Supplementary

Effective removal of cesium by pristine graphene oxide:

performance, characterizations and mechanism

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Contents:

- 1. Synthesis of graphene oxide (GO)
- 2. Fig. S1 X-Ray diffraction patterns of GO, and Fig. S2 SEM images of initial graphite powder
- 3. Table S1 of the maximum Cs adsorption capacity for some of the Cs adsorbents reported in the literature

1. Synthesis of graphene oxide

Graphite powder was obtained from Acros Organics (synthetic origin, > 99% purity). Graphene oxide was prepared according to that of the modified Hummers' method [1]. In brief, 3 grams of graphite powder (Acros Organics) and 1.5 grams of NaNO₃ were mixed together, followed by the addition of $_{69}$ mL of concentrated H₂SO₄ (98% w/w). The mixture was then placed in an ice bath and 9 grams of KMnO₄ was added slowly into the mixture under vigorous stirring for 30 min. De-ionized water (130 mL) was added slowly causing the temperature of the mixture to increase. The mixture was left to cool down to room temperature, followed by addition of hydrogen peroxide in aqueous solution (6% w/v) to oxidize any un-reacted KMnO₄. The oxidized graphite was then separated from the solution by centrifugation at 4,000 rpm for 10 min. The obtained gel-like graphene oxide was washed by centrifugation with concentrated hydrochloric acid (HCl, 35.4% w/w) once, followed by a copious amount of de-ionized water. The obtained GO gel was then dried in a vacuum oven at 40°C for 48 h.



Fig. S1 X-ray diffraction pattern (XRD) of the synthesized graphene oxide film, compared to that of the initial graphite powder. (XRD patterns measured using Bruker D8 ADVANCE with Cu K- α radiation at 1.541 Å.)



Fig. S2 Morphology of the initial graphite powder given for comparison (FE-SEM, JEOL JSM-7800F. 5keV).

Adsorbents	Q _{max} (mg/g)	References
Ferric hexacyanoferrate	339.2	Faustino et al. (2007) [2]
Copper ferrocyanide functionalized	17.1	Sangvanich et al. (2010) [3]
mesoporous silica		
Cs(I) ion-imprinted polymer	32.9	Zhang et al. (2010) [4]
Montmorillonite-iron oxide composite	52.6	Ararem et al. (2013) [5]
Coconut shell activated carbon	0.8	Caccin et al. (2013) [6]
Prussian blue-coated magnetic nanoparticles	96.0	Thammawong et al. (2013) [7]
Magnetic zeolite composite	207.4	Faghihian et al. (2013) [8]
Ethylamine-modified montmorillonite	80.27	Long et al. (2013) [9]
Magnetic graphene oxides	15.1	X. Wang and J. Yu (2015) [10]
PB/Fe ₃ O ₄ /GO caged in calcium alginate	43.5	Yang et al. (2014) [11]
microbeads		
MWCNT reinforced Zeolite-A beads	113.6	Vipin et al. (2015) [12]
Magnetic graphene oxides	9.3	Li et al. (2015) [13]
Prussian blue granules	218.0	Chen et al. (2015) [14]
Graphene oxides nanosheets	40.0	Tan et al. (2016) [15]
Magnetic Prussian blue	280.8	Jang et al. (2016) [16]

Table S1. Maximum Cs adsorption capacity for some of the Cs adsorbents reported in the literature

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