

Tinospora Cordifolia derived biomass functionalized ZnO particles for effective removal of Lead(II), Iron(III), Phosphate and Arsenic(III) from water

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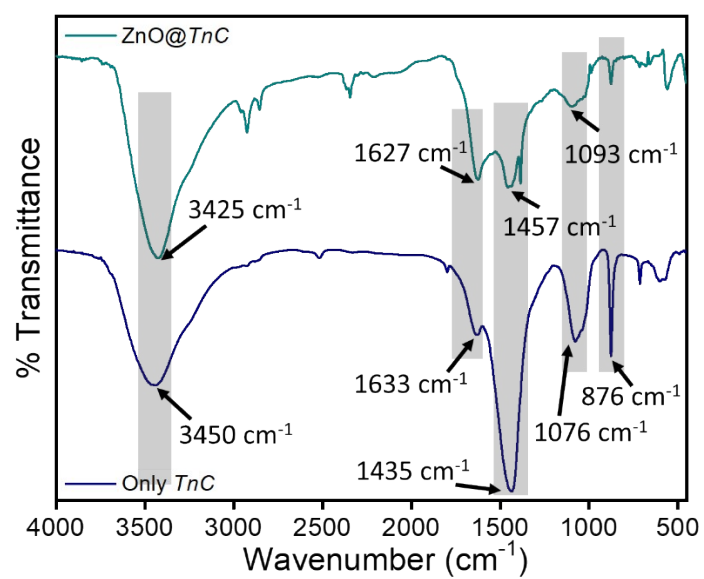


Fig. S1 IR spectra of the biomass of *Tinospora cordifolia* (blue color) and ZnO@TnC (dark cyan color).

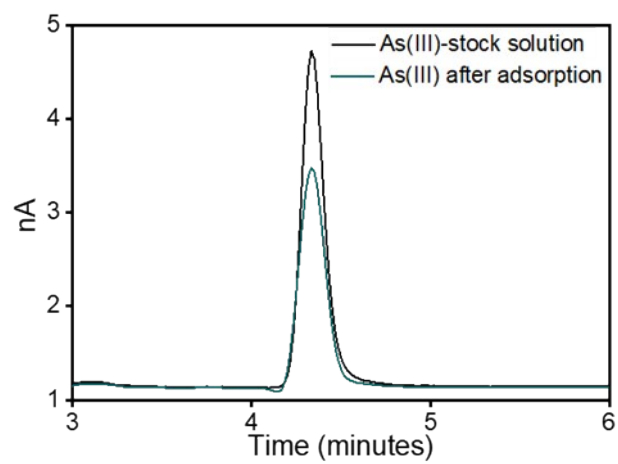


Fig. S2 Ion chromatography spectra of AsO₂⁻ before and after treatment with Fe-ZnO@TnC at different time interval.

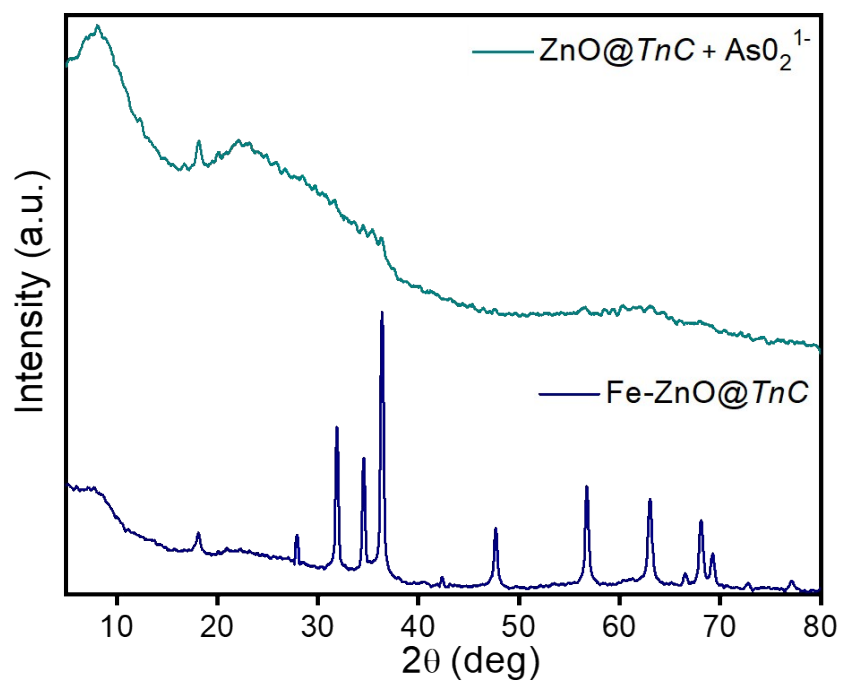


Fig. S3 XRD spectra of Fe-ZnO@TnC before (Blue color) and after (dark cyan color) adsorption of AsO_2^{1-} in aqueous media.

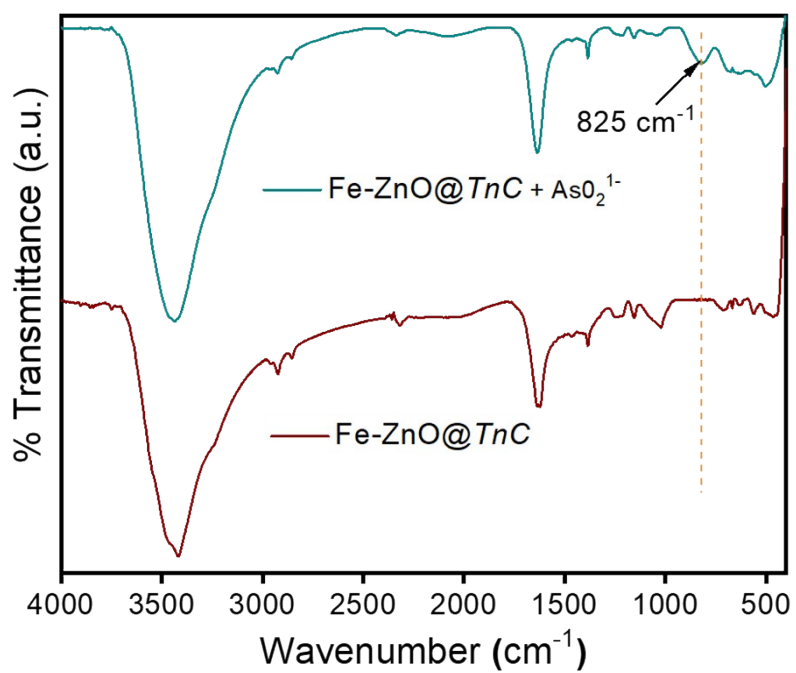


Fig. S4 IR spectra of Fe-ZnO@TnC before (brown color) and after (dark cyan color) adsorption of AsO₂¹⁻ in aqueous media.

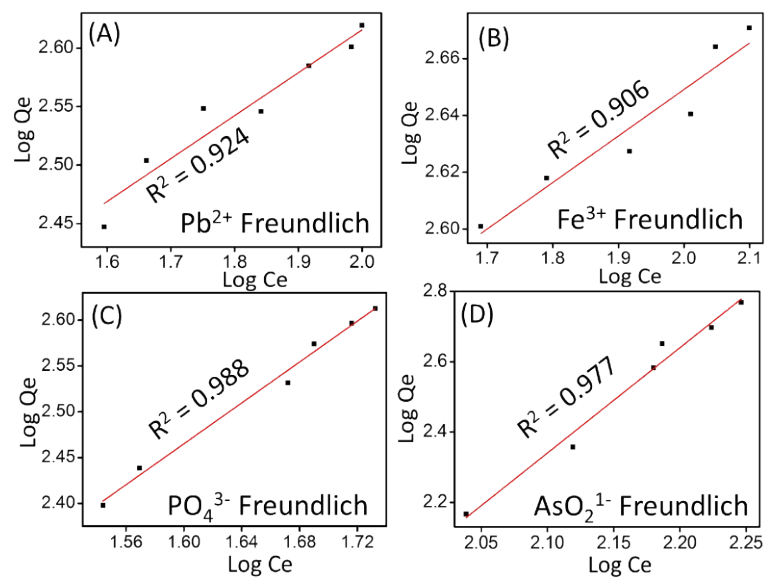


Fig. S5 Plot of $\text{Log } Q_e$ Vs $\text{Log } C_e$ representing linearized form of Freundlich adsorption isotherm of (a) Pb^{2+} (b), Fe^{3+} (c) PO_4^{3-} and (d) AsO_2^{1-} .

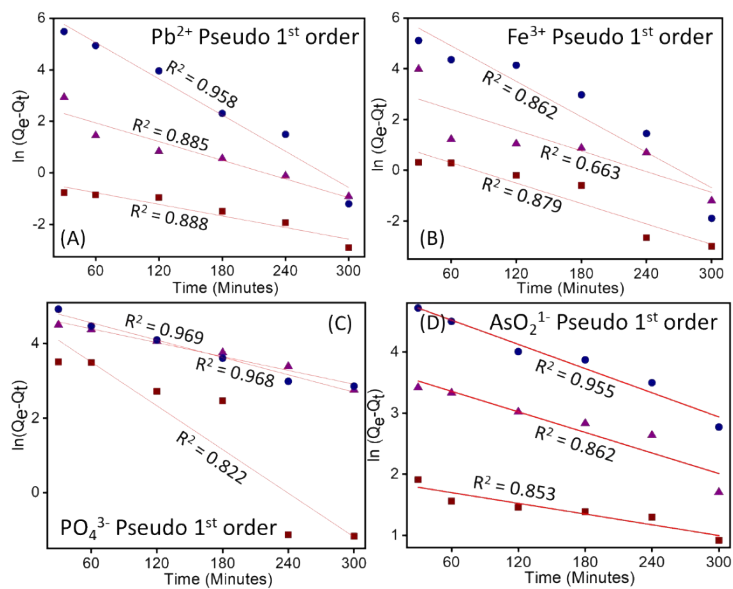


Fig. S6 Plot of pseudo-first-order kinetic study of (A) Pb^{2+} (B), Fe^{3+} (C) PO_4^{3-} and (D) AsO_2^{1-} adsorption by ZnO@TnC.

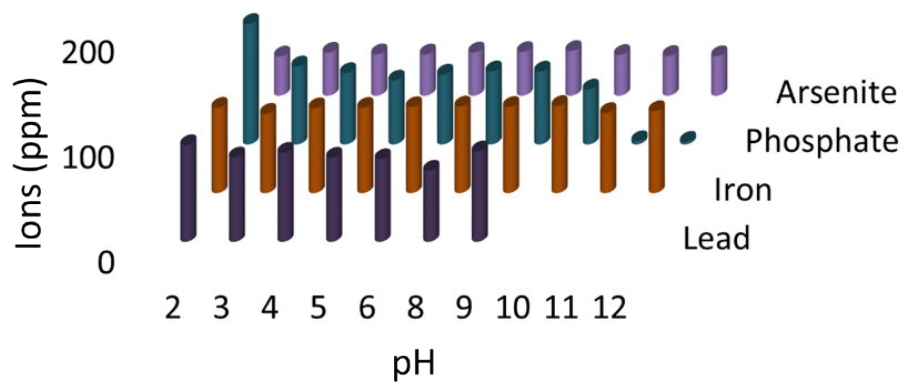


Fig. S7 Bar diagram of adsorption of ions Pb^{2+} (dark blue color), Fe^{3+} (orange color), PO_4^{3-} (dark cyan color) by ZnO@TnC and of AsO_2^{1-} (purple color) by Fe-ZnO@TnC at different pH ranging from 2 to 12.

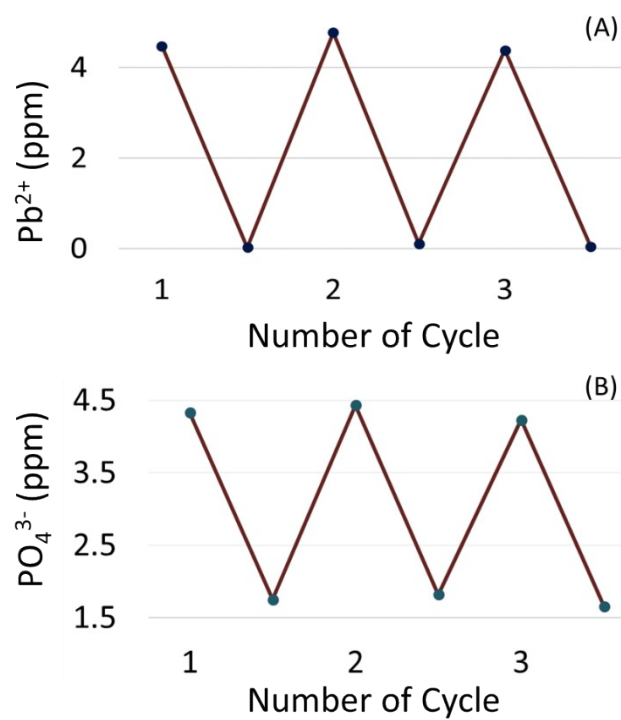


Fig. S8 Regeneration of ZnO@TnC after adsorption of (A) Pb^{2+} in presence of EDTA and (B) PO_4^{3-} in presence of NaOH.

Table S1 Correlation coefficient (R^2) of the pseudo-first-order and pseudo-second-order kinetic model fitted after adsorption of Pb^{2+} , Fe^{3+} , PO_4^{3-} by $ZnO@Tnc$ and of AsO_2^{1-} by $Fe-ZnO@TnC$.

Kinetic fitting	Concentration	Pb^{2+}	Fe^{3+}	PO_4^{3-}	AsO_2^{1-}
Pseudo 1 st order kinetics (correlation coefficient, R^2)	10 PPM	0.888	0.879	0.822	0.853
	50 PPM	0.885	0.663	0.968	0.862
	100 PPM	0.958	0.862	0.969	0.955
Pseudo 2 nd order kinetics (correlation coefficient, R^2)	10 PPM	0.999	0.999	0.991	0.980
	50 PPM	0.999	0.998	0.984	0.947
	100 PPM	0.998	0.997	0.998	0.978

S9

Enlarged FE-SEM images of Fig2 and 7 for clear view of the experimental parameters

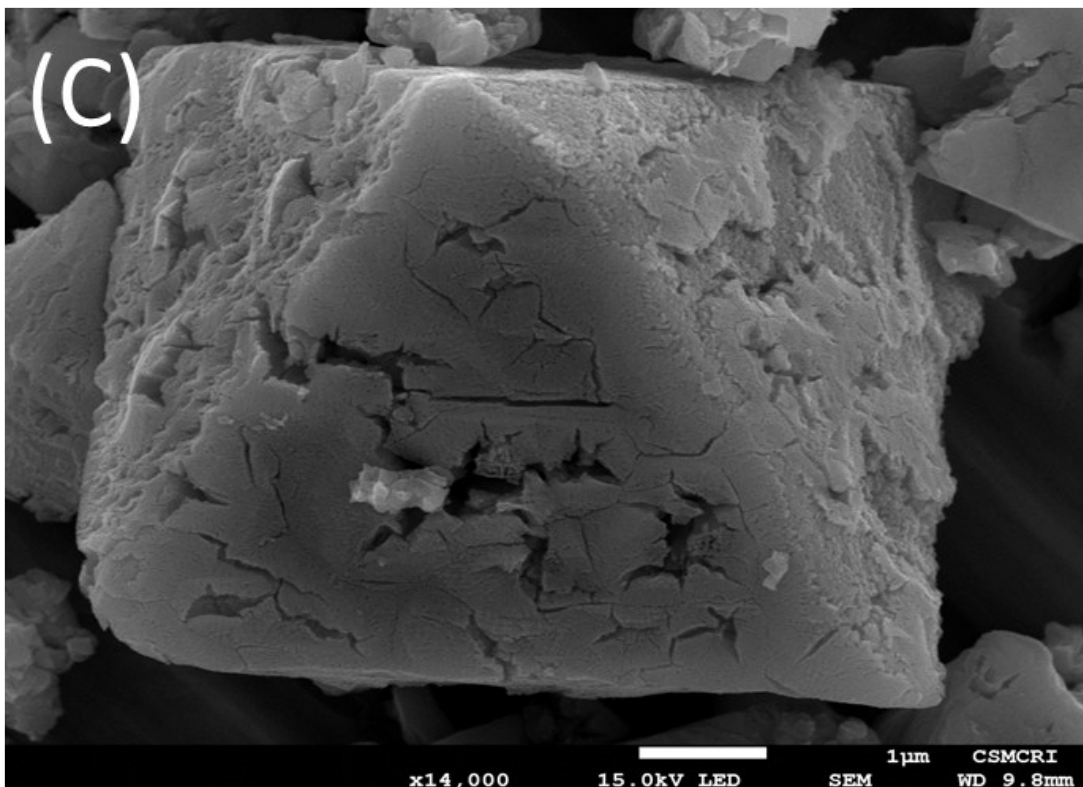
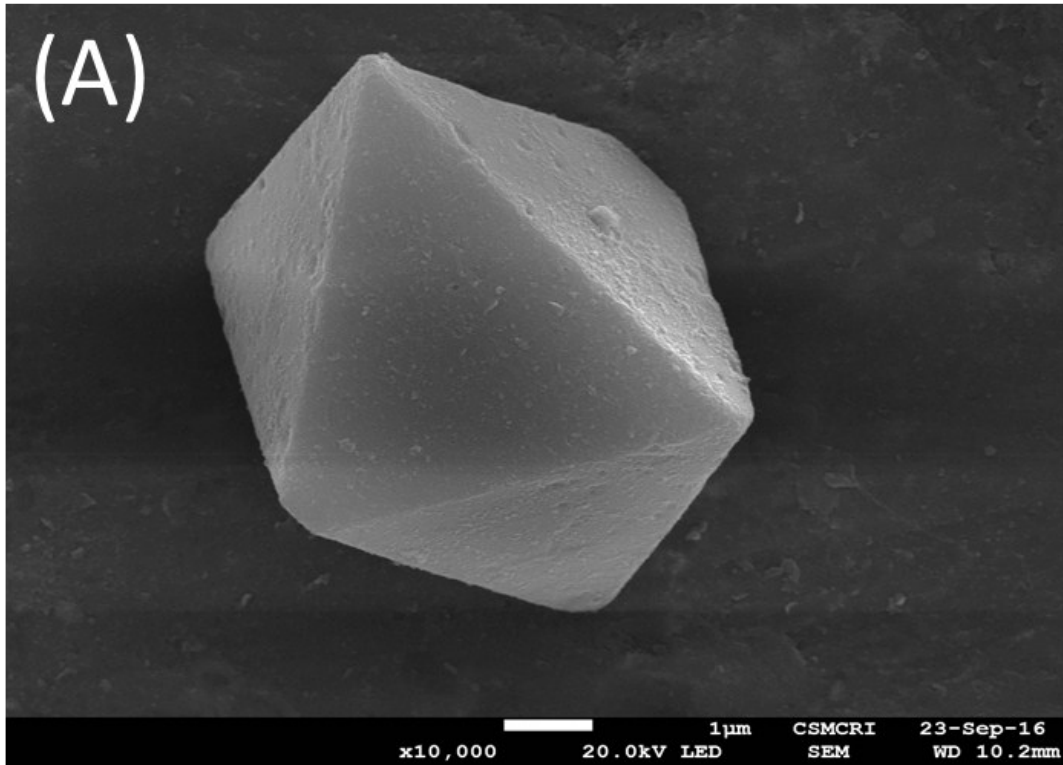


Fig2

