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Performance and removal mechanism of a titanium ore to treat water contaminated with arsenite and arsenate

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Arsenite and arsenate are considered a great concern according to International Agency for Research on Cancer (IARC). The predominance of these species in groundwater depends on pH and redox potential. According to World Health Organization (WHO), the current recommended limit in drinking-water is 10 µg/l. Sorption using iron reagents is a low price alternative but ineffective for the removal of arsenite at neutral pH. The sorbents should be efficient, inexpensive, easy to prepare, and abundant in nature. Ilmenite is the main ore to produce titanium; moreover hematite, magnetite and rutile may be found in ilmenite ore, these oxides have been reported as removal arsenic sorbents. The aim of this work was to study the performance of the ore to remove both arsenic species in water at natural pH and aerobic conditions at low and high arsenic concentrations (150 and 1500 µg/L). Ore was crushed, sieved and submitted to a magnetic treatment. Characterization was performed by BET isotherms, X-ray fluorescence, X-ray diffraction, scanning electron microscopy, infrared, Raman and Mossbauer spectroscopy and electrophoresis. Analysis were done before and after the arsenic removal process. Arsenite oxidation/removal tests were carried out at room temperature, natural pH and aerobic conditions to evaluate the capability oxidation of the titanium ore. Removal arsenate tests were carried at the same conditions to evaluate the removal capacity. Experiments were carried out in presence of calcium and phosphate ions to evaluate competition and contribution effects in the removal process. A titanium ore dose of 7 g/L was necessary to remove arsenic high concentrations of 1500 µg/L and after 6 h reaction, the total arsenic concentration in both arsenite and arsenate system far below than that of 10 µg/L. The titanium ore is an efficient, inexpensive and abundant material to remove arsenic in groundwater.

Biography

C E Cuando-Cerón is pursuing his PhD at National University of Mexico. He has completed his Bachelor's degree in Chemical Engineer and his Master's degree in Environmental Engineering.

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