the correlation coefficient)

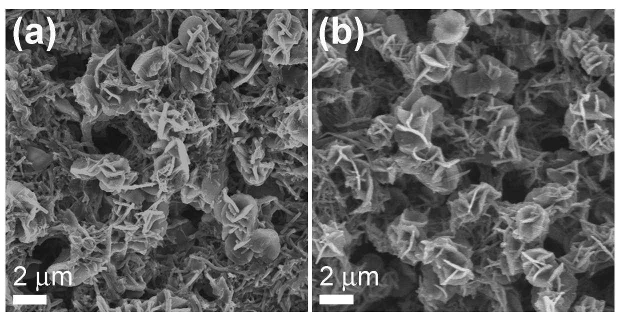

Fig. S2 SEM images of the PANI fiber/sheets synthesized by the common chemical oxidative polymerization in aqueous solutions without $CuCl_2$. Reaction conditions: (a) [aniline] = 0.3 M, (b) [aniline] = 0.1 M; [aniline]:[APS] =1:1; temperature: 0-5 °C.

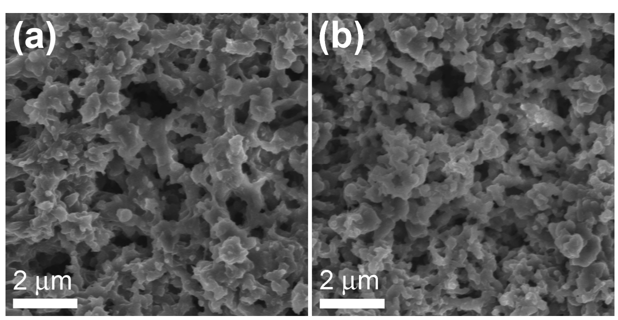

Fig. S3 SEM images of the PANI synthesized in acidic aqueous solutions. Reaction conditions: (a) [HCl] = 0.5 M, (b) [H_2SO_4] = 0.5 M; [aniline] = 0.3 M; [aniline]:[APS]:[$CuCl_2$] = 8:8:1; temperature: 0-5 °C.

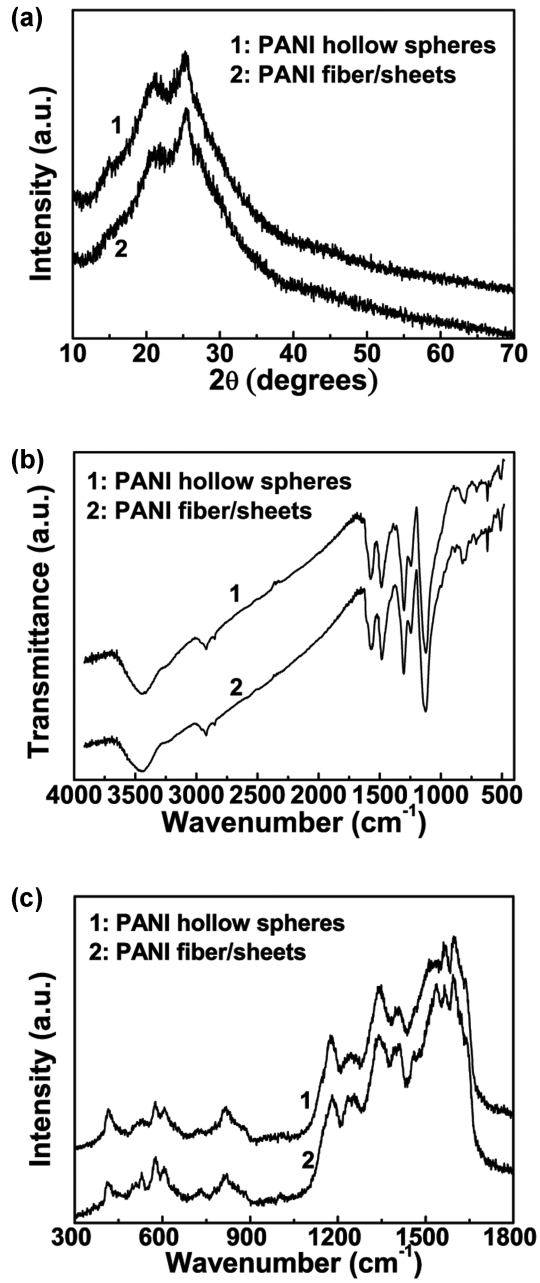

Fig.S4 (a) XRD patterns, (b) FTIR and (c) Raman spectra of the PANI hollow spheres and fiber/sheets

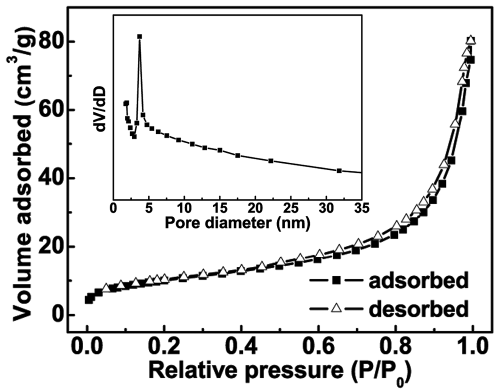

Fig. S5 Nitrogen adsorption-desorption isotherms and the pore size distribution curve of the as-synthesized PANI fiber/sheets.

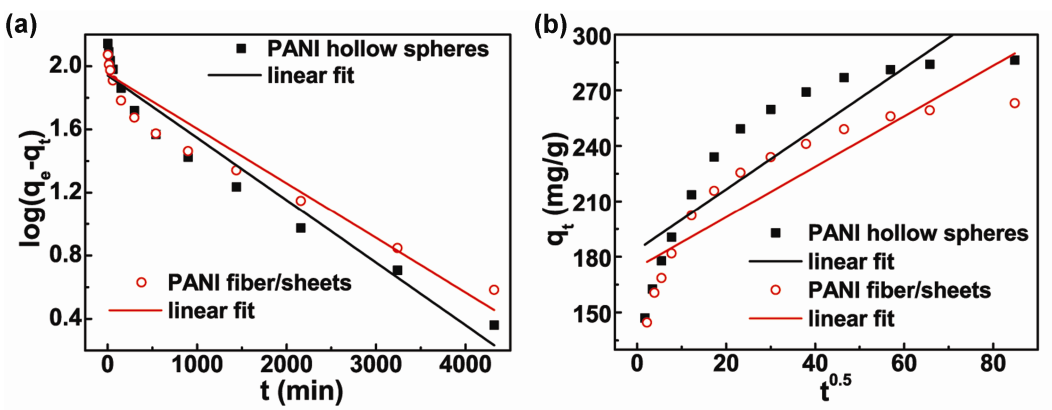

Fig. S6 (a) Pseudo-first-order and (b) intraparticle diffusion kinetics plots for the adsorption of MO at initial concentration of 60 mg/L by PANI hollow spheres and fiber/sheets. Pseudo-first-order equation: $\log(q_e - q_t) = \log q_e - \frac{k_1 t}{2.303}$, correlation coefficient R^2 = 0.94332 and 0.87068 for PANI hollow spheres and fiber/sheets, respectively. Intraparticle diffusion equation: $q_t = k_i t^{0.5} + c$, correlation coefficient R^2 = 0.7485 and 0.78202 for PANI hollow spheres and fiber/sheets, respectively. Here q_e and q_t are the amounts of MO adsorbed on PANI (mg/g) at equilibrium and at time t (min), respectively, k_1 the pseudo-first-order rate constant (min^{-1}), k_i the intraparticle diffusion rate constant (mg/g·min$^{1/2}$) and c the slope that represents the thickness of the boundary layer.

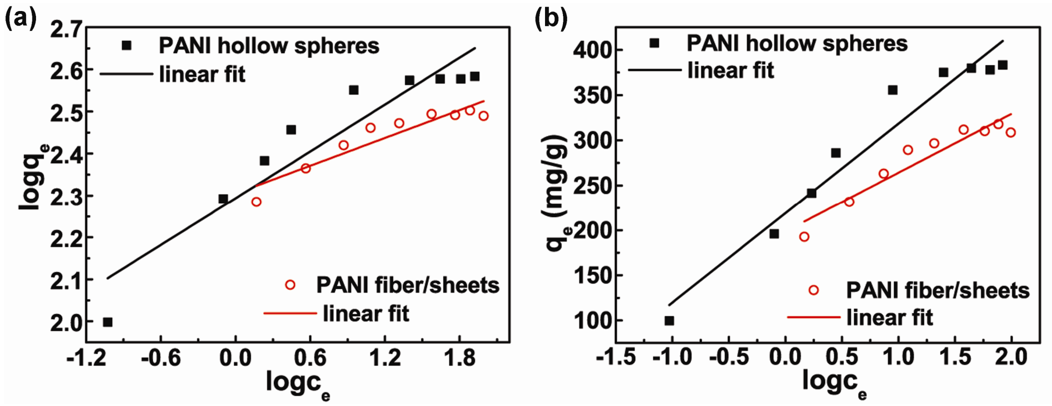

Fig. S7 Adsorption isotherms of MO on PANI hollow spheres and fiber/sheets fitted by the models of (a) Freundlich and (b) Temkin. Freundlich isotherm equation: $\log q_e = \log k_F + \frac{1}{n}\log c_e$, correlation coefficient R^2 = 0.87271 and 0.85897 for PANI hollow spheres and fiber/sheets, respectively. Temkin isotherm equation: $q_e = a + b\log c_e$, correlation coefficient R^2 = 0.9418 and 0.88877 for PANI hollow spheres and fiber/sheets, respectively. Here q_e is the amounts of MO adsorbed on PANI at equilibrium (mg/g), c_e the concentration of MO solution at equilibrium (mg/L), k_F and n Freundlich adsorption isotherm constants, a and b Termkin constants.