Electronic Supplementary Material (ESI) for RSC Advances.

Supplementary Information for

Removal of Trichloroethene by Glucose Oxidase Immobilized on Magnetite Nanoparticles

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Preparation of Magnetite nanoparticles and MIG

Preparation of magnetite nanoparticles: 8.68 mmol of ferric ammonium sulfate and 4.34 mmol of ferrous ammonium sulfate were dissolved in a 250 ml three-necked flask containing 100 ml of ultrapure anaerobic water and then mechanically stirred at 800 rpm in a water bath at 85°C for 20 minutes under the protection of N_2. Then 25% (v/v) ammonia solution was added dropwise and continued dropwise when the color of the solution changed from orange-red to black until the pH of the mixture reached 10. The mixture was transferred to an anaerobic flask and the magnetite particles were separated with neodymium magnets and rinsed several times using deionized water to remove excess ammonia and salt to pH neutral. The magnetite was dried by freeze dryer and stored in a vacuum bag.

Preparation of MIG: First, the magnetite particles (1g) were dispersed in 1 wt% chitosan solution (in 0.05M acetic acid) with a solid-liquid ratio of 10g/L. Then stable chitosan-stabilized magnetic nanoparticles (Fe_3O_4-CS) were obtained by dispersing ultrasonic treatment (40 kHz) for 25 min at room temperature, followed by rinsing with deionized water to pH-neutral, and lyophilization after separation by a magnet. 200 mg Fe_3O_4-CS was added in 30 ml anaerobic water and sonicated at 25°C for 5 min, then 0.4 ml 25% glutaraldehyde (0.2%) was added drop by drop and vortexed for 2 min, then 20 ml solution containing 20 mg of enzyme was added and vortexed for 2 min; finally shaken in a shaker at 150 rpm for 3 h at 30°C (designed enzyme/magnetite content of 10U/mg). The solid was separated with a neodymium magnet and rinsed three times with 50 mL of deionized water to obtain magnetite particles loaded with glucose oxidase (MIG).

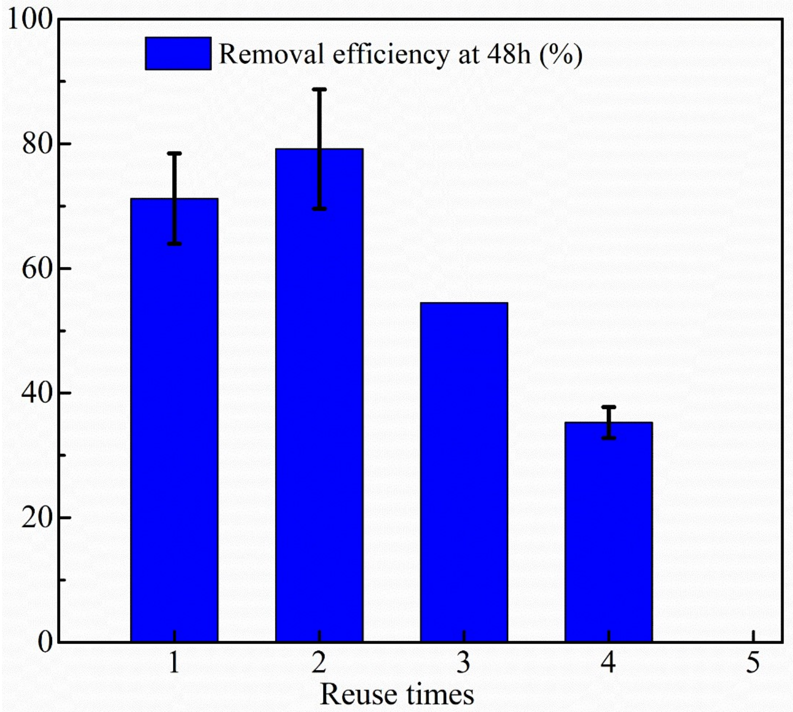

Fig. S1 Effect of recycling numbers of MIG on TCE removal efficiency. Experimental conditions: 200 mg MIG, 10 mg/L TCE, , 2.5 mM glucose, 25°C, 150 rpm, 48 h.

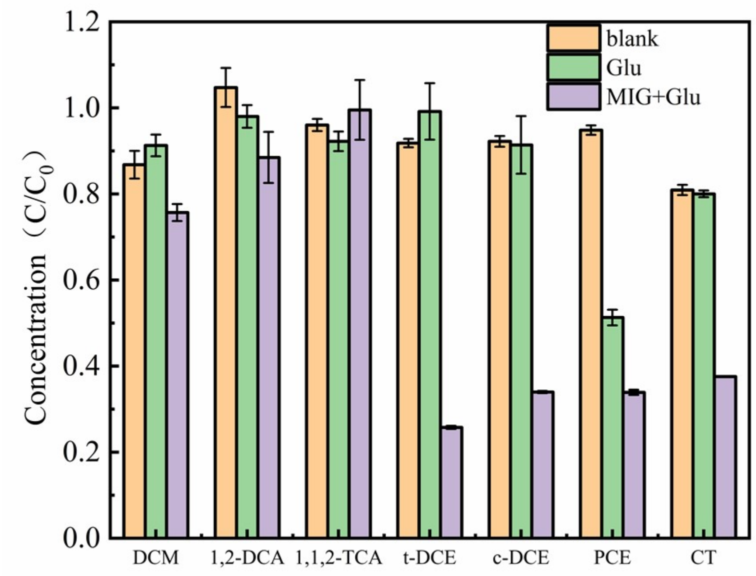

Fig. S2 Removal efficiencies of different chlorinated pollutants by MIG-glucose system. Experimental conditions: 200 mg MIG, 10 mg/L chlorinated pollutant, 2.5 mM glucose, 25°C, 150 rpm, 48 h.

Table S1 Kinetic fitting results of TCE degradation.

Conditions							Pseudo-first order fitting $C_t=C_0*e^{-kt}$		
[TCE] (mg/L)	Temp (°C)	pH Initial	pH Buffered	DO (mg/L)	Salt (2mM)	[HA] (mg/L)	$k*10^3$ (h^{-1})	$t_{1/2}$ (h^{-1})	R^2
5							26.26±7.36	26.40	0.7925
10	25						62.62±16.31	11.07	0.5868
20		6.1					52.29±4.94	13.26	0.9598
50							60.44±8.38	11.47	0.9090
	15		N/A				50.34±8.56	13.77	0.8262
	40						71.54±6.06	9.69	0.9731
		3.6		6.01			82.4±12.29	8.41	0.9097
		7.0			N/A		58.42±4.75	11.86	0.9736
		9.0					35.62±7.09	19.46	0.8699
			3.7				90.41±20.16	7.67	0.7788
			5.4			N/A	51.88±11.08	13.36	0.7052
			7.1				71.75±9.83	9.66	0.9209
			9.0				79.01±9.82	8.77	0.9459
				0			20.97±5.55	33.05	0.2711
10				3.45			27.62±8.55	25.10	0.1399
	25			5.85			21.52±2.23	32.21	0.9189
					NaCl		25.51±5.62	27.17	0.5420
		6.1			$CuCl_2$		26.72±4.48	25.94	0.7615
					$MgCl_2$		24.75±6.56	28.01	0.3085
			N/A		$CaCl_2$		23.28±6.01	29.77	0.3226
				6.01	Na_2SO_4		23.12±5.14	29.98	0.5130
					NaH_2PO_4		26.92±6.04	25.75	0.5345
						10	22.19±5.49	31.24	0.7896
					N/A	20	30.2±6.41	22.95	0.8470
						50	18.05±3.28	38.40	0.8448
						100	17.39±1.12	39.86	0.9750