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Synthesis of stable sand composites using iron oxide and graphite oxide coated on the sand surface

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Sand filtration is one of the earliest and still most widely used ways for treating drinking water, and it consumes the most energy of all the steps involved in the treatment of water. In contrast to turbidity and microorganisms in the water, other pollutants can be removed by coating various compounds on the sand surface. The key problem is that the coating chemicals dissolve in the water. Presently, sand composites are chemically modified using iron oxide-assigned sand composites labelled Fe₂O₃-GOS. The material was stored for six months in water to analyse its stability. The turbidity of stored water does not increase during that time. However, the turbidity of the graphite oxide-coated (GOS) sand and iron oxide-coated sand (Fe₂O₃-S) composites increased (0.01 to 0.06 NTU and 0.01 to 0.09 NTU, respectively). The Fe content following the 1-hour shaking time is examined. The Fe₂O₃-GOS and Fe₂O₃-S composites showed 6 ppb, and 67 ppb, respectively. The attachment of graphite oxide in the presence of iron oxide is the most stable sand composite. This composite can be used to remove fluoride and turbidity from water. Turbidity and fluoride removal rates are 94% (5 NTU to 0.26 NTU) and 73% respectively, after 1 hour of shaking at 2 mg L^{-1} initial fluoride loading. These experiments were all carried out in batch mode. Our data suggested that iron-assigned graphite oxide sand material is the most stable composite for sand filter units.

Keywords: Fluoride, graphite oxide, sand composites, stability, turbidity