Selective Chromate Filtration Based Cellulose Fiber Composite by Lab-in Syringe Systems

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Chromium can be found in two oxidation states in environmental samples, namely, the hexavalent (Cr (VI)) and trivalent (Cr (III)) chromium. Cr (III) is a micronutrient while Cr (VI) is a confirmed carcinogen, which requires its removal from environmental matrices. Cr (VI) contamination of drinking water is considerable risk in places where environmental legislation is not enforced against the removal of this specific form of chromium. A simple point of use device for the removal of Cr (VI) would be most needed especially in remote areas lacking appropriate wastewater treatment plants and war zones. A lab-in-syringe system is developed for the filtration of Cr (VI) from aqueous matrices based on a composite of graphene oxide (GO) in bacterial cellulose (BC) matrix. GO was functionalized with 3-aminopropyltriethoxysilane (APTES) the filtration is achieved by passing the polluted sample through the lab-in-syringe system at pH = 1. Different Cr (VI) concentrations were tested and filtration was achieved at concentrations as low as 5 mg/L. Other metals were tested against the composite and it was found to be selective for Cr (VI). Real samples provided from industrial settings were tested and the Cr (VI) was eliminated at concentrations up to 50 mg/L.