Supporting Information for manuscript entitled

A New Strategy to Enhance Phosphate Removal from Water by Hydrous Manganese Oxide

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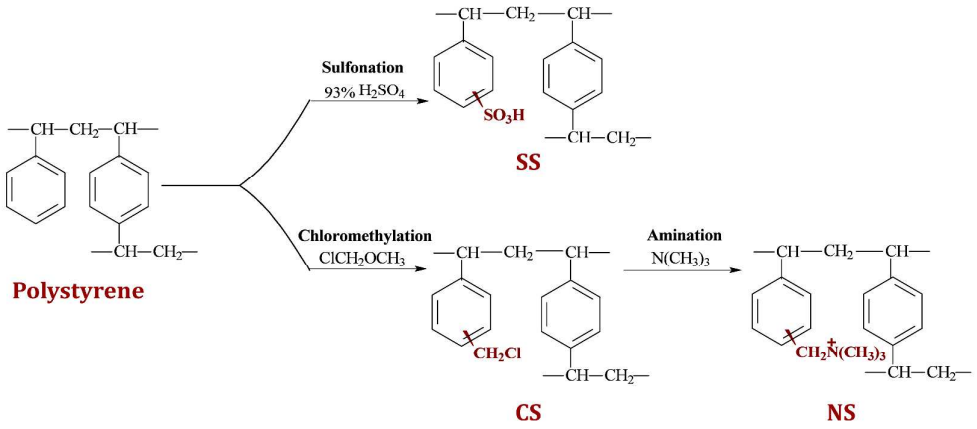
The *Supporting Information Available* contains 14 pages, including Scheme S1, Figures S1-S7, and Tables S1-S4.



Scheme S1 The historic relationship between three polymeric hosts

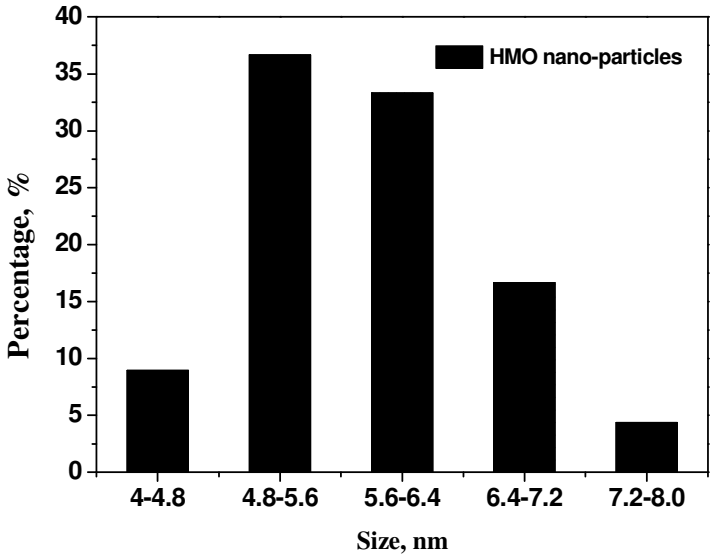


Figure S1 Particle size distribution of nano-HMO inside NS with the aid of Nano Measure (Version 1.2, ZKBC)

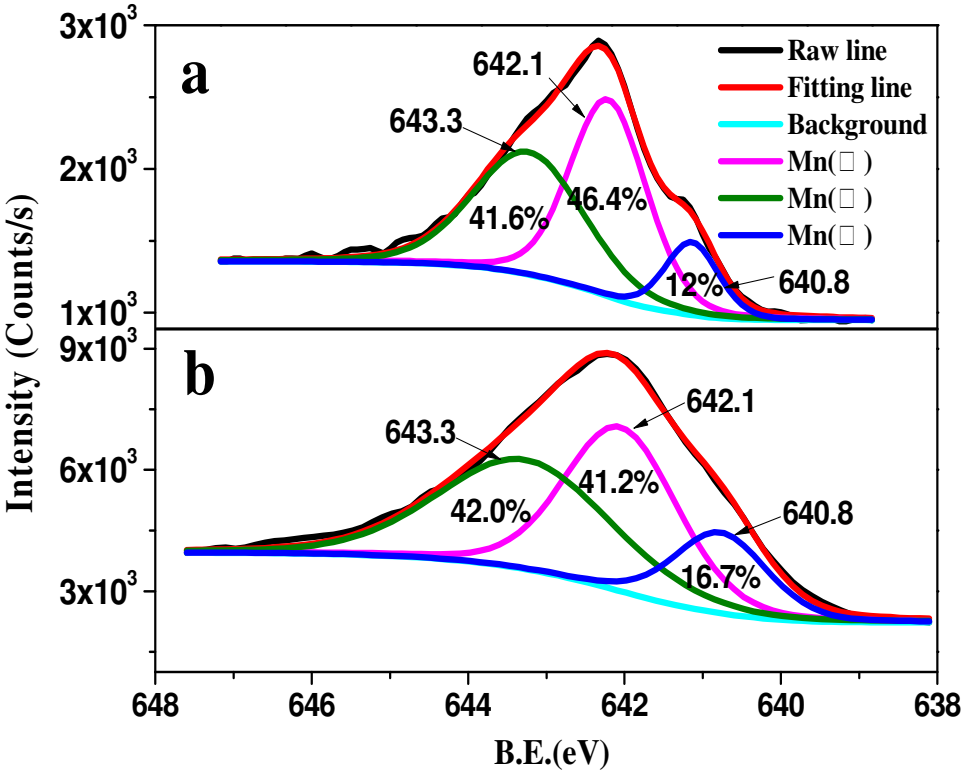


Figure S2 XPS spectra of manganese species in HMO@NS and HMO (a) HMO@NS; (b) HMO

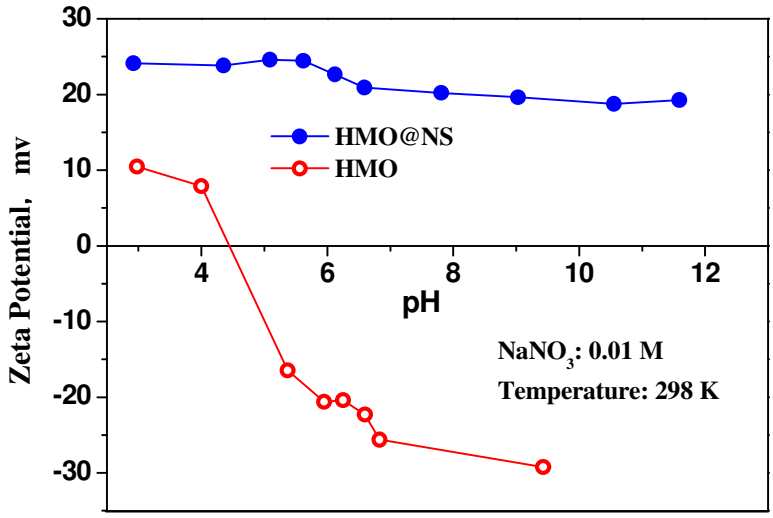


Figure S3 Zeta potentials of HMO and HMO@NS at different pH values.

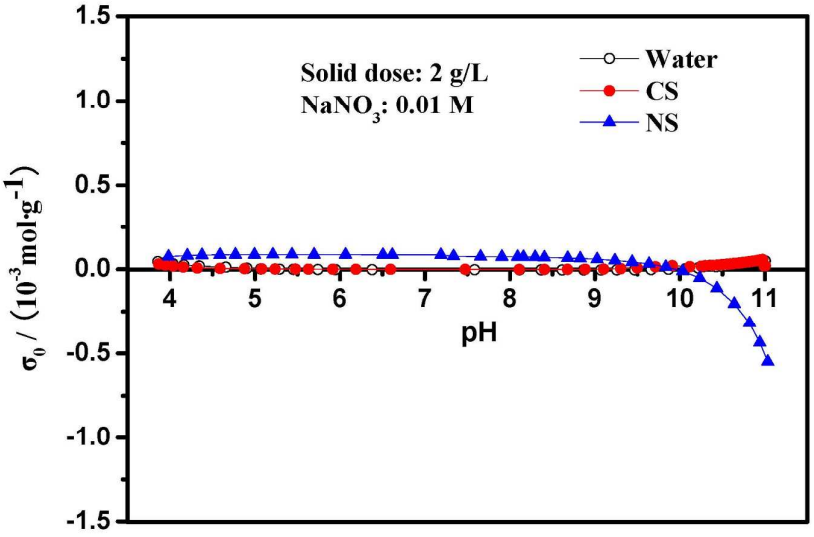


Figure S4 Potentiometric titration curves of CS and NS as compared to water

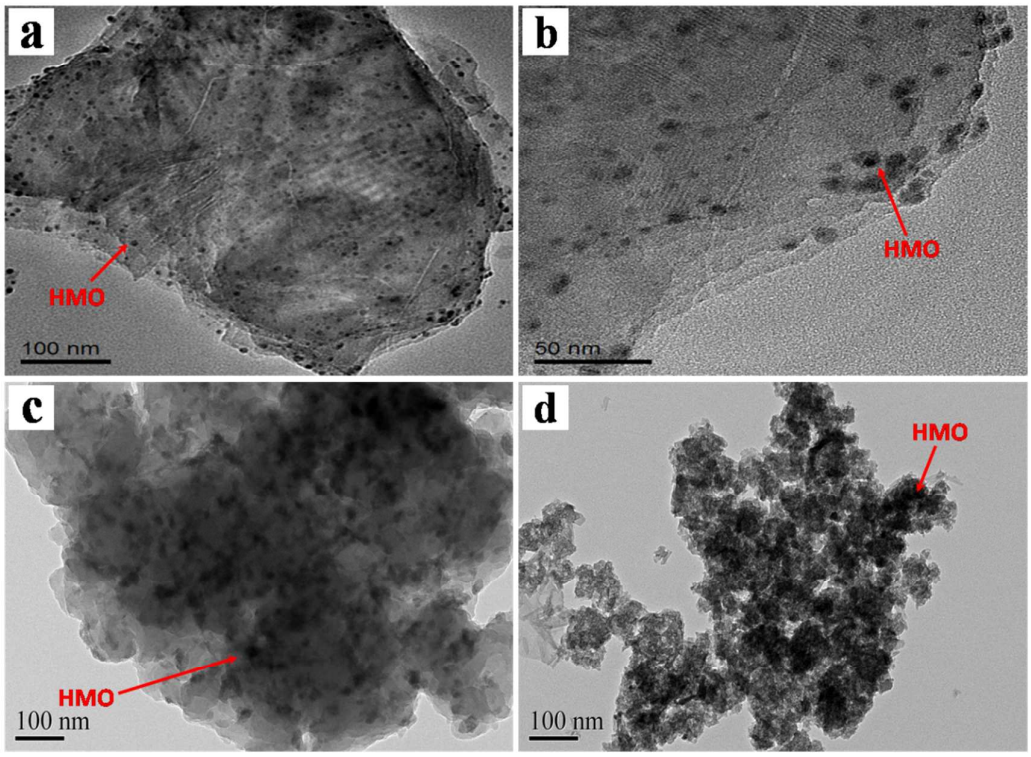


Figure S5 TEM images of three polymer-based HMO nanocomposites and the bulky one. (a) HMO@NS; (b) HMO@SS; (c) HMO@CS; (d) HMO

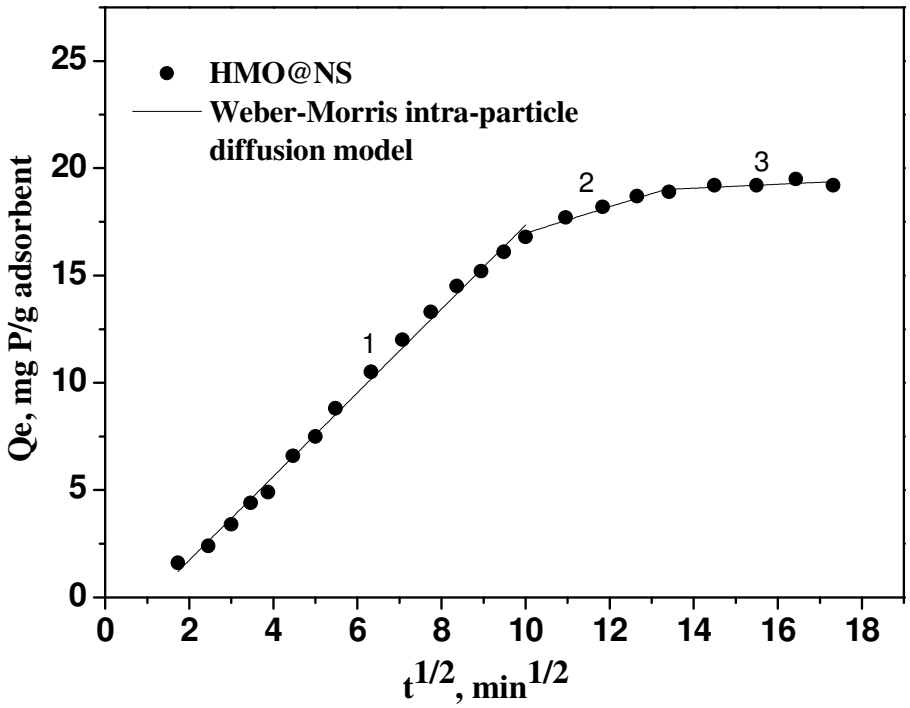


Figure S6 Phosphate adsorption kinetics from the background by HMO@NS at 298 K and pH 7.0. Adsorbent dose was 0.5 g/L. Initial phosphate was 10 mg P/L.

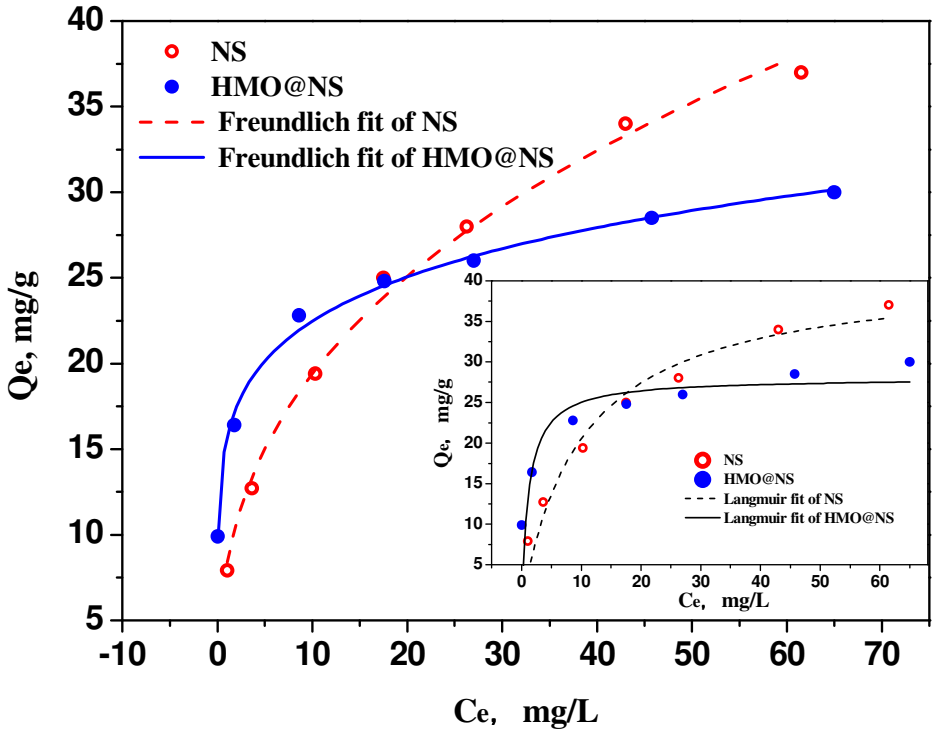


Figure S7 Adsorption isotherms of HMO@NS and NS at 298 K, pH 7.0. Each adsorbent dose was 0.50 g/L.

Table S1

The intraparticle diffusion model parameters for phosphate adsorption on HMO@NS and NS

Adsorbent	Intraparticle diffusion model					
	K_{p1}	I	R^2	K_{p2}	I	R^2
HMO@NS	1.64	0	0.993	0.502	12.2	0.966
NS	1.26	0	0.991			

K_{p1}: Intraparticle diffusion rate constant of the first step for HMO@NS or NS;

K_{p2}: Intraparticle diffusion rate constant of the second step for HMO@NS;

I: Y-intercept.

Table S2
Langmuir and Freundlichmodel parameters for phosphate adsorption on NS and HMO@NS.

Adsorbent	Langmuir model			Freundlich model		
	q_{max}(mg/g)	b(L/mg)	R^2	$K_{[mg/g\cdot(L/g)^n]}$	n	R^2
NS	41.2	0.099	0.950	8.25	2.69	0.994
HMO@NS	28.0	0.833	0.644	15.66	6.37	0.994

Table S3
Comparison of adsorption capacity of different phosphate adsorbents

Adsorbents	q_{max}	References
Fly ash	20.2	1
Blast furnace slag	18.9	2
CMOMO	26.3	3
Ferric sludge	25.5	4
Acid mine drainage sludge	32.0	5
Iron oxide tailings	8.2	6
Aluminum	23.0	7
Fe oxide tailing	21.5	8
Fe(III)/Cr(III) hydroxide	6.5	9
Fe-Mn binary oxide adsorbent	36	10
MgMn-layered double hydroxides	22.3	11
HMO@NS	>29.78*	Present study

* Obtained from the Freundlich adsorption isotherm (Figure S7 and Table S2) at the equilibrium concentration of 60 mg P/L.

Table S4

Basic properties of the real effluent sampled from a WWTP in Nanjing city.

pH	Phosphate (mg P/L)	Cl- (mg/L)	SO_4^{2-} (mg/L)	NO_3^- (mg/L)	Mg^{2+} (mg/L)	Ca^{2+} (mg/L)	NH_4^+-N (mg/L)	COD (mg/L)
7.2	1.3	71.3	47.5	26.4	11.3	67.6	0.5	18.7

Literature cited

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