Nanofiber Cellulose Zero Valent Iron Filtration: Potential for Reduction of Water-Borne Particulate and Microbial Contaminants

Carlson, Ceirra

A critical issue in the world today is providing clean drinking water for people throughout the world. Nearly 780 million people are unable to access clean drinking water today. Despite the fact that water covers approximately six tenths of our planet, uncontaminated drinking water is perhaps our most rare and endangered resource. Current research through coal mining drainage has revealed zero valent iron as a hopeful component that could possibly be implemented to reduce microbial contamination. The foundation of cellulose nano-fibers has also been viewed as a potential improved filtration source. This would be an economically effective resource because it can be obtained from recyclable products like paper, cardboard, wood and more. This improved particulate filtration, along with zero valent iron utilization could produce a major advancement in providing adequate amounts of clean water safely, effectively and economically. A working filtration system containing these elements was built that successfully removed water borne particulates and living microbial contaminants. Cellulose nanofiber paper was generated by shredding recycled paper and blending it to a fine consistency. The regeneration of the cellulose was accomplished by treating this pulp with sodium hydroxide and heat. Cellulose nanofiber paper, in addition to being very inexpensive and readily abundant proved to be 5% mores effective at reducing particulates than regular filter paper, encompassing a decrease of about 92.3% of particulates. Zero Valent Iron, showed effective results in reducing microbial contaminants in water by 70%. This research could provide a feasible new filtration system that could be scaled to much larger systems and be implemented to benefit countries needing access to clean water.

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