

# Development of Iron-Oxide-Coated Fiberglass for Arsenic (V) removal

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## ABSTRACT

Iron-oxide-coated fiberglass (IOCFG hereafter) was developed and evaluated for arsenate removal effectiveness. Different fiberglass types (cloth, mat and fibers) were coated with iron oxide using different combinations of temperature (25<sup>0</sup>C and 110<sup>0</sup>C), pH (1.3, 7 and 8.5) and initial iron concentrations (0.25M and 2.5M) following the adsorption method. Iron loadings of 11-34 mg Fe g<sup>-1</sup> was obtained on fiberglass at room temperature, which could be attributed to its surface properties (surface area and silanol functional groups). Fiberglass insulation fibers were selected based on their higher iron retention ability as compared to other fiberglass types. An iron loading of 231 mg g<sup>-1</sup> was obtained on fiberglass insulation fibers (pH 1.3, 110<sup>0</sup>C), which is ~ 8 times higher than maximum reported iron loading on sand. Comparison of iron loading on fiberglass fibers and sand indicated that ~ 13 times lower initial iron concentration was required to achieve 45 mg g<sup>-1</sup> iron loading on fiberglass fibers as compared to sand. 10g L<sup>-1</sup> iron-oxide-coated fiberglass insulation fibers (IOCFG) with an iron loading of 231 mg Fe g<sup>-1</sup>, developed at coating conditions (pH 1.3, 0.25M Fe<sub>initial</sub>, 110<sup>0</sup>C), were contacted with synthetic ground water (Well # 303, El Paso) containing 100 µg L<sup>-1</sup> arsenate. Experiments were conducted for 12h, 24h and 48h at pH 7.6 and 25<sup>0</sup>C. More than 90 % arsenate removal was achieved within 12 h of the sorption experiment by IOCFG (0.01 mg arsenate g<sup>-1</sup> IOCFG), which could be attributed to the iron oxide loading on fiberglass. This is the first study illustrating the application of fiberglass for the development of iron-oxide based fibrous sorbents and its applicability in removing metals like arsenic for treating drinking water and wastewater.

Keywords: Arsenic, Iron oxide coating, Adsorption, Fiberglass, Fibers