Supporting Information

Lignosulfonate functionalized g-C_3N_4/carbonized wood sponge for highly efficient heavy metal ions scavenging

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The K_d values are defined by the equation:

$$K_d = \frac{(C_0 - C_e)}{C_e} \times \frac{V}{m}$$

where C_0 (mg/L) and C_e (mg/L) are the initial and equilibrium concentrations of metal ions; V is the volume of the treated solution (mL); m is the weight of adsorbent (g). In generally, K_d values above 10^4 are generally regarded as very good, while values above 10^5 are exceptional.

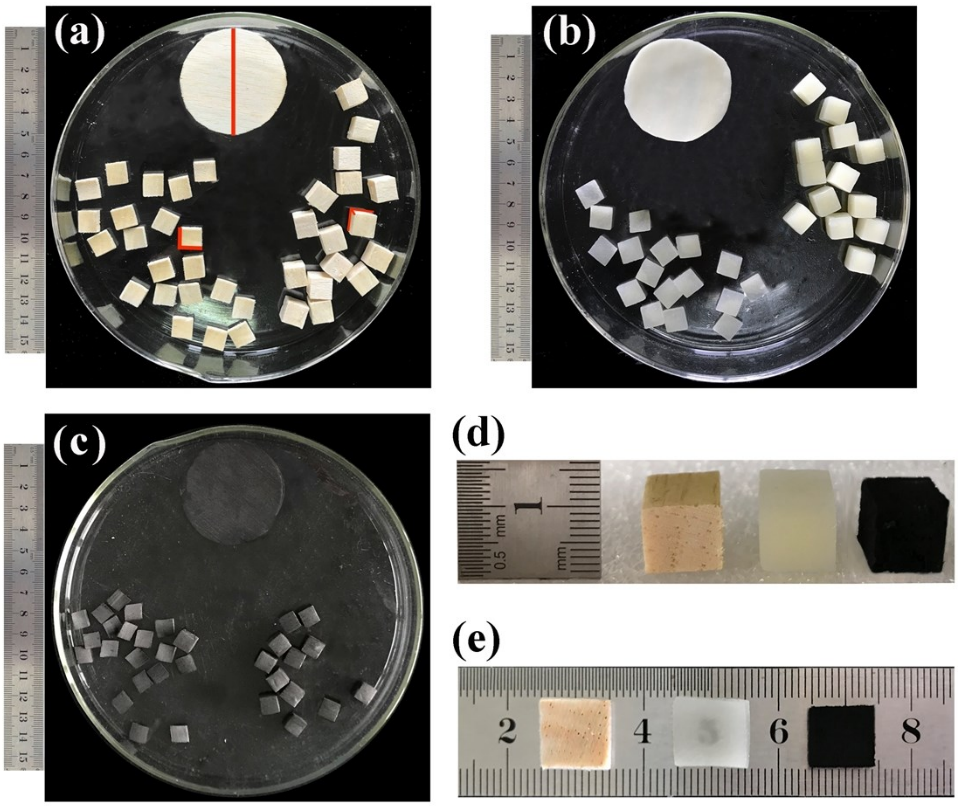

Fig. S1 Photograph illustration of (a) natural balsa wood, (b) delignified balsa wood aerogel, (c) LS-C_3N_4/CWS. Graphical comparison from left to right of natural balsa wood, delignified balsa wood aerogel and g-C_3N_4/CWS: (d) cube with a size of 10 mm × 10 mm × 10 mm and (e) slice with a size of 10 mm × 10 mm × 1 mm. The size of these three materials are similar but colors change significantly: delignified balsa wood aerogel appears to be white and transparent; while LS-C_3N_4/CWS is black due to pyrolysis at 550 °C. According to statistics, the qualities of cube-shape natural balsa wood, delignified balsa wood aerogel and LS-C_3N_4/CWS are 0.1308 g, 0.0315 g and 0.0436 g, respectively; while the sliced natural balsa wood, delignified balsa wood aerogel and LS-C_3N_4/CWS are 0.0131 g, 0.0030 g and 0.0044 g, respectively.

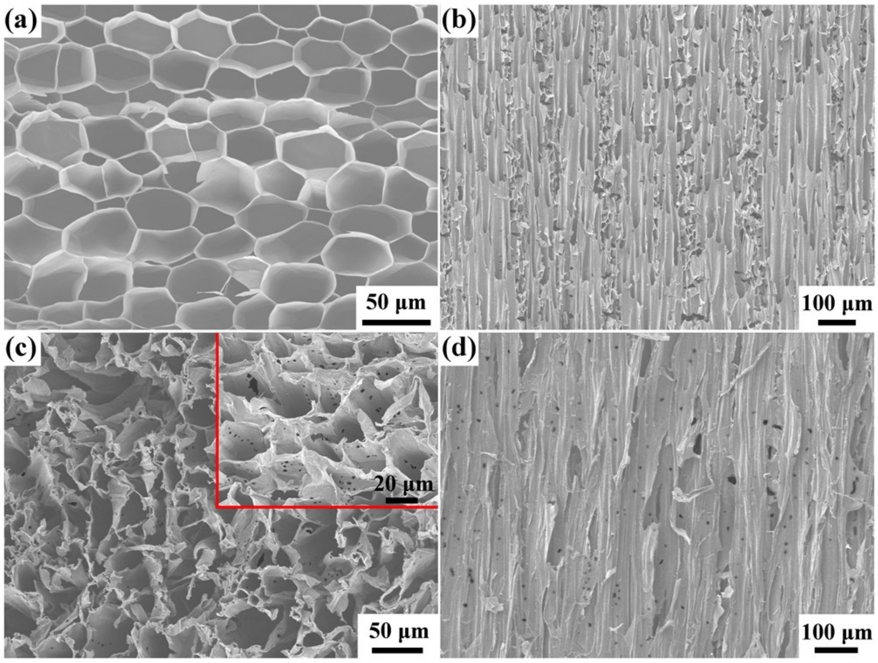

Fig. S2 SEM images: (a) cross-section of natural balsa wood slice; (b) longitudinal section of natural balsa wood slice; (c) cross-section of delignified balsa wood aerogel; (d) longitudinal section of natural balsa wood slice.

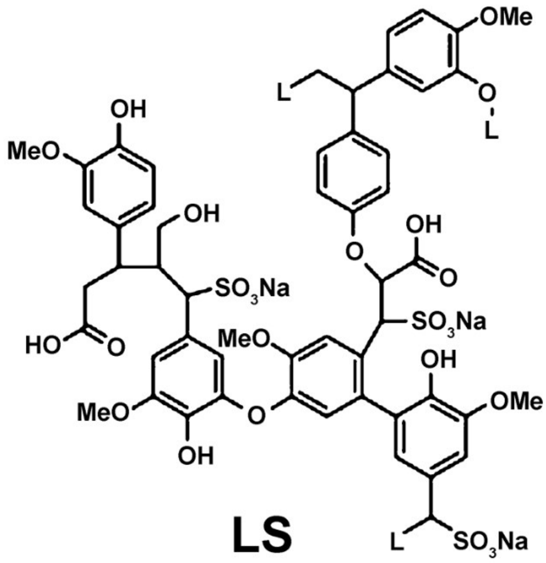

Fig. S3 Chemical structure of a typical lignosulfonate (LS) segment (L= Lignin).

Table S1 The apparent densities of various samples.

Materials	Density (mg/cm^3)	Materials	Density (mg/cm^3)
WS	29.8	g-C_3N_4/CWS	38.2
CWS	9.2	LS-CWS	10.2
LS-C_3N_4/CWS	49.3		

Table S2 Element composition of CWS, g-C_3N_4/CWS and LS-C_3N_4/CWS.

samples	Elemental analysis/wt%				
	C	H	N	O	S
CWS	78.05	1.54	1.19	12.34	0.01
g-C_3N_4/CWS	54.79	1.96	35.68	6.89	0.00
LS-C_3N_4/CWS	64.11	2.15	9.09	21.71	1.15

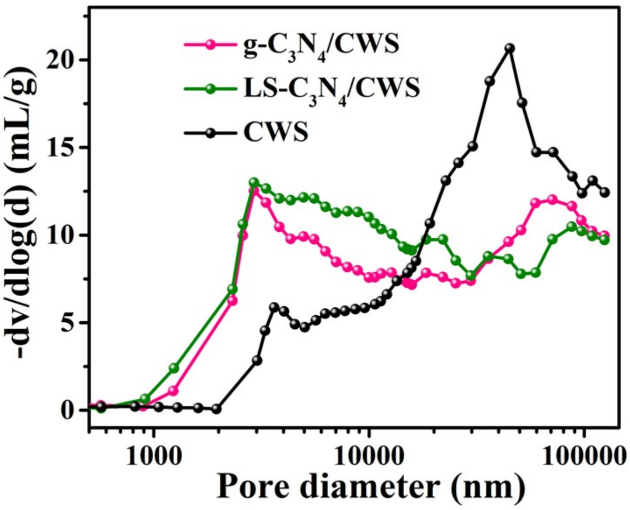

Fig. S4 Macropore size distribution curves of the obtained samples by mercury intrusion porosimetry.

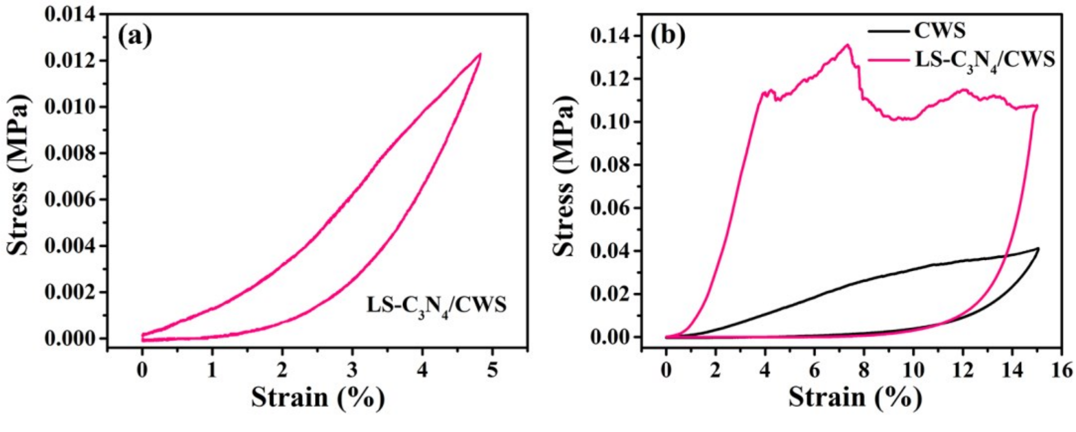

Fig. S5 (a) Stress−strain curves of LS-C_3N_4/CWS under compression with maximum strains of 5%; (b) Stress−strain curves of WS and LS-C_3N_4/CWS under compression with maximum strains of 15%.

Table S3. Langmuir and Freundlich isotherm parameters for LS-C_3N_4/CWS toward Pb^{2+}, Cd^{2+} and Cu^{2+}.

Models	Langmuir model			Freundlich model		
parameters	Q_{max} (mg/g)	K_L (L/mg)	R^2	K_F (mg/g)	1/n	R^2
Pb^{2+}	659.6	0.0792	0.9993	80.3	0.3786	0.9352
Cd^{2+}	329.1	0.0738	0.9992	72.7	0.2800	0.8872
Cu^{2+}	173.5	0.0361	0.9990	38.2	0.2741	0.8808

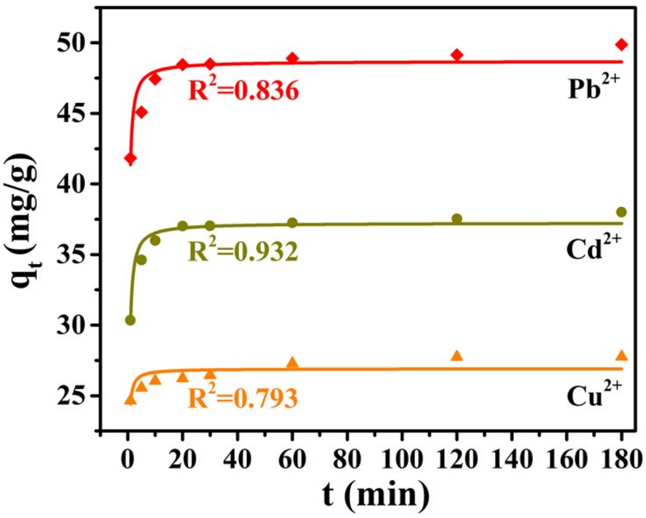

Fig. S6 Pseudo-first-order model kinetic fitting curves of Pb^{2+}, Cd^{2+} and Cu^{2+} on LS-C_3N_4/CWS adsorbent.

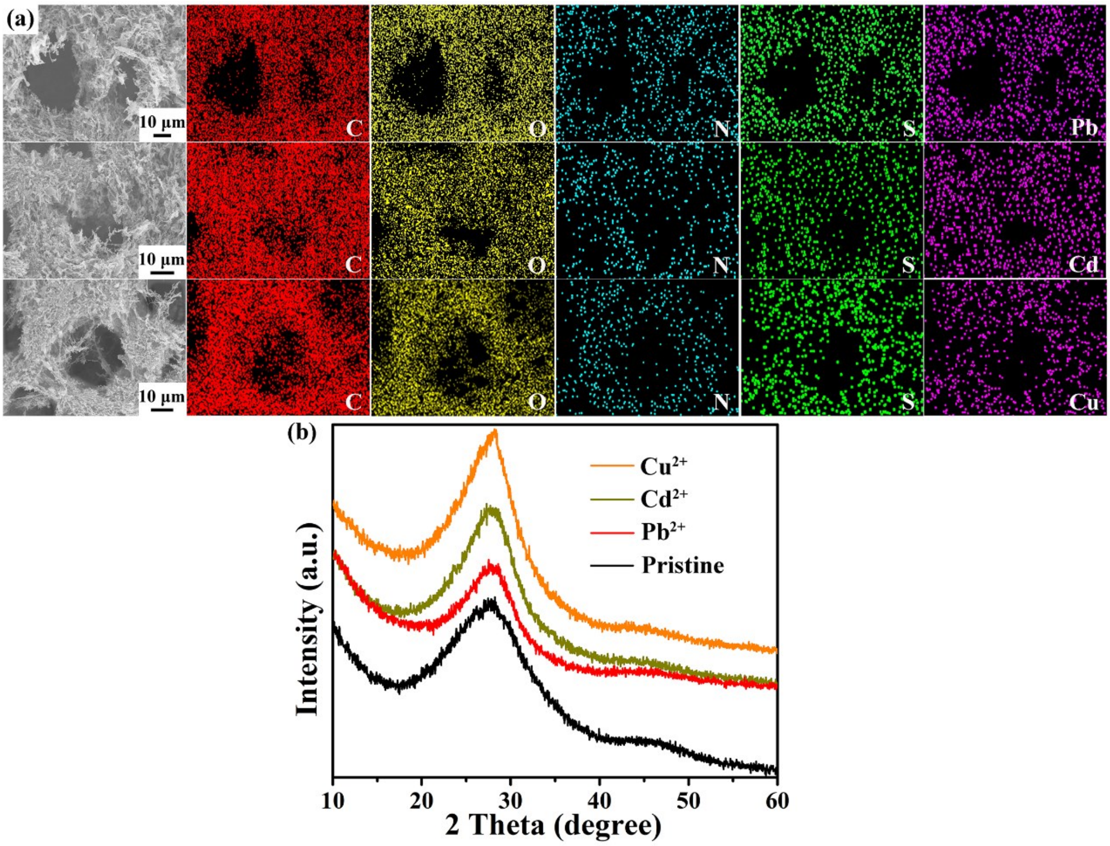

Fig. S7 SEM images with EDS mapping (a) and XRD patterns of LS-C_3N_4/CWS (b) after Pb^{2+}, Cd^{2+} and Cu^{2+} sorption.

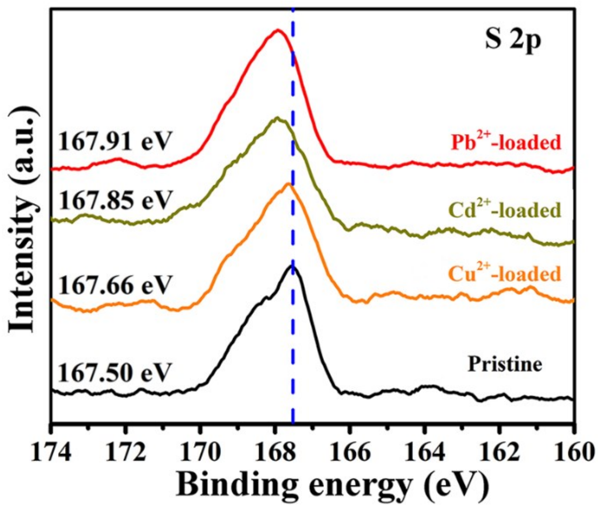

Fig. S8 S 2p spectra for LS-C_3N_4/CWS before and after adsorption of Pb^{2+}, Cd^{2+} and Cu^{2+}.