

Multithiol Functionalized Graphene Bio-Sponge for Efficient Removal of Heavy Metal Ions in Water

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Abstract

Efficient water purification technologies are still highly sought-after owing to the uncontrollable widespread of heavy metals in water bodies. This work presents a sustainable modification of a graphene bio-sponge for heavy metals adsorption consisting of alginate bio-polymeric network encapsulated with magnetic reduced graphene oxide (mrGO) and functionalized with multithiol precursor via photoinitiated thiol-ene click chemistry.[1] The multithiol functionalized graphene bio-sponge (SH-Graphene bio-sponge) is well-engineered with bountiful of oxygen functionalities and high density of sulfur-containing groups (10.2 at % S) for capturing Cd (II) and Pb (II) ions. SH-functionalized graphene bio-sponge exhibited excellent adsorption capacity for Pb (II): 101.01 and Cd (II): 102.99 mg/g, outperformed commercial and literature reported adsorbents in highly competitive selectivity studies using co-existing heavy metal ions (Cu, Co, Pb and Cd) spiked- sea water. The multithiol modified bio-sponge was highly recyclable and showed remarkable stability with only 0.015 mg/L Pb (II) detected, meeting the strict US EPA maximum contaminant level (MCL) for lead, after five repeating adsorption-desorption cycles using mixed heavy metal ions solution and acidic eluent. The outcomes from this work contribute promising solution towards the development of scalable, energy-efficient and sustainable adsorbents for efficient water purification technology.

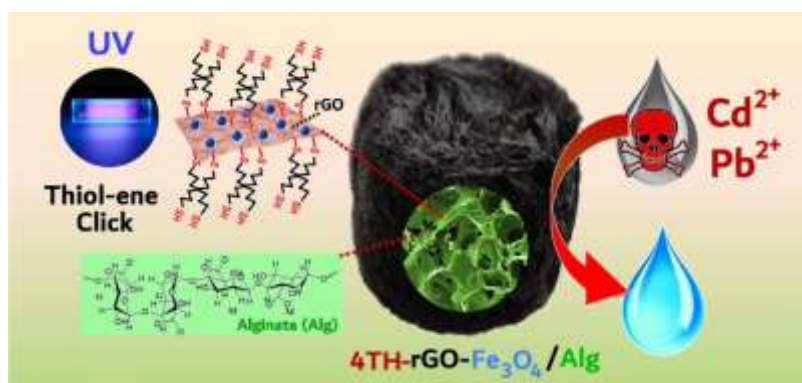


Figure 1: Multithiol functionalized graphene bio-sponge via photoinitiated thiol-ene click approach for efficient removal of Cd(II) and Pb(II).

REFERENCES

- [1] Yap, P. L.; Auyoong, Y. L.; Hassan, K.; Farivar, F.; Tran, D. N. H.; Ma, J.; Losic, D. *Chemical Engineering Journal*, 395, (2020) 124965.