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Immobilization of Iron- and Manganese-oxidizing Bacteria with a Biofilm-forming
Bacterium for the Effective Removal of Iron and Manganese from Groundwater

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ABSTRACT: In this study, three bacteria with high Fe- and Mn-oxidizing capabilities were isolated from groundwater well sludge and identified as *Acinetobacter* sp., *Bacillus megaterium* and *Sphingobacterium* sp. The maximum removal ratios of Fe and Mn (99.75% and 96.69%) were obtained by an optimal combination of the bacteria at a temperature of 20.15°C, pH 7.09 and an inoculum size of 2.08%. Four lab-scale biofilters were tested in parallel for the removal of iron and manganese ions from groundwater. The results indicated that the Fe/Mn removal ratios of biofilter R4, which was inoculated with iron- and manganese-oxidizing bacteria and a biofilm-forming bacterium, were approximately 95% for each metal during continuous operation and were better than the other biofilters. This study demonstrated that the biofilm-forming bacterium could promote the immobilization of the iron- and manganese-oxidizing

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