Use of converter furnace steel slag for bacteria removal in flow-through columns

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ABSTRACT

The aim of this study was to investigate the removal of bacteria (\textit{Escherichia coli}) in flow-through columns (length = 10 cm; inner diameter = 2.5 cm) containing converter furnace steel slag and quartz sand. The X-ray fluorescence (XRF) analysis shows that calcium (Ca) and iron (Fe) were the major elements of the steel slag. The X-ray diffractometry (XRD) pattern indicates that hematite (Fe$_2$O$_3$), magnetite (Fe$_3$O$_4$), and dicalcium ferrite (Ca$_2$Fe$_2$O$_5$) were the major constituents of the steel slag. Results show that the percent removals of bacteria in the steel slag were 2.4–3.2 times greater than those of the sand. As the steel slag content increased from 0 to 100% in the mixture of steel slag and sand, the percent removal increased from 39.9 ± 2.7 to 97.3 ± 0.1%. Results indicate that the steel slag was effective in the removal of bacteria. This could be attributed to iron oxides present in the steel slag, which play an important role of bacterial adhesion. Also, calcium oxide, which was released from the steel slag, could contribute to the removal of bacteria as bactericide. This study demonstrates that the steel slag has potential as a reactive media to remove bacteria from aqueous solution.

\textit{Keywords:} Bacteria removal; Calcium oxide; Column experiment; Converter furnace steel slag; Iron oxide

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