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Supporting Information

Alginate/graphene double-network nanocomposite hydrogel bead with low-swelling, enhanced mechanical property, and enhanced adsorption capacity

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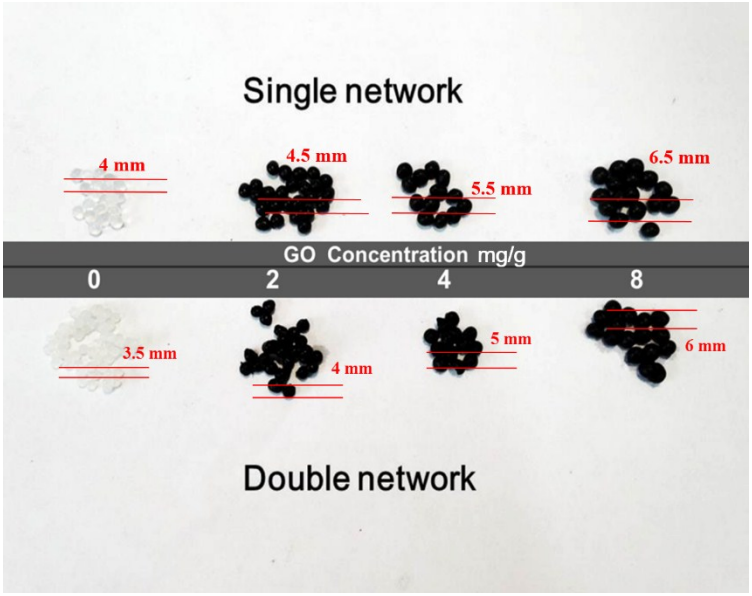

Fig. S1 Optical images of hydrogels with different GO content.

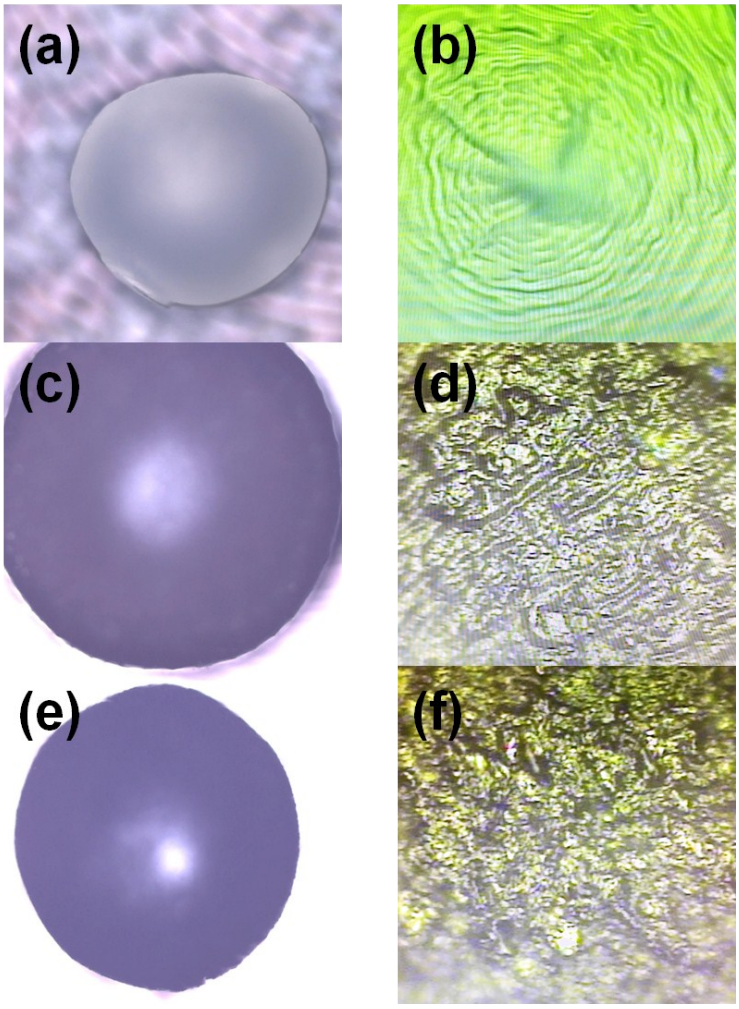

Fig. S2 Optical images of (a) alginate gel×5, (b) alginate gel×20, (c) GAS×5, (d) GAS×20, (e) GAD×5 and (f) GAD×20.

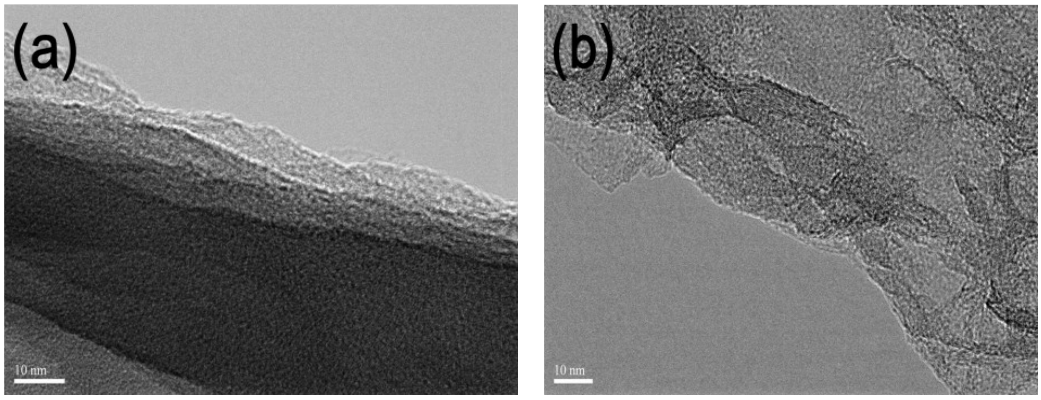

Fig. S3 TEM images of (a) GAS and (b) GAD.

The adsorption isotherm was fitted by Langmuir and Freundlich models as in equations (1) and (2).

$$\frac{C_e}{q_e} = \frac{1}{K_L} + (\frac{\alpha_L}{K_L})C_e \quad (1)$$

$$Inq_e = InK_F + \frac{1}{n} InC_e \quad (2)$$

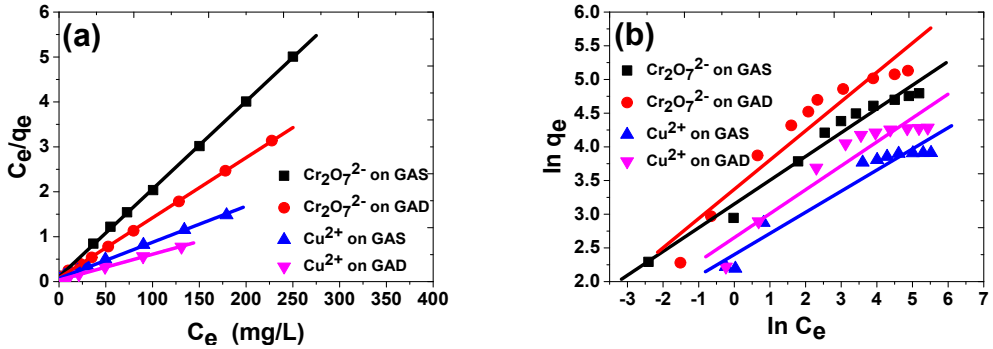

Fig. S4 Langmuir and Freundlich model for metal adsorption on GAS and GAD.

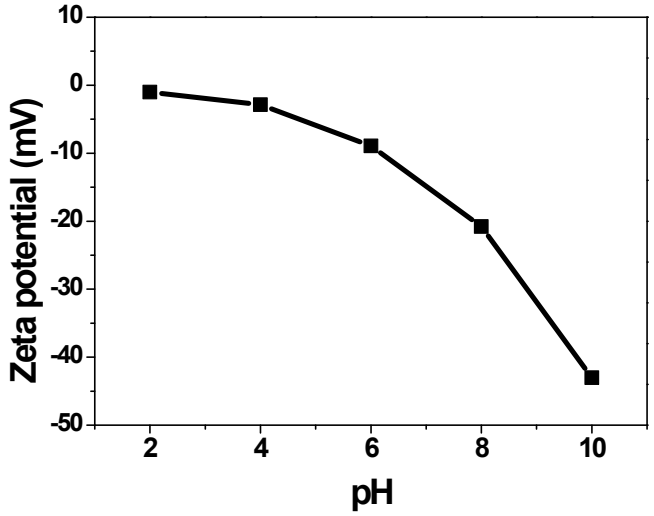

Fig. S5 Zeta potential of GAD under different pH.

Table S1 Concentrations of Ca^{2+} and Na^{+} in GAS and GAD before and after being soaked in NaCl for 24h.

Mass ratio (%)	Before		After	
	GAS	GAD	GAS	GAD
Ca^{2+}	14.1	13.2	0.8	2.5
Na^{+}	2×10^{-6}	2×10^{-7}	1.4×10^{-3}	1.2×10^{-3}

Table S2 Langmuir isotherm parameters of $Cr_2O_7^{2-}$ and Cu^{2+} adsorption on GAD.

Isotherm model	Parameters	$Cr_2O_7^{2-}$		Cu^{2+}	
		GAS	GAD	GAS	GAD
Langmuir	q_m(mg/g)	51.28	72.46	125.00	169.5
	K_L(L/mg)	9.47	12.34	13.83	29.58
	R^2	0.999	0.999	0.996	0.999
Freundlich	K_F (L/g)	11.70	14.15	23.33	29.08
	n	3.34	2.81	2.83	2.30
	R^2	0.917	0.893	0.973	0.917