Supplementary Information

One-pot hydrothermal synthesis of carbonaceous nanocomposites for efficient decontamination of copper

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S1: size distribution of nanodots on GA1

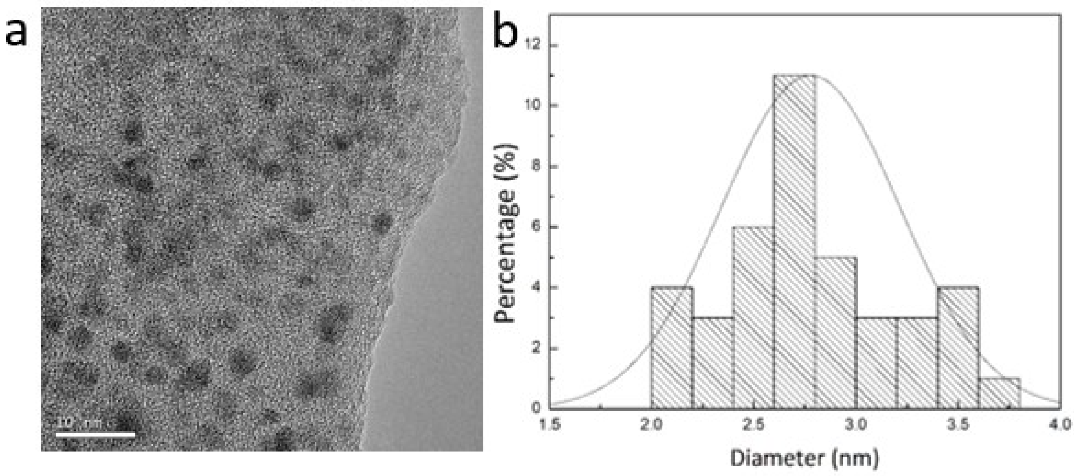

Fig.S1 HRTEM images of GA1 (a) and size distribution of the nanodots on GA1 (b).

S2: Fig. S2 show the Gran plots for the titration data of the materials. The Gran function (G) is expressed as:

At acidic side: $G_a = (V_0 + V_{a0} + V_b) \times 10^{-pH} \times 100$ （2）

At alkaline side: $G_b = (V_0 + V_{a0} + V_b) \times 10^{-(13.8-pH)} \times 100$ （3）

where G_a and G_b are the Gran functions at the acidic and alkaline sides, respectively, V_0 (mL) is the initial solution volume, V_{ao} (mL) represents the total volume of HCl added before titration to achieve pH ~ 3, V_b (mL) represents the volume of NaOH added at the different titration points. The hydroxide ions added to the suspension of materials are consumed by three steps reflected in the Gran plots: neutralization with excess H^+ (before Veb1), interaction with the various OH^- acceptors on the surface of materials (between V_{eb1} and V_{eb2}), and adjustment of the pH of suspension (after V_{eb2}). The two equivalent points, V_{eb1} and V_{eb2}, are obtained from linear regression of the Gran plots as shown in Fig. S2.

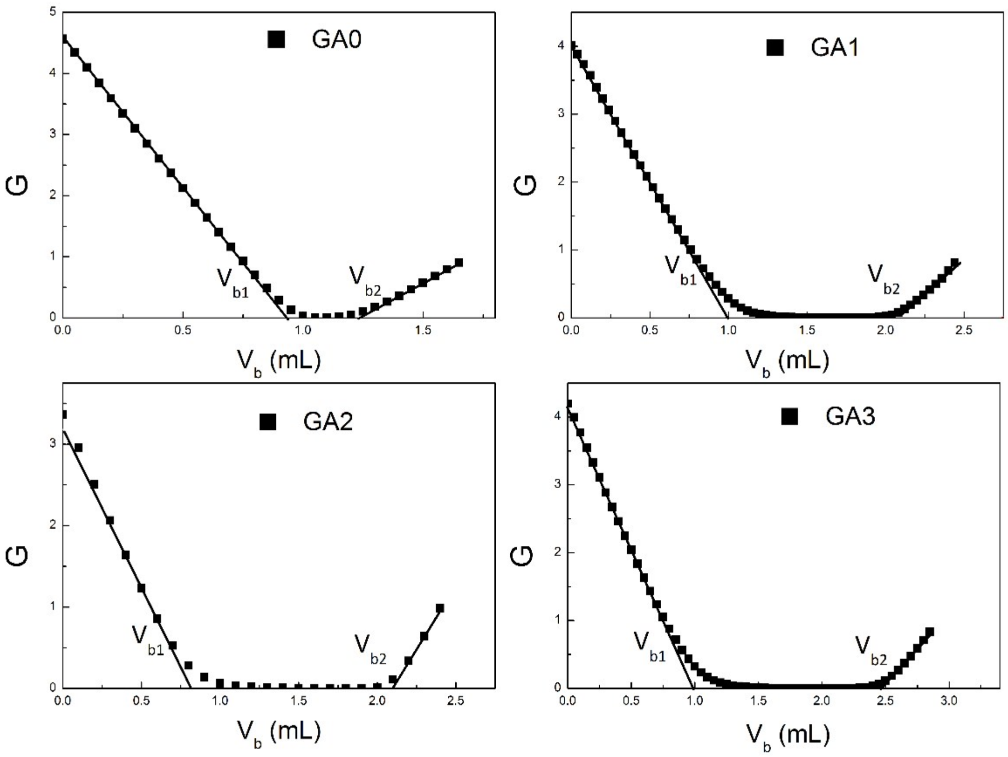

Fig. S2 Gran plots of GA0, GA1, GA2 and GA3.

S3: C1s and O1s XPS of GA0, GA1, GA2 and GA3

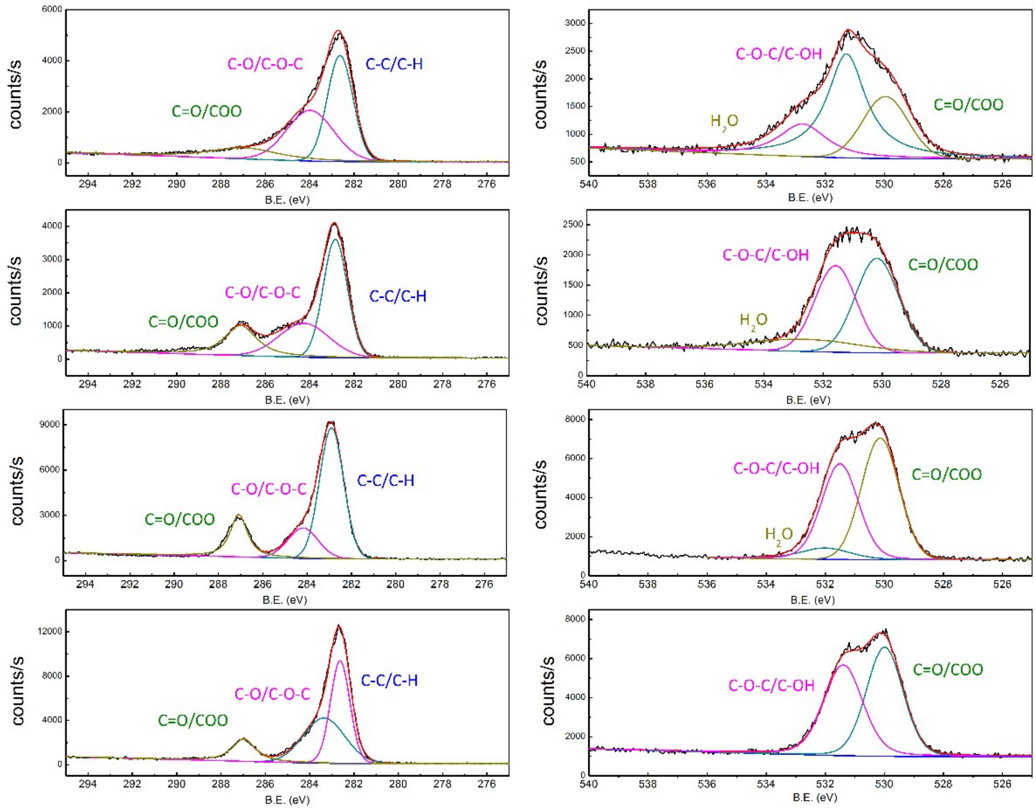

Fig. S3 C1s and O1s XPS of GA0, GA1, GA2 and GA3

S4: modeling the relationship between Q_m and oxygen content

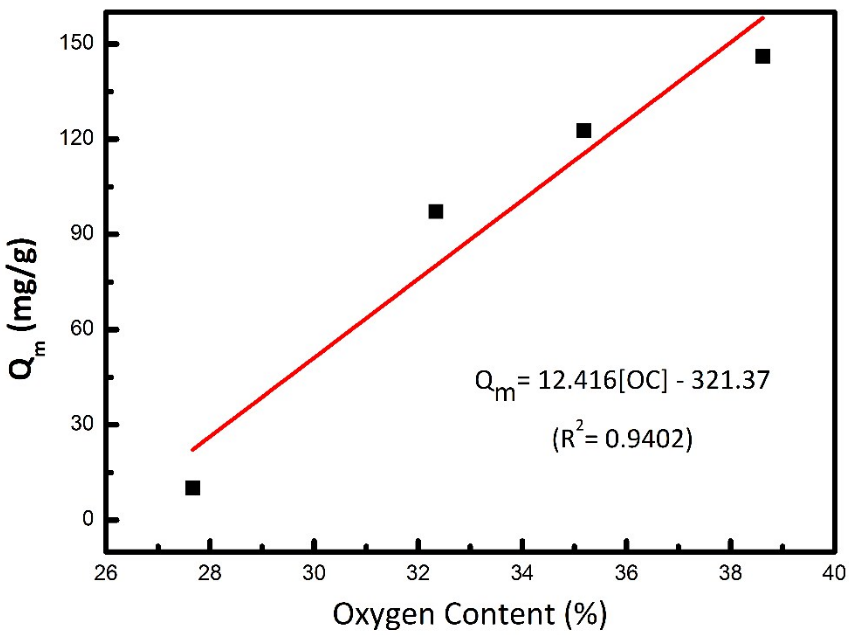

Fig. S4 Relationship between Q_m and oxygen content, [OC] represented oxygen content.

Table S1 two equivalent points (Veb1 and Veb2) obtained from linear regression of the Gran plots

Material	V_{eb1}(mL)	V_{eb2}(mL)	V_{eb2}-V_{eb1}(mL)
GA0	0.94	1.23	0.29
GA1	1.02	2.07	1.05
GA2	0.82	2.1	1.28
GA3	1	2.48	1.48

Table S2 pseudo-second-order adsorption kinetics fitting model fitting parameters of the adsoption of Cu(II) on GA1

Equation	k [g/(mg·h)]	Q_e (mg/g)	R^2
$\frac{t}{C_t}=\frac{1}{kC_q^{\ 2}}+\frac{1}{C_q}t$	0.091	41.67	0.998

Table S3 General Langmuir Freundlich adsorption isotherm model fitting parameters of the adsoption of Cu(II) on GA1 under different salt

Salt	Q_m (mg/g)	k	α	R^2
NaCl	97.24	0.33	2.47	0.976
$NaNO_3$	112.68	0.37	1.22	0.999
$NaClO_4$	114.71	0.29	1.59	0.971

Table S4 General Langmuir Freundlich adsorption isotherm model fitting parameters of the adsoption of Cu(II) on GA1 under different temperature

Temperature(K)	Q_m (mg/g)	k	α	R^2
298	97.24	0.33	2.47	0.976

313	100.65	0.19	2.13	0.941
328	101.78	0.21	2.77	0.968

Table S5 General Langmuir Freundlich adsorption isotherm model fitting parameters of the adsoption of Cu(II) on GA1 in the presence of organic compounds

Organic	Q_m (mg/g)	k	α	R^2
No Organic	97.24	0.33	2.47	0.976
[Bmim][Cl]	93.41	0.22	3.45	0.939
Fulvic acid	117.61	0.19	3.22	0.96
Humic acid	138.08	0.18	3.46	0.981