

## Electronic Supporting Information

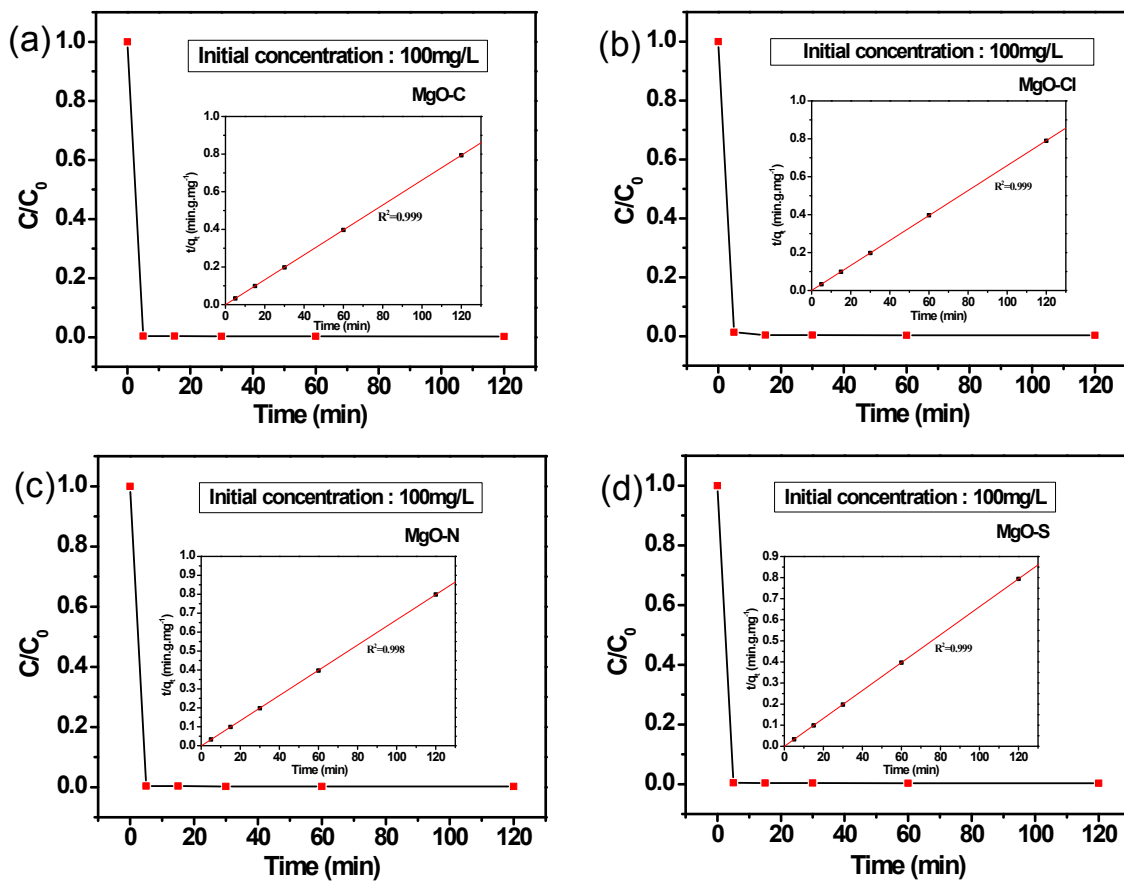


Fig. S1: Adsorption of Pb(II) ions with contact time for the samples: (a) MgO-C, (b) MgO-Cl, (c) MgO-N and (d) MgO-S. The insets show the corresponding kinetic plots.

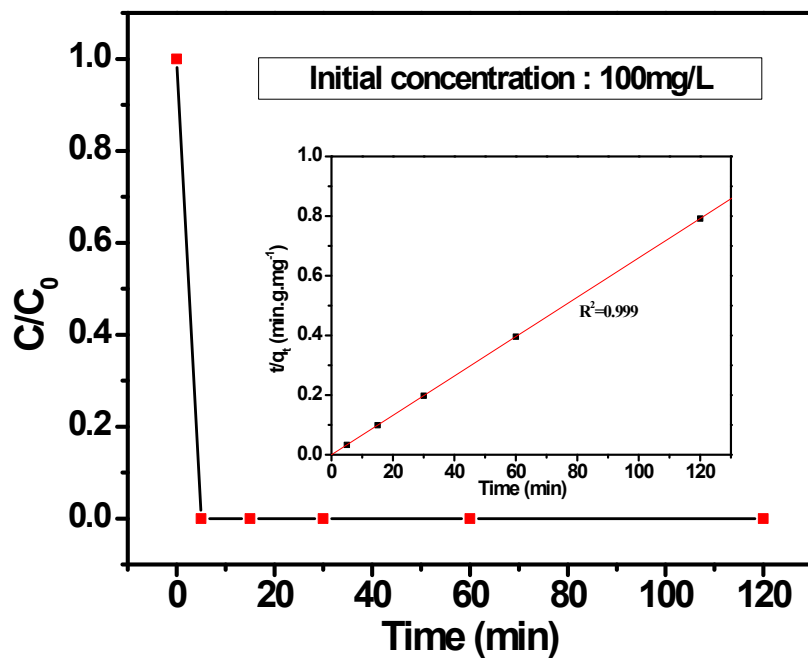


Fig. S2: Adsorption of Cd(II) ions with contact time for all the samples: MgO-C, MgO-Cl, MgO-N and MgO-S. The inset shows the corresponding kinetic plot.

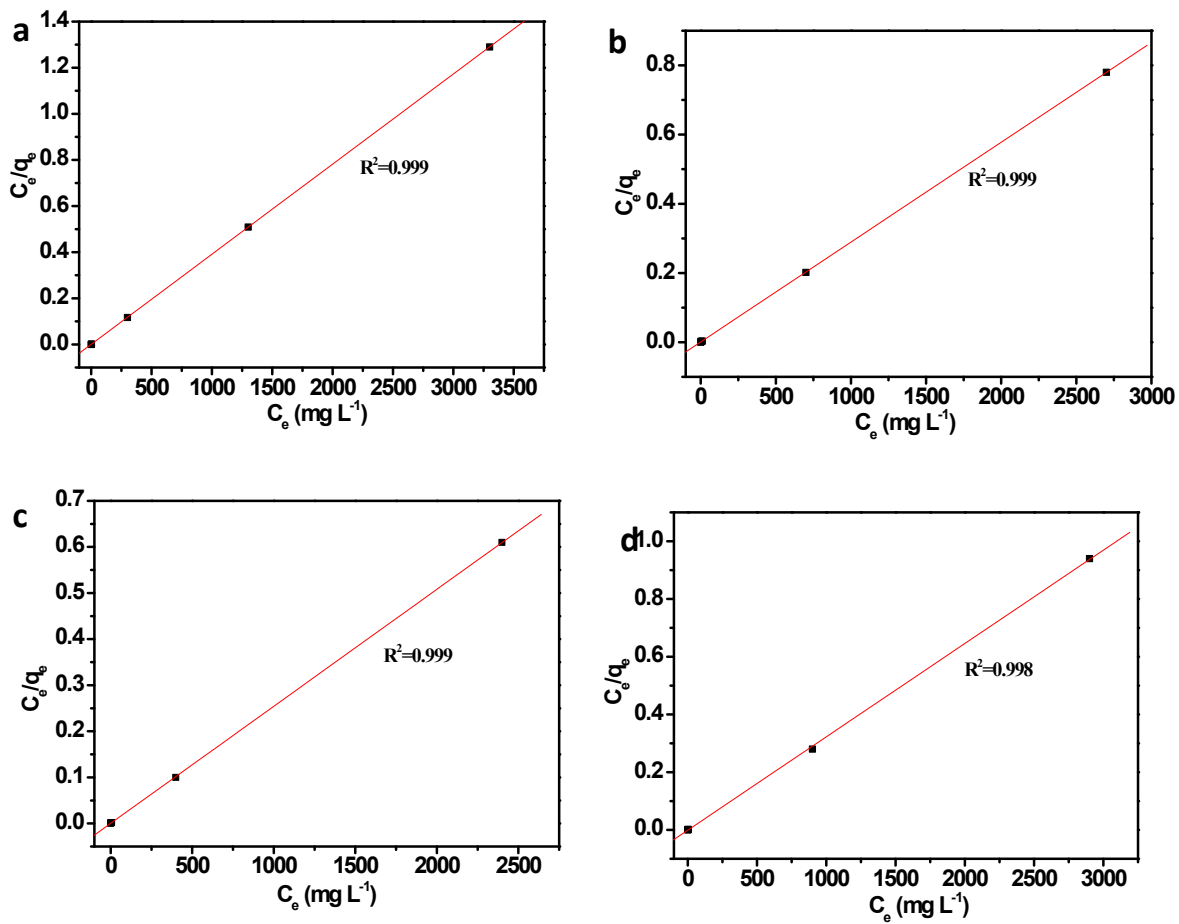


Fig. S3: Langmuir isotherms of Pb(II) ions adsorption on the samples: (a) MgO-C, (b) MgO-Cl, (c) MgO-N and (d) MgO-S.

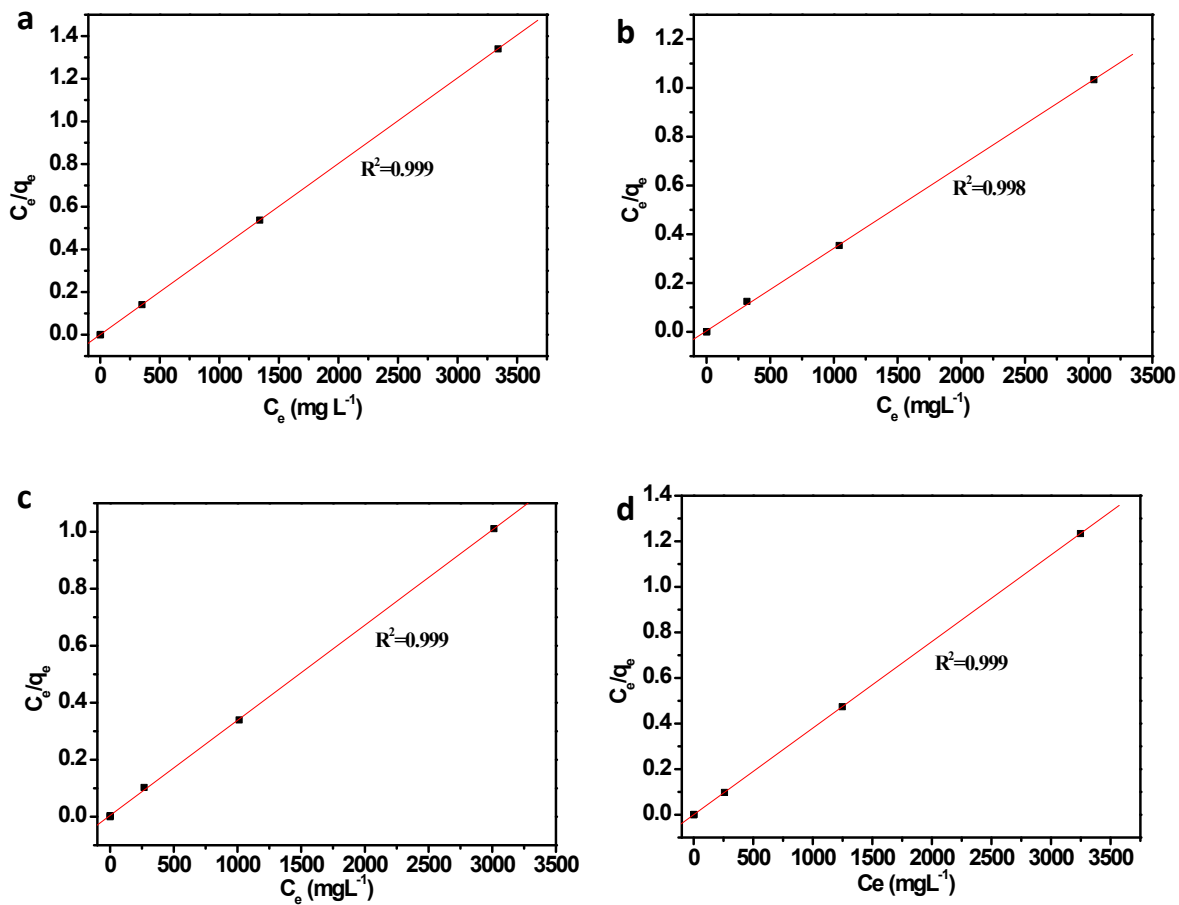


Fig. S4: Langmuir isotherms of Cd(II) ions adsorption on the samples: (a) MgO-C, (b) MgO-Cl, (c) MgO-N and (d) MgO-S.

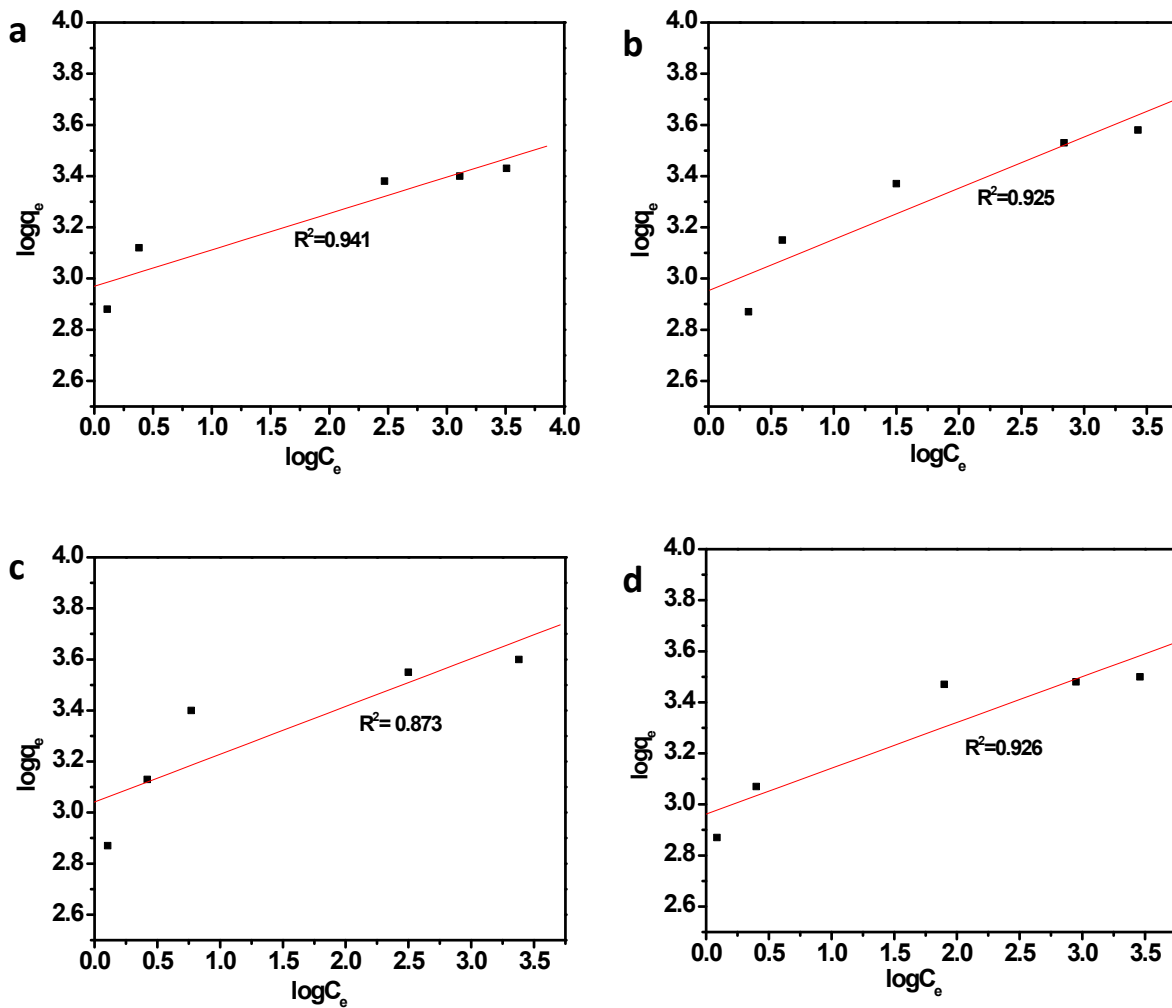


Fig. S5: Freundlich isotherms of Pb(II) ions adsorption on the samples: (a) MgO-C, (b) MgO-Cl, (c) MgO-N and (d) MgO-S.

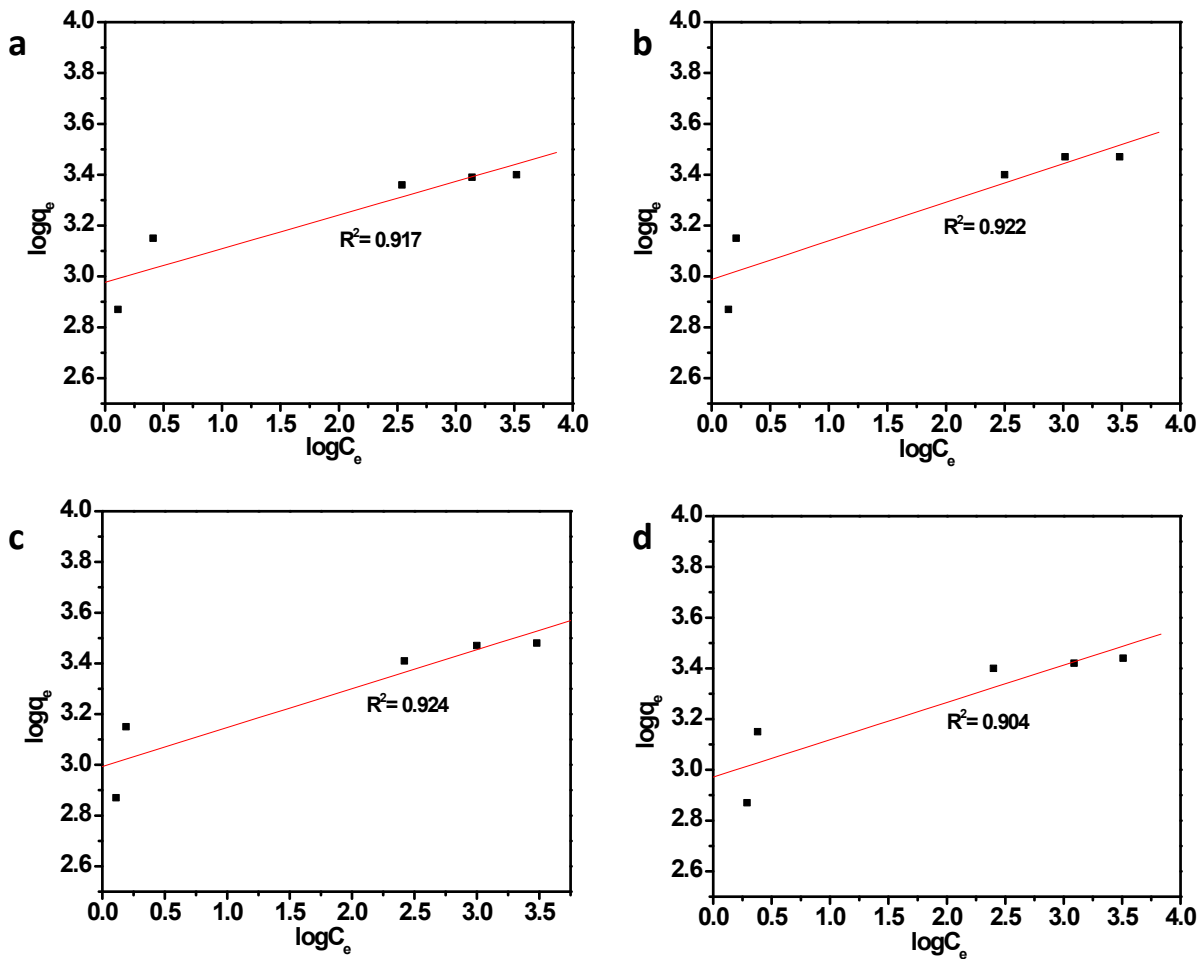


Fig. S6: Freundlich isotherms of Cd(II) ions adsorption on the samples: (a) MgO-C, (b) MgO-Cl, (c) MgO-N and (d) MgO-S.

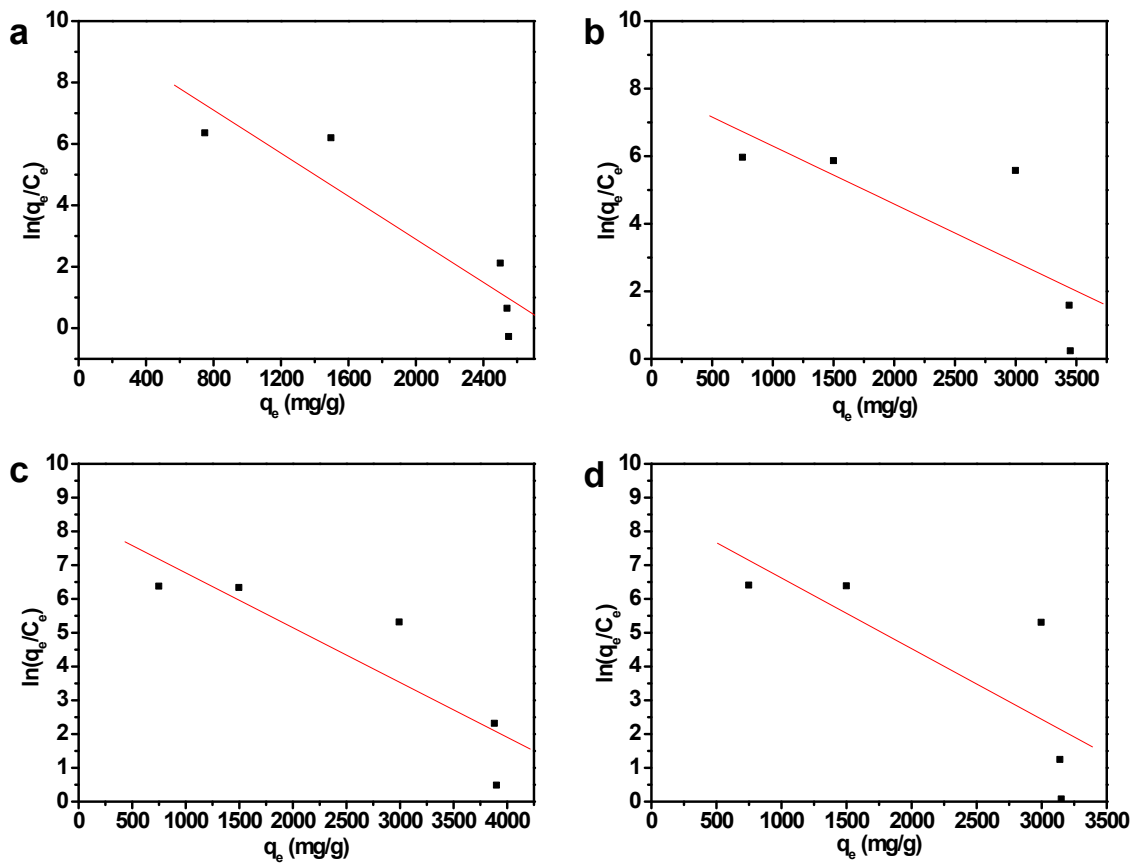


Fig. S7: The plots of  $\ln(q_e/C_e)$  Vs.  $q_e$  of Pb(II) ion adsorption on the samples: (a) MgO-C, (b) MgO-Cl, (c) MgO-N and (d) MgO-S.

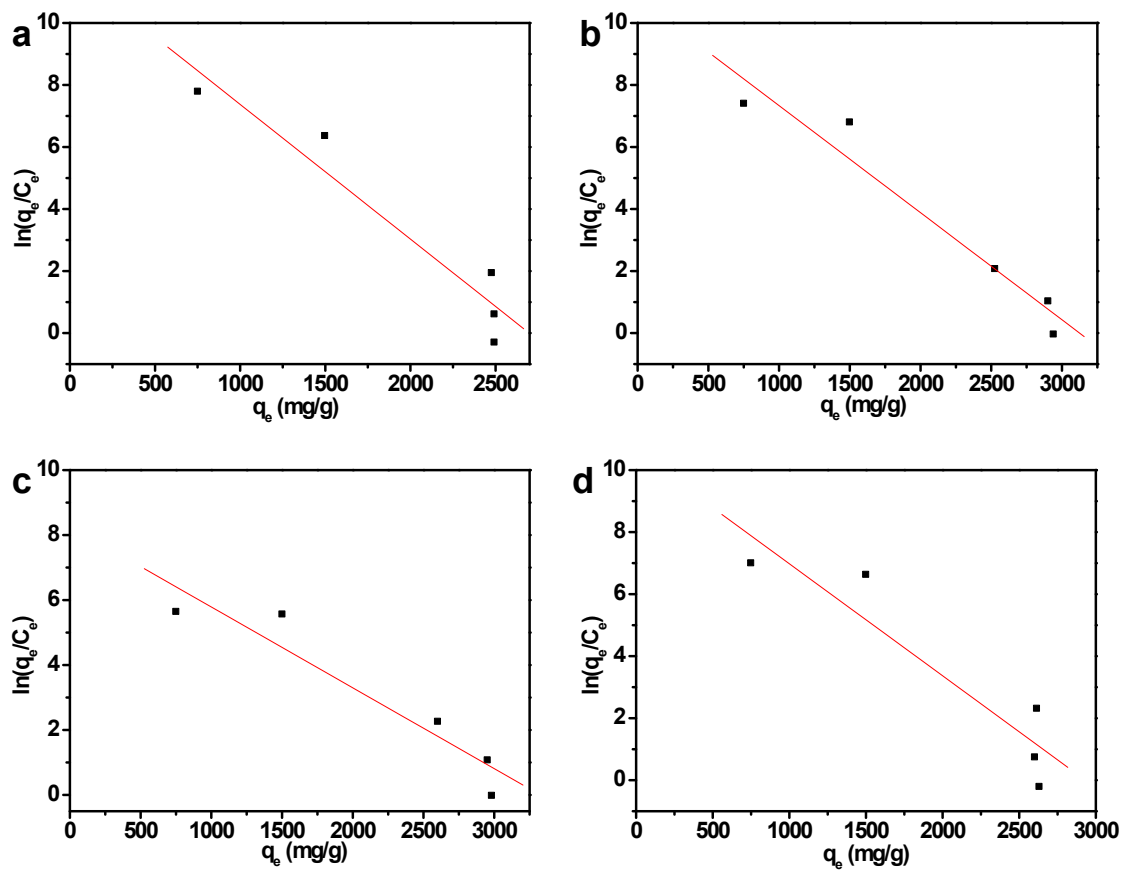


Fig. S8: The plots of  $\ln(q_e/C_e)$  Vs.  $q_e$  of Cd(II) ion adsorption on the samples: (a) MgO-C, (b) MgO-Cl, (c) MgO-N and (d) MgO-S.



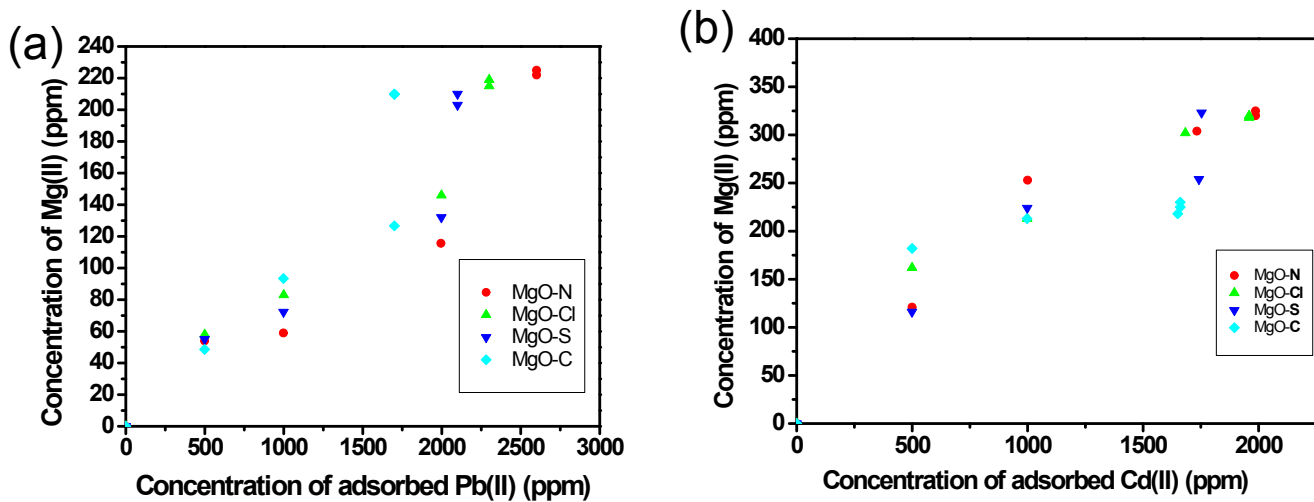


Fig. S9: Relationship between  $Mg^{2+}$  ion released and (a) Pb(II) and (b) Cd(II) ions adsorbed.

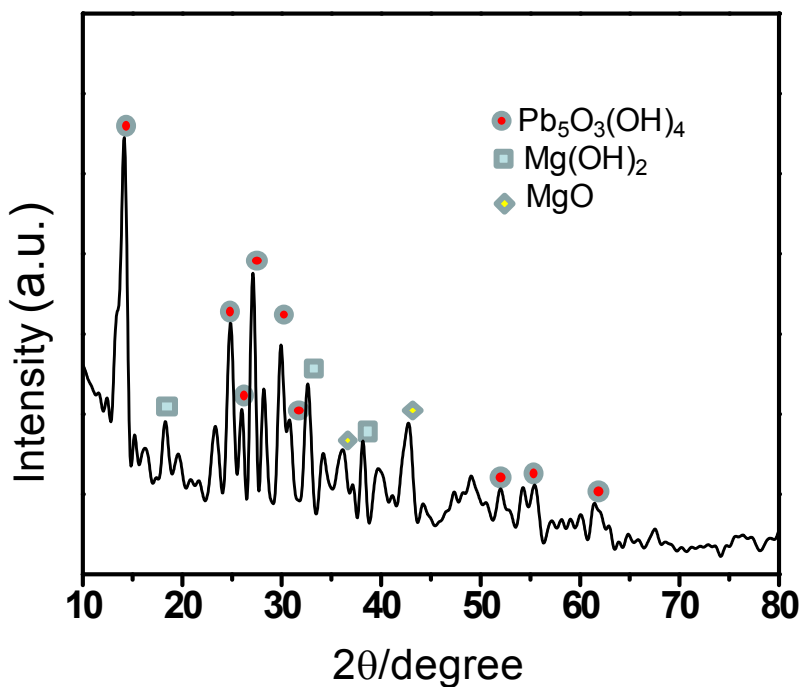


Fig. S10: XRD patterns of the samples after adsorption of Pb(II) with MgO.

Table S1: Parameters of kinetic model for the adsorption of Pb(II) and Cd(II) ions

Heavy metal ions	Pb (II)				Cd (II)			
	MgO-C	MgO -Cl	MgO -N	MgO -S	MgO-C	MgO -Cl	MgO -N	MgO -S
Sample ID								
$q_e$ (mg/g)	151.1	151.04	151.13	151.09	151.51	151.51	151.51	151.51
$K_2$ (gmg <sup>-1</sup> min <sup>-1</sup> )	0.168	0.084	0.062	0.313	0.311	0.311	0.311	0.311
$R^2$	0.999	0.999	0.998	0.999	0.999	0.999	0.999	0.999