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REMOVAL OF HEAVY METALS BY ADSORPTIVE FILTRATION

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EXTENDED ABSTRACT

The US Environmental Protection Agency (USEPA) recently introduced more stringent arsenic regulations by lowering the maximum contaminant level (MCL) to 10 μg/L (ppb) arsenic in drinking water. During the present study, an iron solution injection sand filtration process was designed and tested to selectively remove arsenic (As(V)), chromate (Cr(VI)) and cadmium (Cd(II)) from aqueous solutions down to trace level. Bench scale sand columns with chemical feeding system were used to conduct the filtration study. The filtration results demonstrate that As(V) could be removed by ferric solution-treated sand filters from 2,000 ppb down to less than 5 ppb using two sand filters connected in series (two stage filtration). During the filtration, ferric concentrations in the first and second filters were maintained at 5 and 2 ppm, respectively, through a continuous injection scheme. Bench scale filtration results suggest that Cr(VI) could also be effectively removed by injection of ferrous solution into the sand columns. Similar ferric treatment of the sand columns also significantly increased Cd (II) removal. Batch adsorption experimental results suggest that when solution pH is lower than 8, arsenate can be removed by iron-treated sand. Arsenate-saturated sand can be regenerated using a high pH (pH > 12) solution. Scanning Electron Microscope (SEM) and energy dispersive x-ray (EDX) studies suggest that very little amount of Fe on the sand surface was dissolved when the sand was regenerated using a dilute NaOH solution (pH = 13).

Key words: filtration; heavy metals; water; arsenic; iron; ferric; chromium, cadmium; wastewater; heavy metals; removal; pH; effluent; treatment; adsorption; silica; sand.