

Supplementary material

Optimisation of phosphate loading on graphene oxide-Fe(III) composites – possibilities for engineering slow release fertilisers

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Graphene oxide preparation

Natural graphite rock (Eyre Peninsula, South Australia) was sourced from a local mine and milled into a fine powder using a benchtop ring mill (Rocklabs, NZ). The GO sheets were prepared using a modified Hammer method^{1, 2}. Briefly, a 9 : 1 mixture of concentrated sulphuric acid and phosphoric acid (240 : 27 mL) was cooled to 4° C. Under stirring at room temperature the cooled acid mixture was added slowly to the graphite powder (2 g) and potassium permanganate (12 g), then heated to 50° C for about 12 h, forming a thick paste. The reaction was cooled to room temperature and poured onto ice (300 mL) with hydrogen peroxide (2 mL). The mixture was first washed with distilled water twice, then with hydrochloric acid (32 %) and finally twice with ethanol. For each successive wash, the product was centrifuged at 2950 g for 1 h to remove the product from the supernatant. The light brown GO obtained was vacuum dried overnight at 45° C.

Table S1. Selected physical and chemical properties of soils.

Soils	pH (H ₂ O) 1 : 5	Organic C (%)	CaCO ₃ (%)	CEC (cmol _c kg ⁻¹)	Clay (%)	Fe _{ox} (mg kg ⁻¹)	Al _{ox} (mg kg ⁻¹)	Total P (mg kg ⁻¹)
Port Wakefield	9.1	0.8	8.1	22.3	4.2	293	409	79
Black Point	8.5	1.6	< 0.5	16.4	18.1	557	1269	57
Monarto	7.9	1.0	< 0.5	8.2	8.3	351	535	148

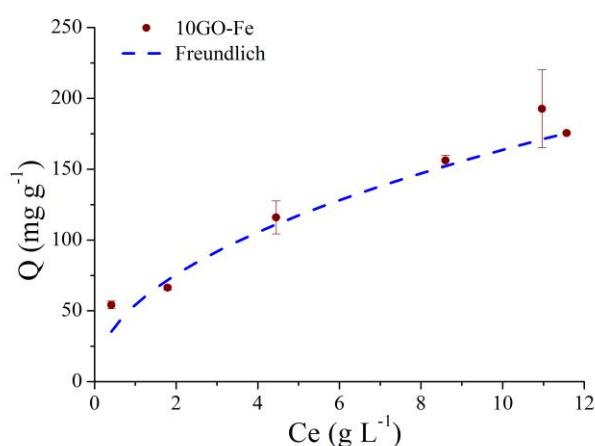


Fig. S1. Adsorption isotherm of P loading onto 10GO-Fe. Initial P concentrations 1.5 – 15 g L⁻¹, sorbent dosage 10 g L⁻¹, initial pH 6.0. Error bars represent standard deviations (n = 3)

References:

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