Electronic Supplementary Material (ESI) for Inorganic Chemistry Frontiers.

Supporting information

Towards magnetic responsive chalcogenides for efficient separation in water treatment: Facile synthesis of magnetic layered chalcogenides Fe_3O_4/KMS-1 composite adsorbent and their zinc removal application in water

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Table S1. Isotherm parameters for adsorption of Zn(II) by different samples.

Samples	Langmuir			Freundlich		
	q_m	K_L	R^2	1/n	K_f	R^2
KMS-1	140.1	0.210	0.988	0.112	75.1	0.966
Fe_3O_4	no date	no date	0.146	0.960	0.108	0.984
FK_1	89.1	0.060	0.985	0.192	28.6	0.972
$FK_{0.5}$	100.8	0.123	0.998	0.135	46.3	0.902
$FK_{0.4}$	105.3	0.096	0.996	0.119	51.4	0.978
$FK_{0.3}$	110.5	0.200	0.999	0.108	60.0	0.890

Table S2. Kinetic parameters for the removal of Zn(II) by KMS-1 and $FK_{0.3}$

Samples	$q_{e\ exp}$ (mg/g)	Pseudo- first-order			Pseudo- second-order		
		k_1 (min^{-1})	$q_{e\ cal}$ (mg/g)	R^2	k_2*10^3 (g/mg·min)	$q_{e\ cal}$ (mg/g)	R^2
KMS-1	104.3	0.032	29.3	0.8473	3.71	105.3	0.9998
$FK_{0.3}$	88.6	0.025	30.02	0.9863	2.00	90.5	0.9996

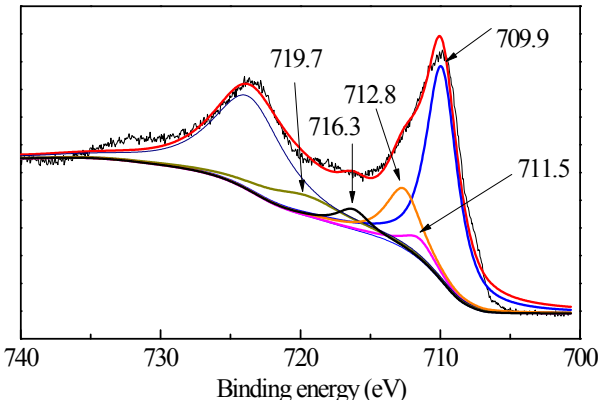

Fig. S1. XPS spectra of Fe 2p.

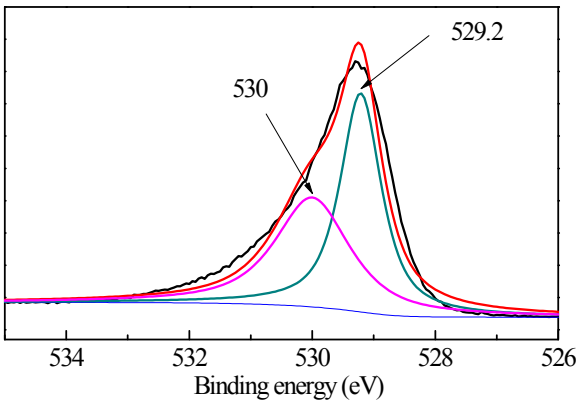

Fig. S2. XPS spectra of O 1s.

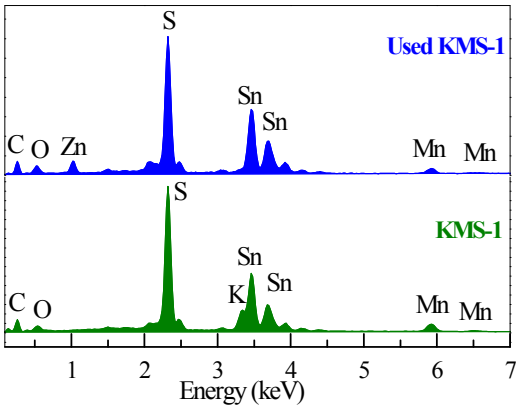

Fig. S3. EDS of KMS-1 and used KMS-1

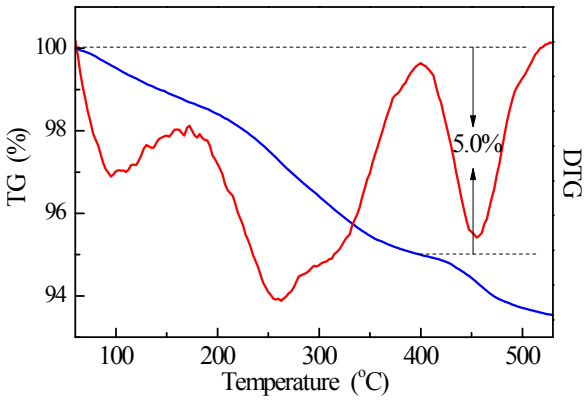

Fig. S4. TG and DTG curves for the used KMS-1.

The reaction equation of ion exchange between KMS-1 and Zn:

$$K_{1.9}Mn_{0.95}Sn_{2.05}S_6 + 1.35Zn^{2+} \xrightarrow{H_2O} [Zn(H_2O)_{1.7}]_{0.95}Zn_{0.4}Mn_{0.55}Sn_{2.05}S_6 + 0.4Mn^{2+} + 1.9K^{+} \quad \text{(S1)}$$