

SUPPLEMENTARY INFORMATION

for

The use of acrylic yarn modified with amidoxime and carboxylate containing polymer for lead removal from drinking water

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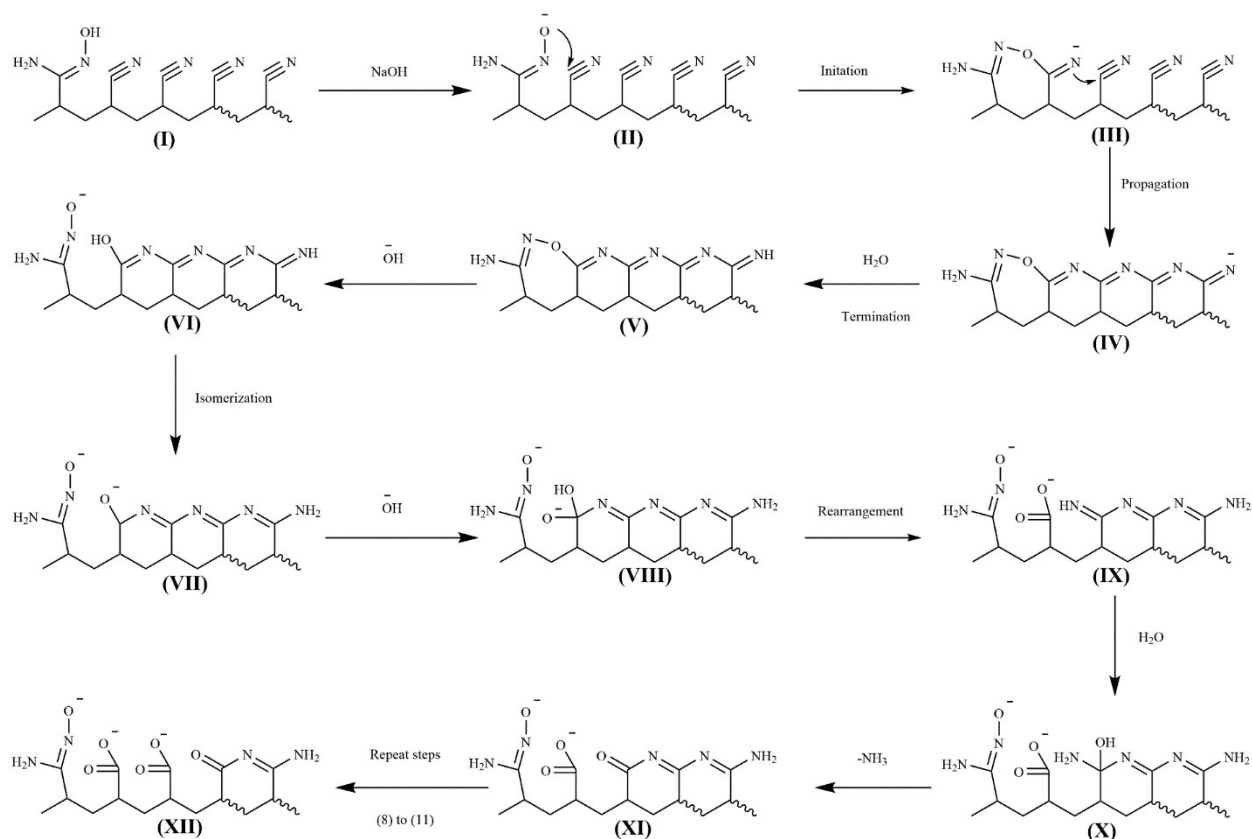
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Supporting Information



Scheme S1 Proposed base hydrolysis mechanism in AO fiber

A potential mechanism for the hydrolysis of the remaining nitrile group of amidoximated acrylic yarn is proposed and shown in Scheme 1. It was found that 1 M NaOH hydrolyzed the nitriles slowly, presumably due to the electronic repulsion between the carboxylate formed and the attacking hydroxide ions. In the presence of NaOH, amidoxime is deprotonated and bears a negative charge (Scheme 1, **II**).²⁵ The electrons on the oxygen of AO attack the adjacent nitriles, initiating a chain conjugation and forming a cyclic structure (Scheme 1, **IV**). Here the observed result was the development of red color on the adsorbent. As time progressed, the conjugated structures (CS) converted slowly into CO (Scheme 1, **IX–XI**). A polymeric gel with high swelling capacity was formed as sodium acrylate and AO combined. The CO formation on the adsorbent were determined by the proportion of AO and by the duration of the hydrolysis. The original yarn was white, as was the AO fiber. After 18 h of hydrolysis, the fiber had become red – the greater the CS content, the more intense the color. On washing with DI water, the color changed to pale yellow.

Supporting Information

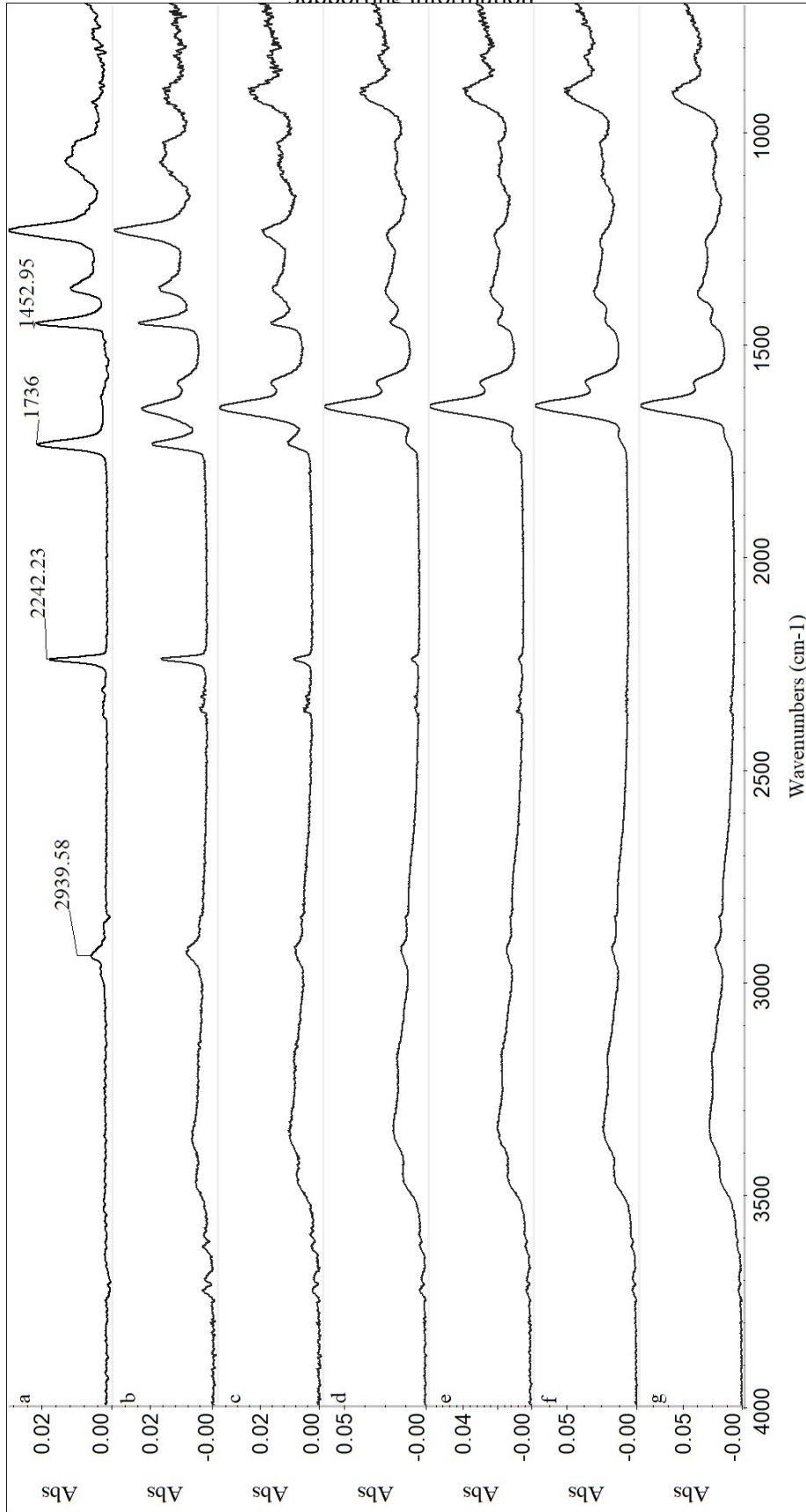


Figure S1

IR spectra of a) acrylic yarn, b) AO10, c) AO20, d) AO30, e) AO40, f) AO60 and g) AO120 (32 scan and resolution 2)

Supporting Information

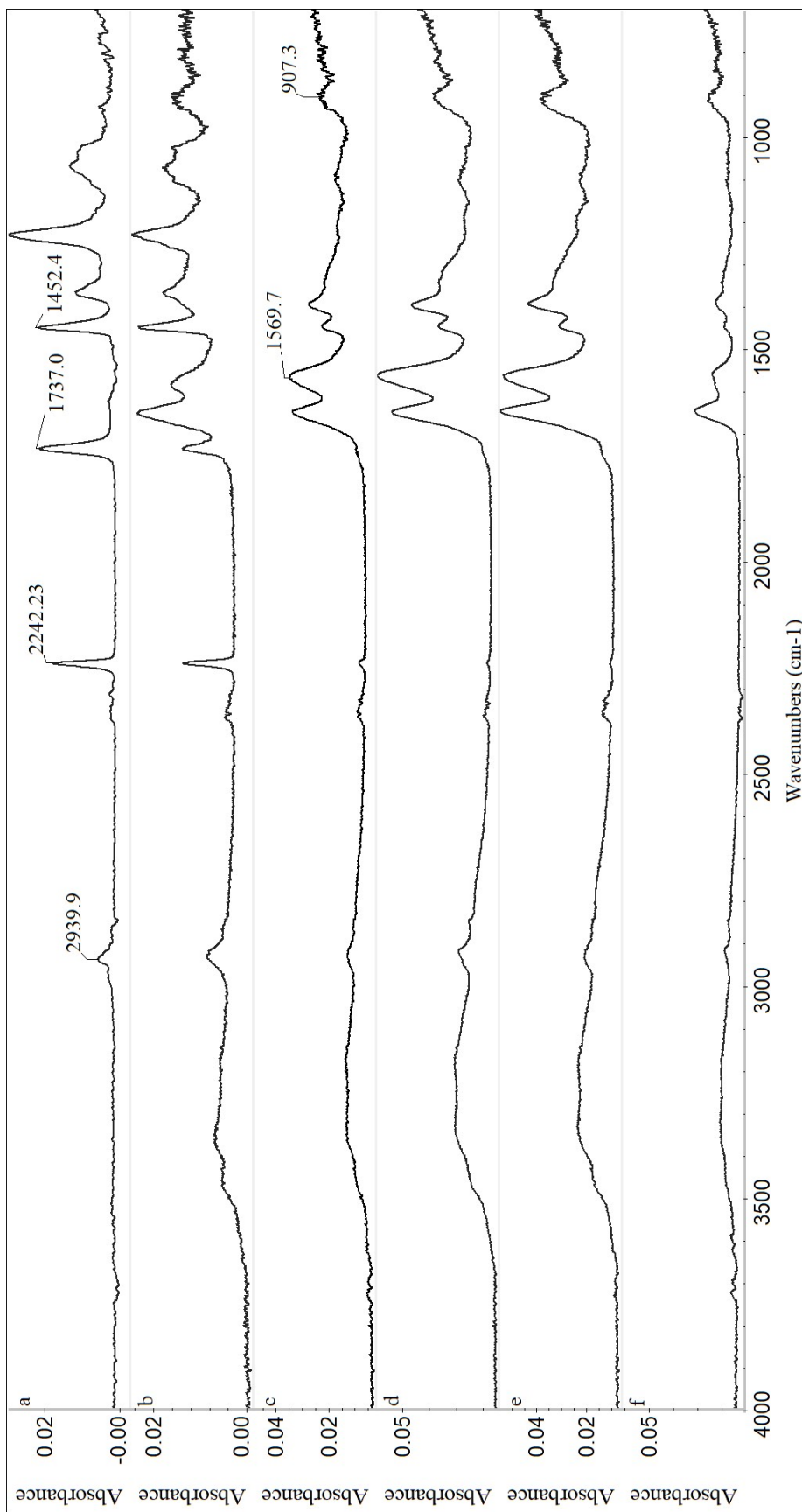


Figure S2

IR spectra of a) acrylic yarn, b) AOC O10, c) AOC O20, d) AOC O30, e) AOC O40, and f) AOC O60 (32 scan and resolution 2)

Supporting Information

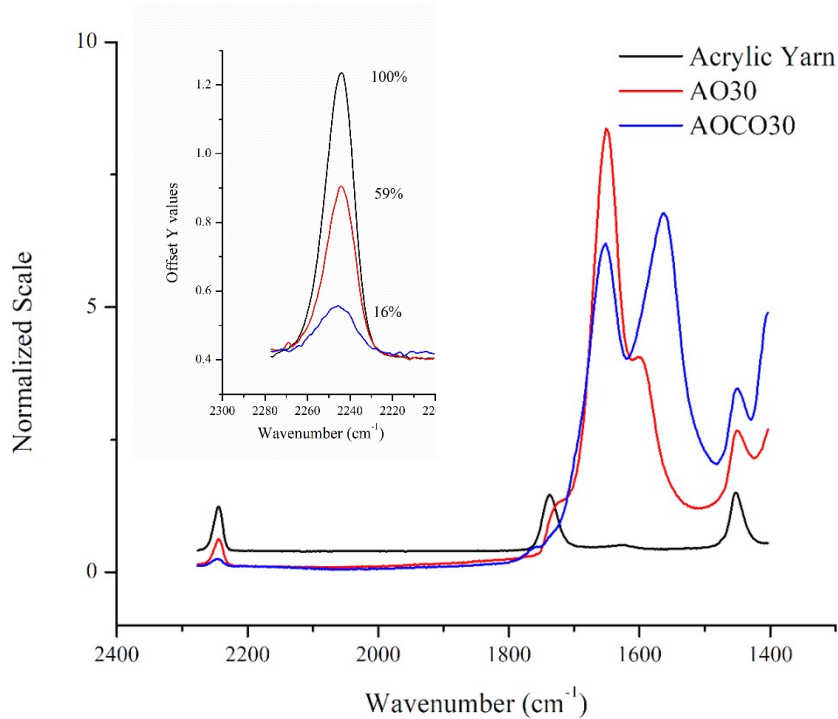


Figure S3 Comparison of the normalized spectra with respect to methylene peak height of a) acrylic yarn, b) AO30 and c) AOCO30

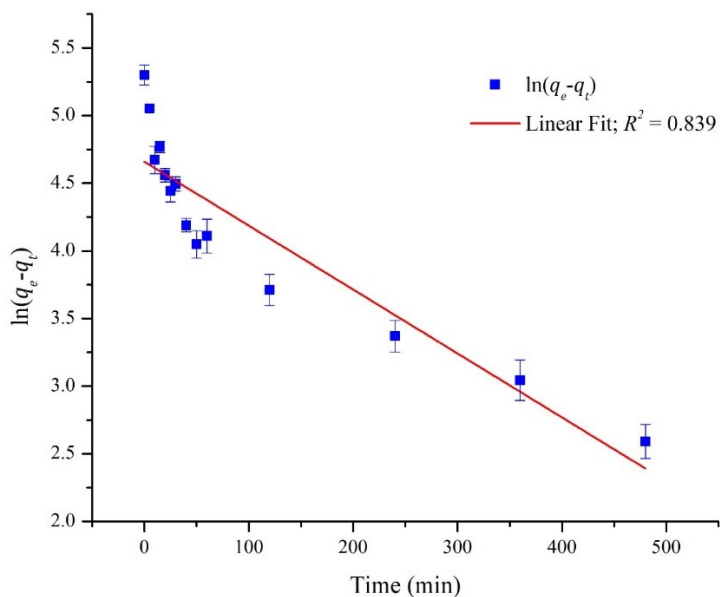


Figure S4 Pseudo-first order sorption kinetics of Pb²⁺ on adsorbent AOCO30; (initial concentration = 25 ppm; temperature = 22±3 °C; adsorbent dose = 0.1 g/L; pH = 5.4; stirring rate = 120 rpm)

Supporting Information

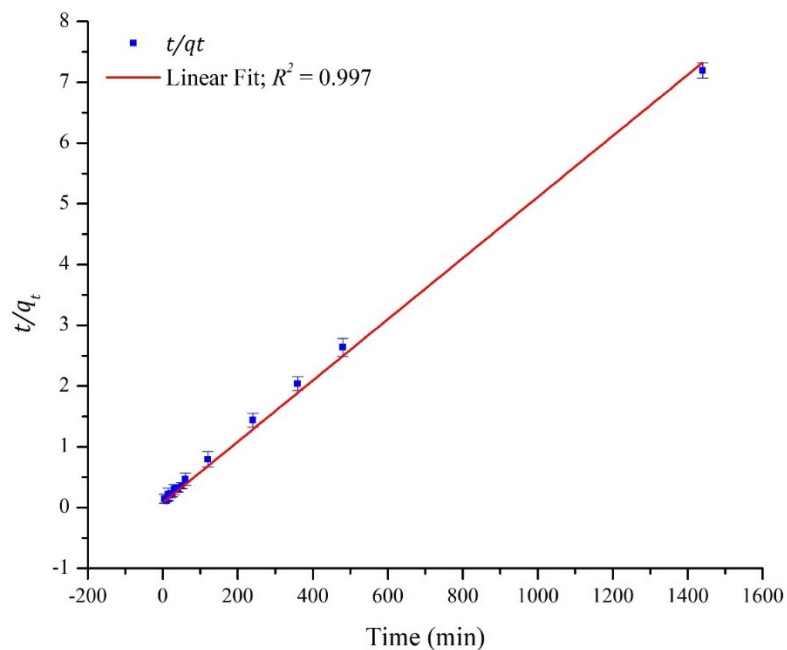


Figure S5 Pseudo-second order sorption kinetics of Pb^{2+} on adsorbent AOCO30; (initial concentration = 25 ppm; temperature = 22 ± 3 °C; adsorbent dose = 0.1 g/L; pH = 5.4; stirring rate = 120 rpm)

Supporting Information

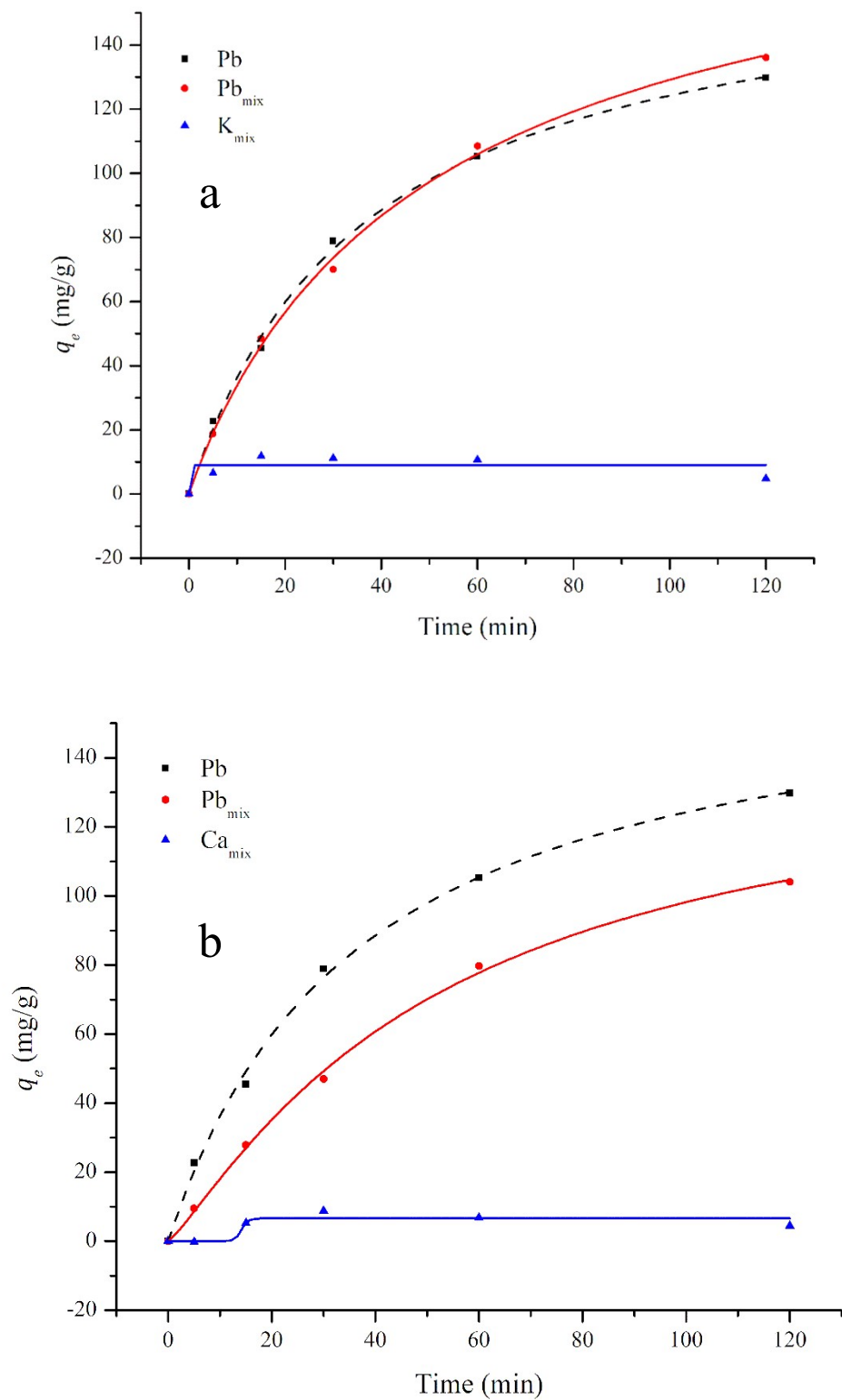


Figure S6 a and b Variation of adsorption capacity with contact time; dashed line: Pb²⁺ only in solution; solid lines: Pb²⁺ with a) K⁺ and b) Ca²⁺ as competing metal ions; adsorbent dose = 0.1 g/L; initial concentration = 25 ppm each and contact time = 24 h

Supporting Information

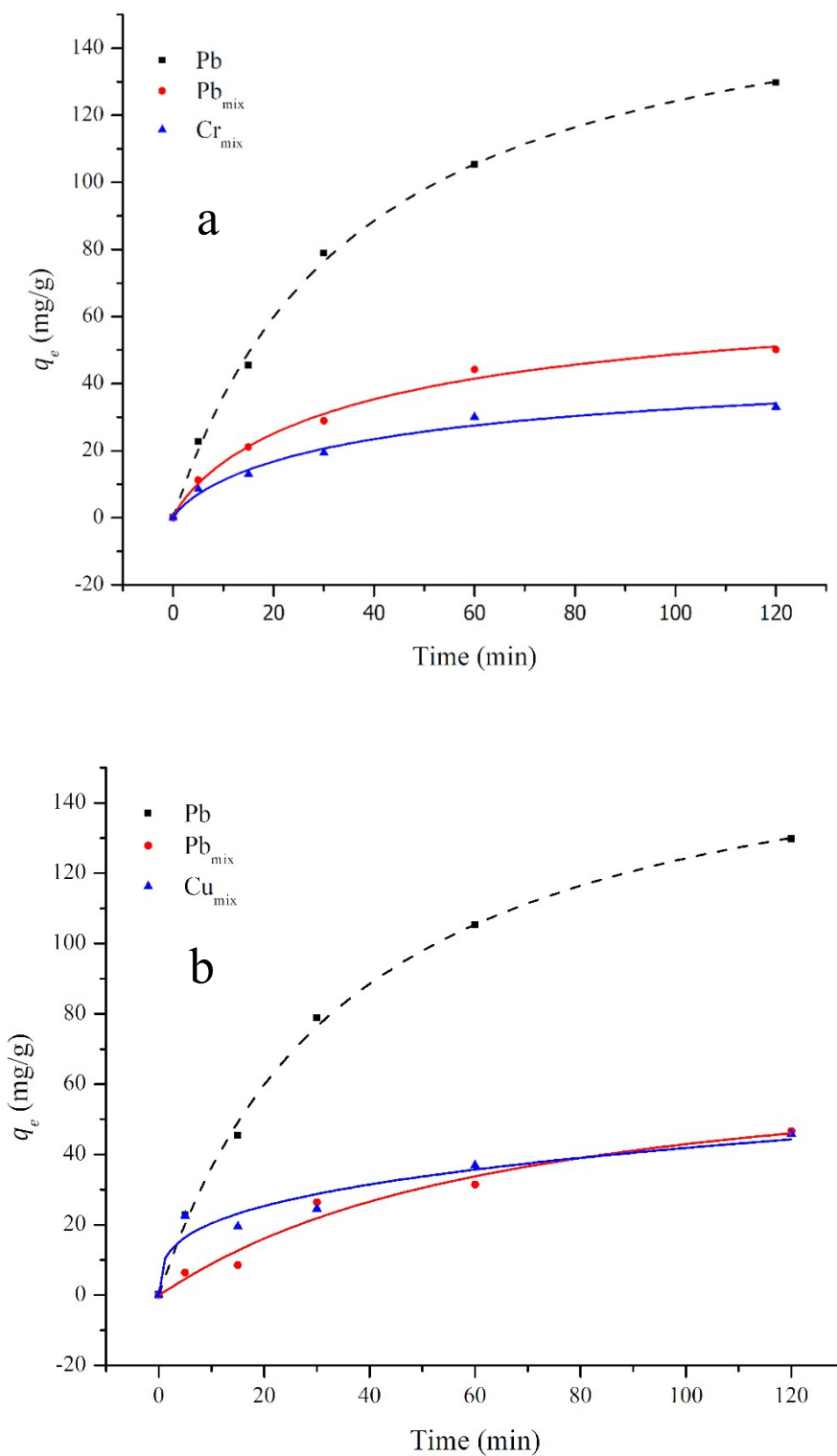


Figure S7 a and b Variation of adsorption capacity with contact time; dashed line: Pb^{2+} only in solution; solid lines: Pb^{2+} with a) Cu^{2+} and b) Cr^{3+} as competing metal ions; adsorbent dose = 0.1 g/L; initial concentration = 25 ppm each and contact time = 24 h

Supporting Information

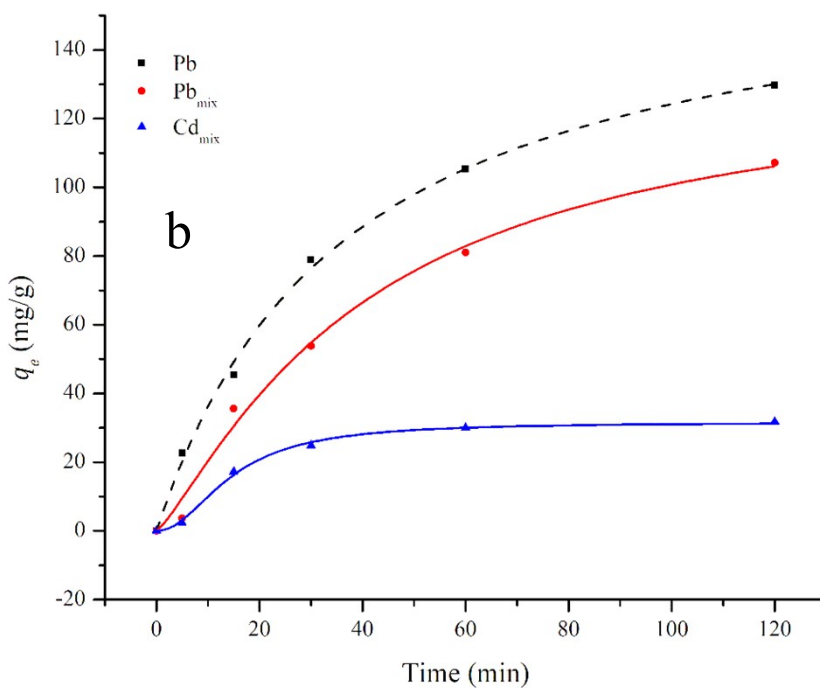
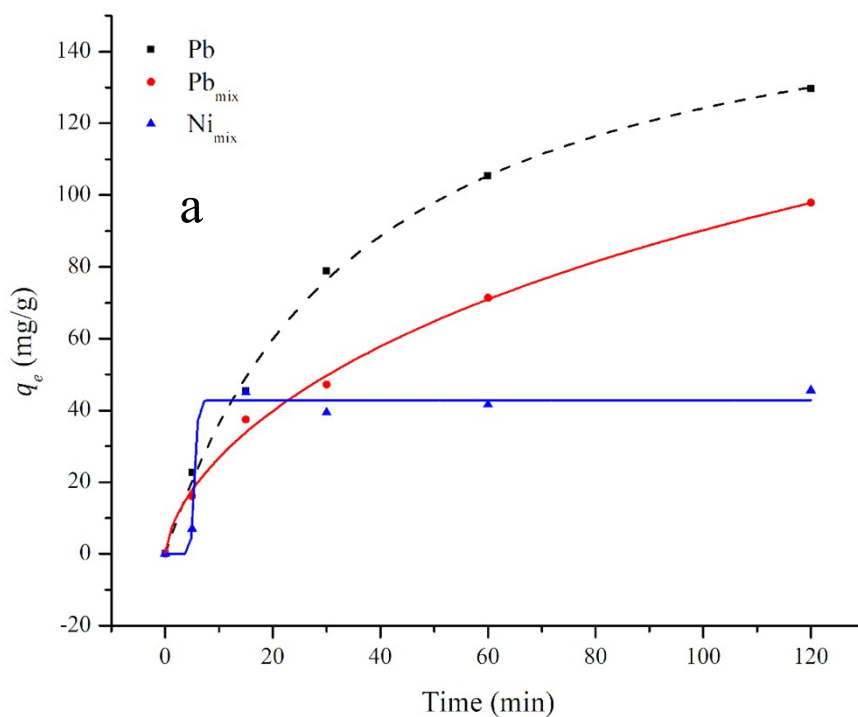


Figure S8 a and b Variation of adsorption capacity with contact time; dashed line: Pb^{2+} only in solution; solid lines: Pb^{2+} with a) Ni^{2+} and b) Cd^{2+} as competing metal ions; adsorbent dose = 0.1 g/L; initial concentration = 25 ppm each and contact time = 24 h