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CLAY COMPOSITE WATER FILTERS: THE CASE OF FLUORIDE, NITRITE AND *E. Coli* REMOVAL

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Abstract

Inorganic ceramic materials is receiving more attention in recent times due to their unique characteristics which include different pore structures, hydrophilic surfaces, high chemical, thermal and mechanical stabilities which offer avenues for application in water treatment. In the present work, cost-effective clay ceramic water filters of different designs were developed from clay (50, 60, and 70) %, sawdust (15, 20, 25, and 35) %, grog (5, 10 and 15)% ratios plus 5% bone char by volume and sintered at temperature of 950ºC for 6hrs. For the flow rate, fluoride and nitrite tests synthetic waters were used, while for *E.coli* removal efficiency test of the filter diluted wastewater sample collected by purposive sampling methods from Modjo River was used. The analysis of the optimal performing sintered filter by X-ray diffraction revealed the existence of mixed phases such as quartz, kaolinite, mulite and ilite. The surface functional group analysis by infrared spectroscopy showed the presence of strong bands at 3696 cm^{-1}, 3622 cm-^{1}, 3450 $cm^{-1}$of hydroxyl linkages. Field emission scanning electron microscopy of fractured filter surfaces with better performance showed the formation of interconnected porous microstructure materials. The ceramic water filter developed from 50 % clay, 15% grog, 35% sawdust, and 5% bone char, (C950-50-35-15), characterized with total porosity 36.33±0.05 %, flow rate 1.91±0.55L/h and *E*. coli, nitrite, and fluoride removal efficiencies 99.91±0.09 %, 76.00±0.22%, and 96.8±0.41% respectively.

Keywords: ceramic filter, grog, microstructure, porosity, sintering

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