Fabrication of novel magnetic chitosan/graphene-oxide/metal oxide nanocomposite beads for efficient Cr(VI) adsorption

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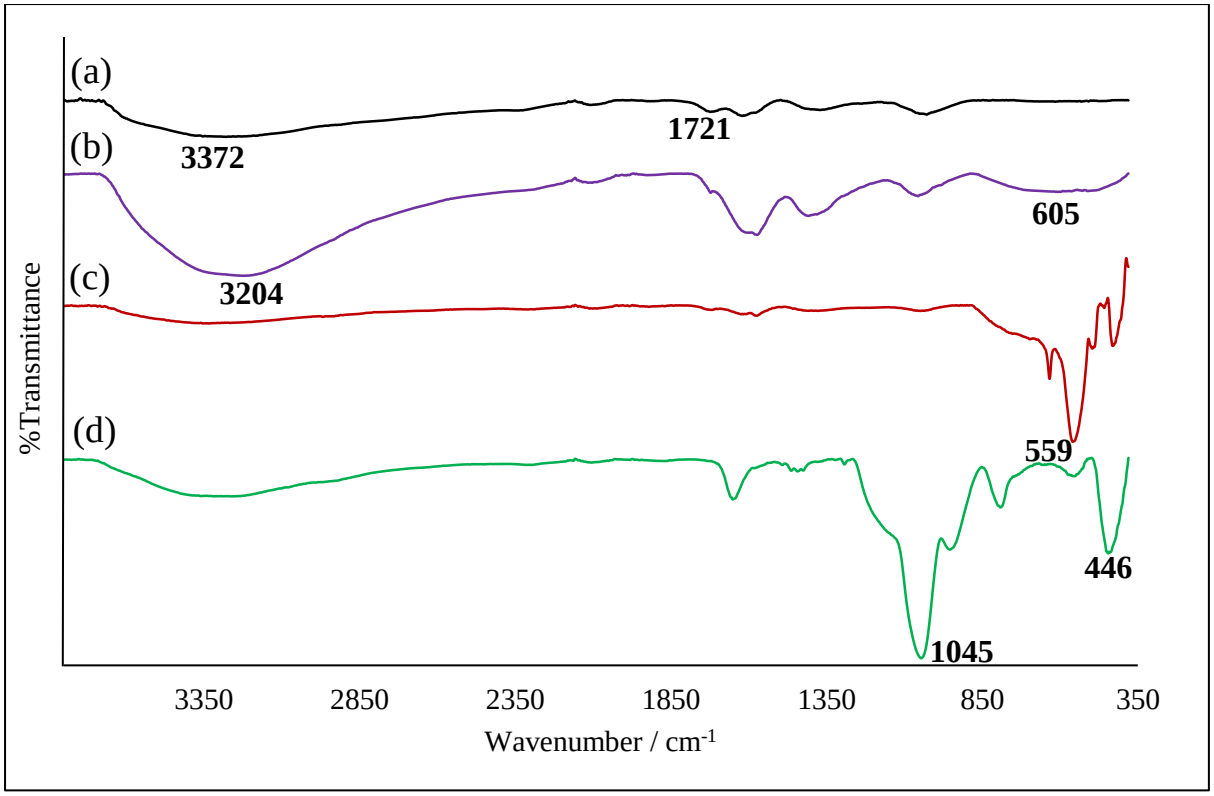


Fig S1. ATR-FTIR spectra of (a) GO, (b) GO-MnO_2, (c) GO-Al_2O_3 and (d) GO-SiO_2

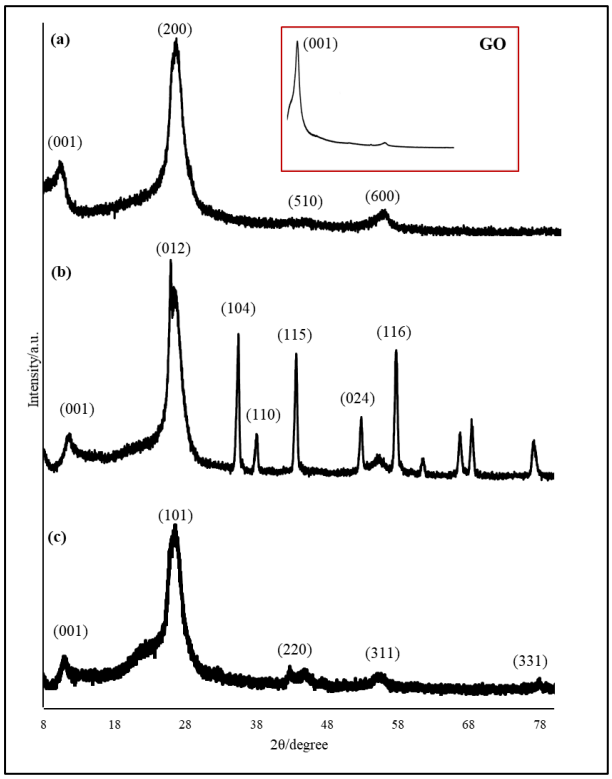


Fig. S2 XRD of (a) GO-MnO_2, (b) GO-Al_2O_3 and (c) GO-SiO_2

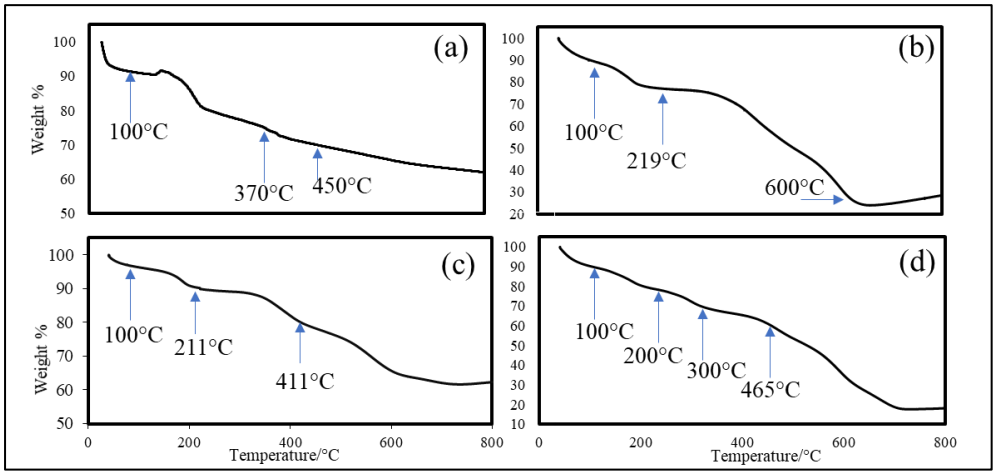


Fig. S3 TGA of (a) GO, (b) GO-MnO_2, (c) GO-Al_2O_3 and (d) GO-SiO_2

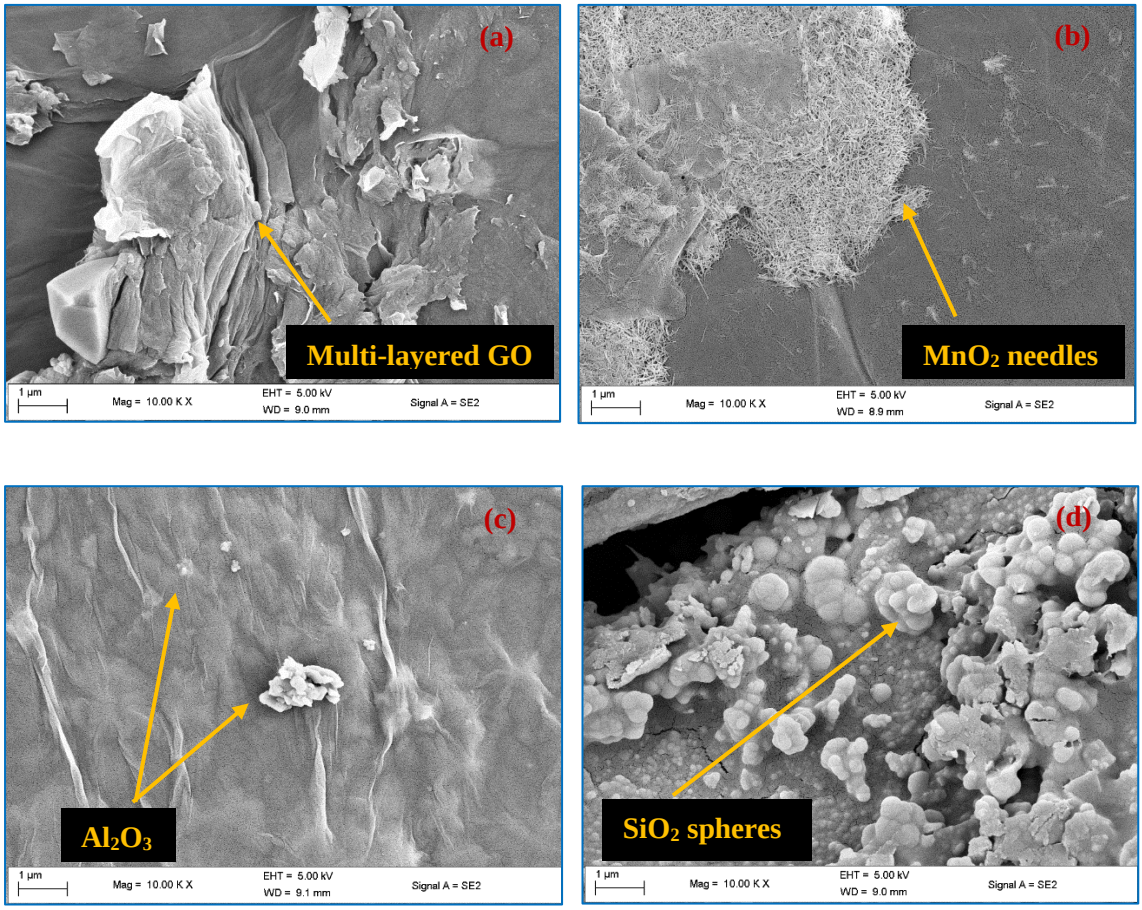


Fig. S4 SEM images of (a) GO, (b) GO-MnO_2, (c) GO-Al_2O_3 and (d) GO-SiO_2

Fig. S5 FTIR-ATR spectrum of chitosan

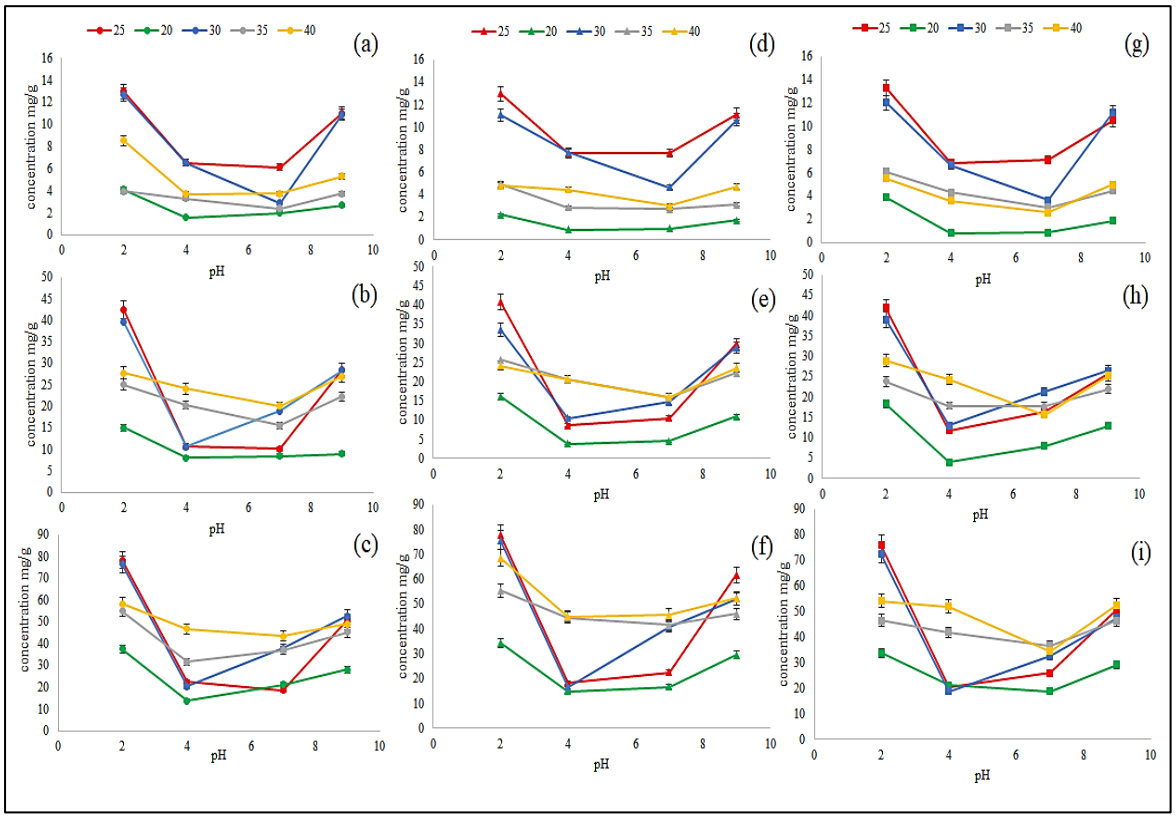


Fig. S6 Effect of pH on uptake for MCSCl-GO-MnO_2 (a-c:10-100 mg L^{-1}), MCSCl-GO-Al_2O_3 (d-f:10-100 mg L^{-1}) and MCSCl-GO-SiO_2 (g-i: 10-100mg L^{-1}) at 20, 25, 30, 35 and 40°C

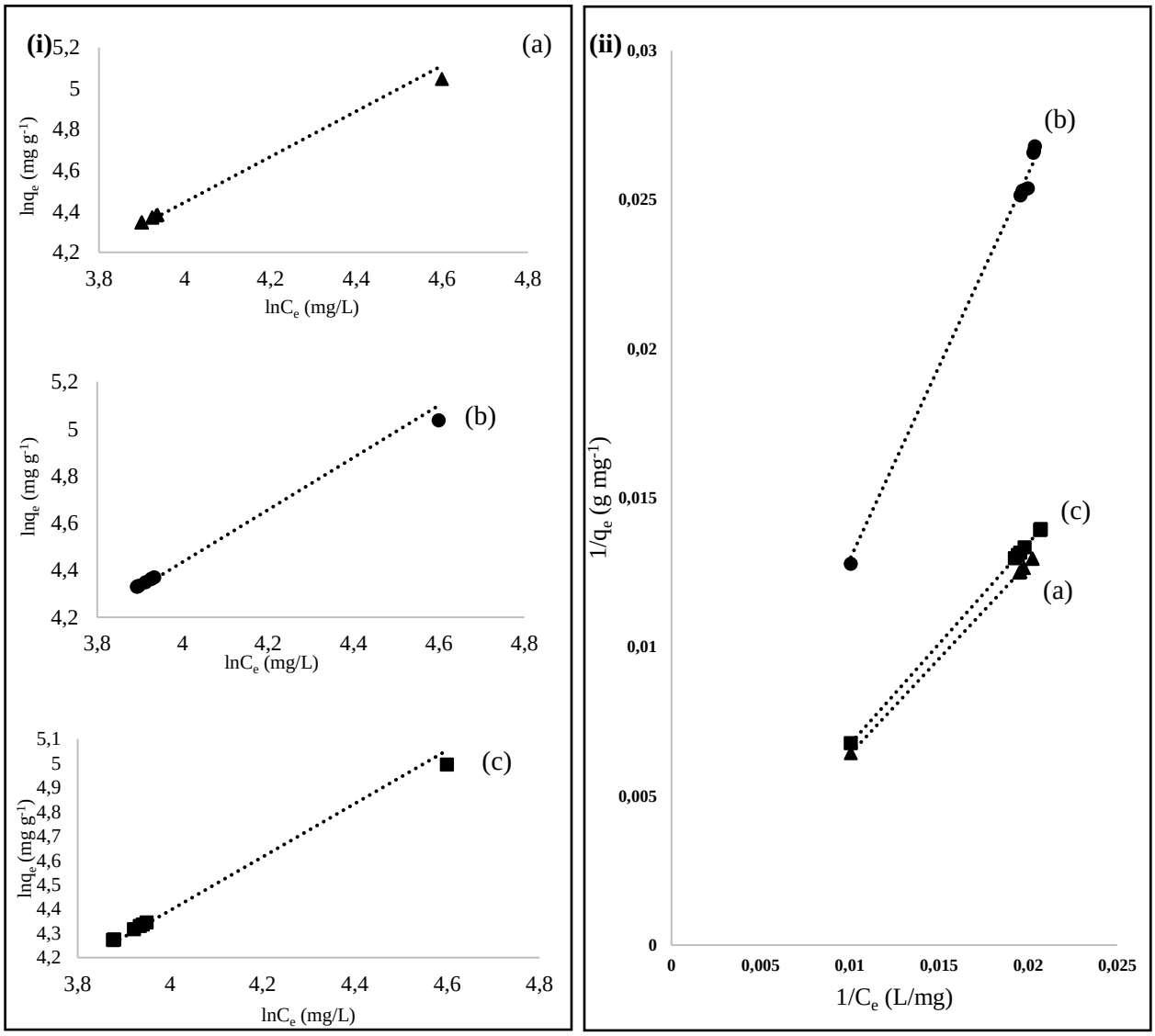


Fig. S7 (i) Freundlich isotherm and (ii) Langmuir isotherm of (a) MCSCl-GO-MnO_2, (b) MCSCl-GO-Al_2O_3 and (c) MCSCl-GO-SiO_2

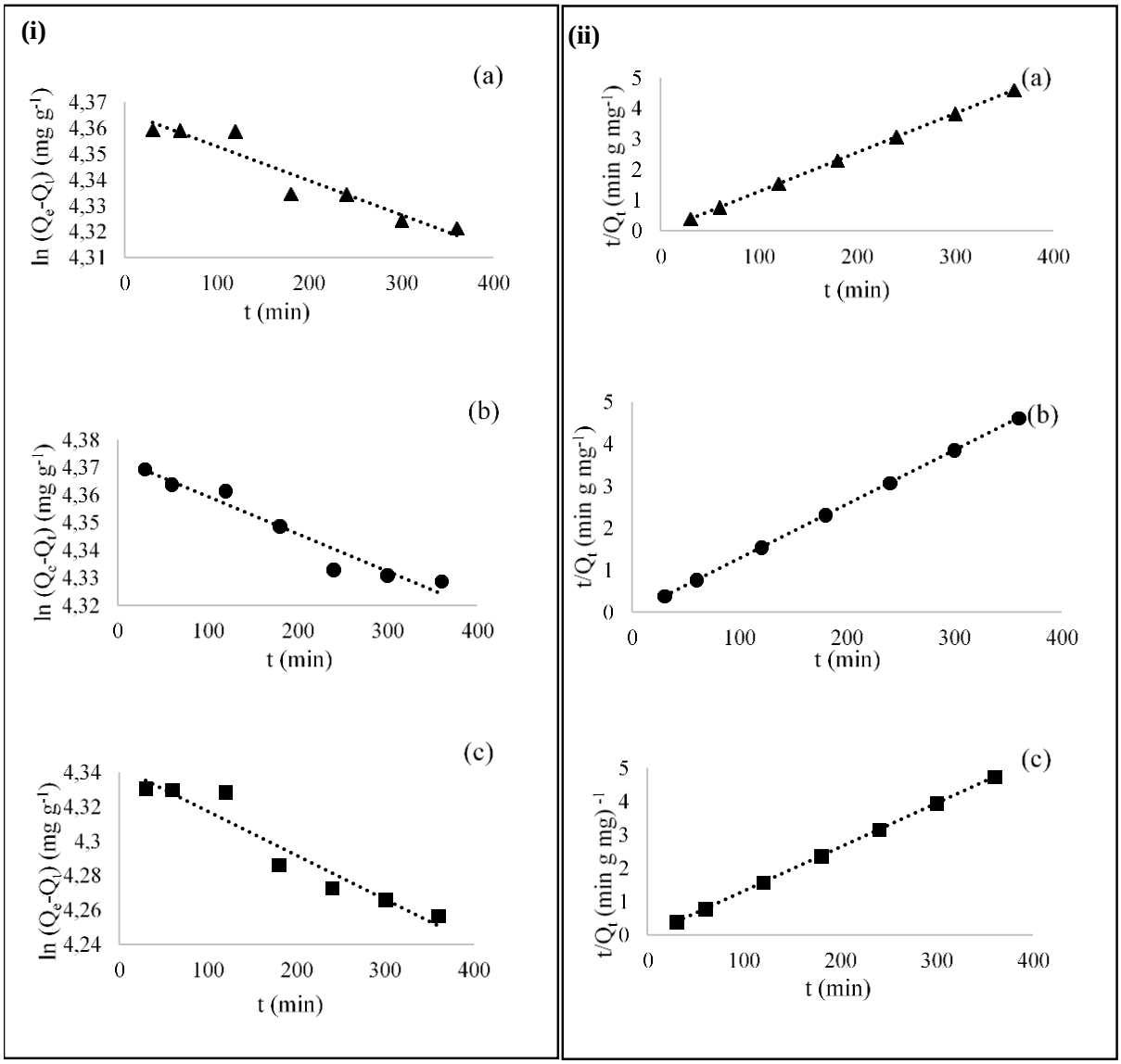


Fig. S8 (i) Pseudo first-order and (ii) pseudo second-order kinetic models for Cr(VI) adsorption onto (a) MCSCl-GO-MnO_2, (b) MCSCl-GO-Al_2O_3 and (c) MCSCl-GO-SiO_2

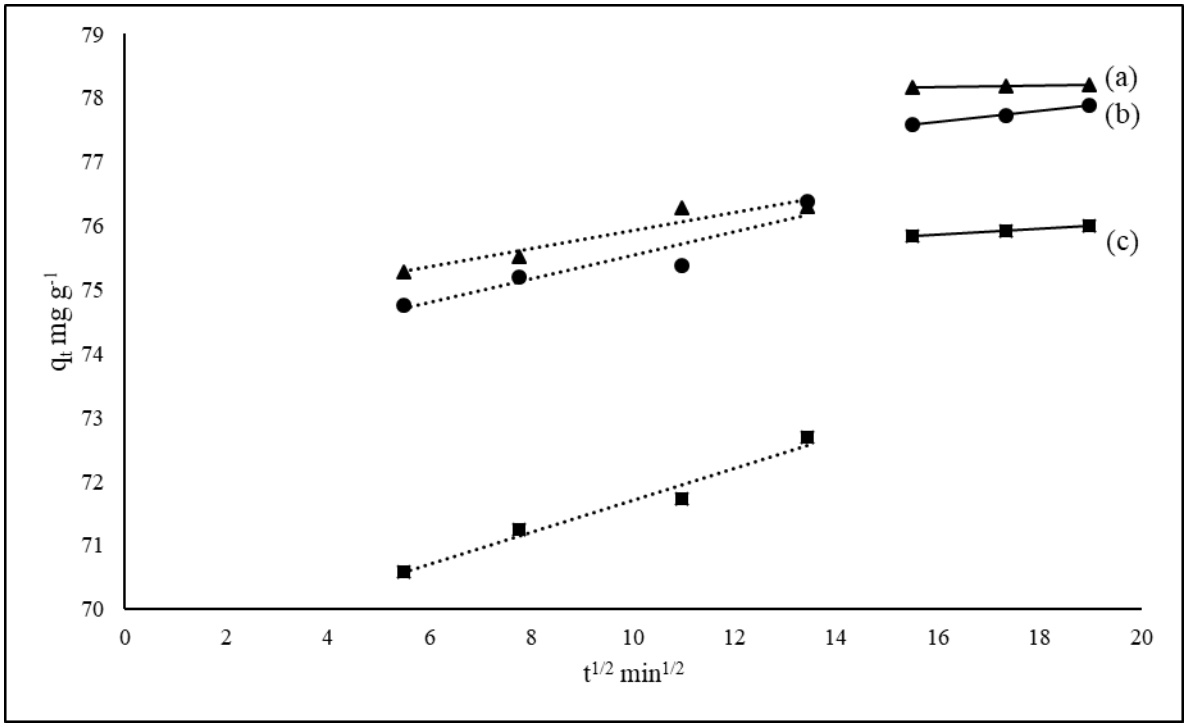


Fig. S9 Intraparticle diffusion kinetics of (a) MCSCl-GO-MnO_2, (b) MCSCl-GO-Al_2O_3 and (c) MCSCl-GO-SiO_2 for Cr(VI) adsorption at initial concentration 100 mg L^{-1}, pH 2 and 25°C.

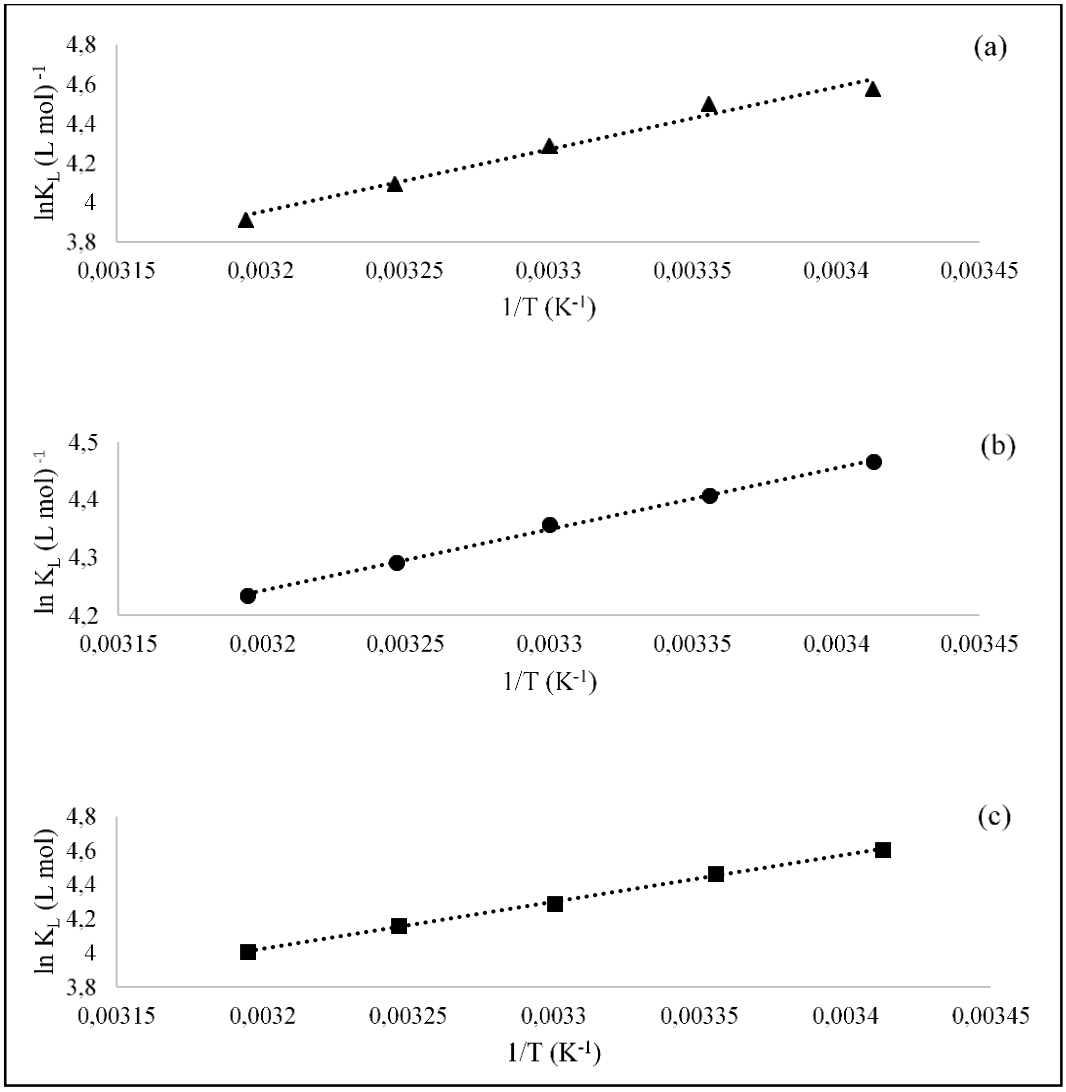
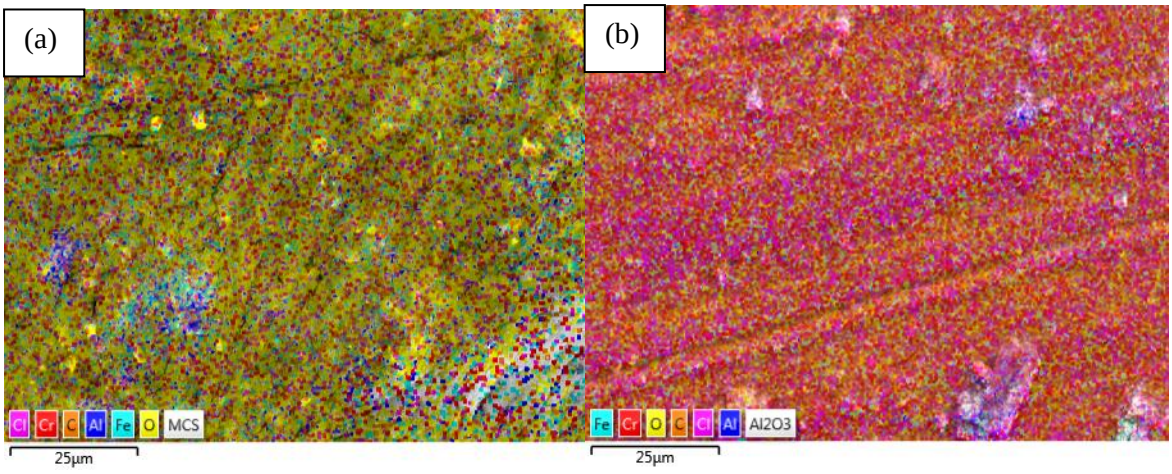


Fig. S10 van't Hoff plots for Cr(VI) adsorption onto (a) MCSCl-GO-MnO_2, (b) MCSCl-GO-Al_2O_3 and (c) MCSCl-GO-SiO_2



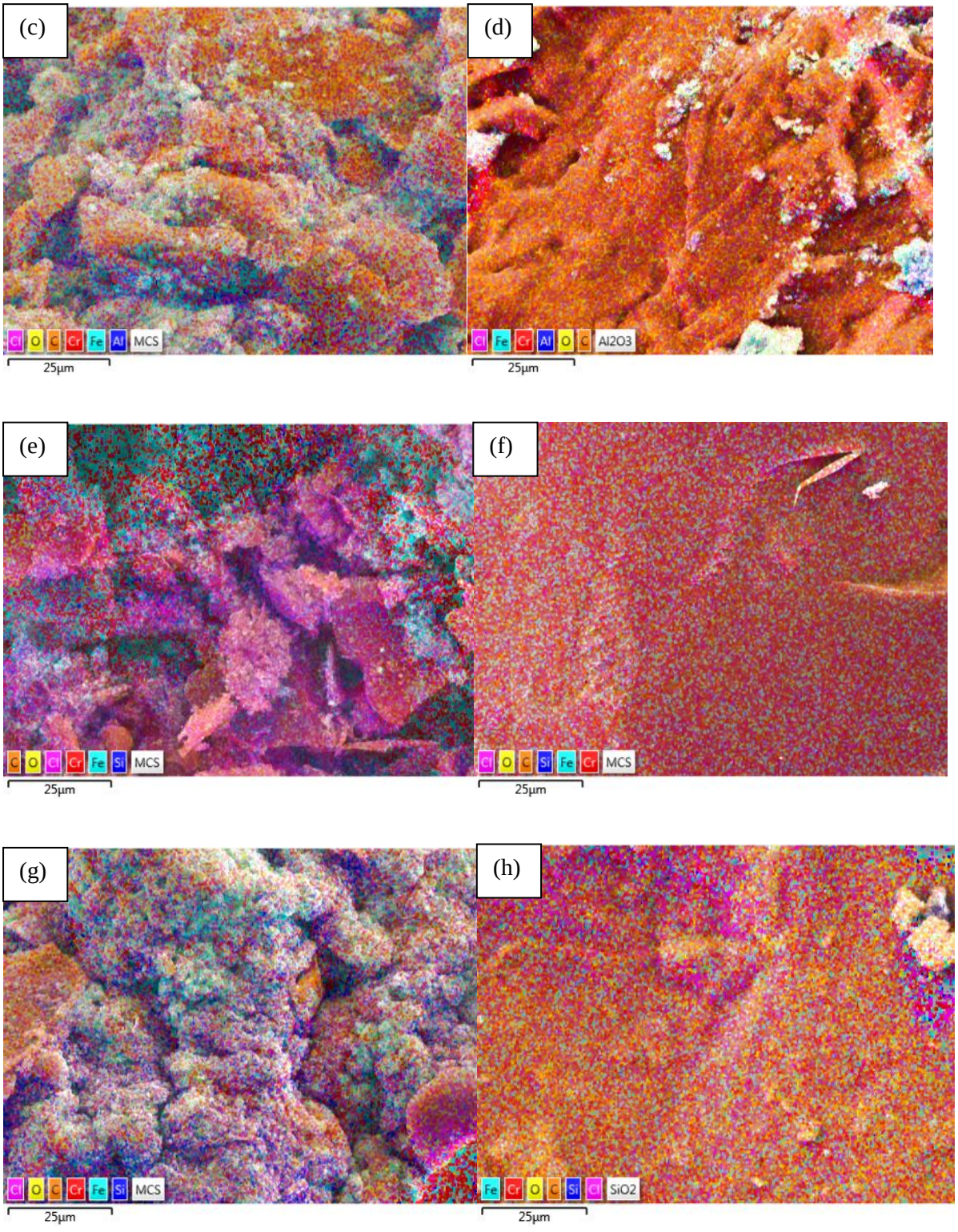


Fig. S11 Adsorbed (a-b) and desorbed (c-d) Cr(VI) surface and cross-sections of MCSCl-GO-Al_2O_3 and adsorbed (e-f) and desorbed (g-h) Cr(VI) surface and cross-sections of MCSCl-GO-SiO_2