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ENHANCED REMOVAL OF FECAL BACTERIA BY ZINC-MODIFIED ZEOLITE IN AN INTERMITTENT MEDIA INFILTRATION SYSTEM

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Abstract

The reuse of a wastewater treatment system was investigated using intermittent media infiltration (IMI) to evaluate the fecal coliform (FC) removal efficiency with natural zeolite containing clinoptilolite from the state of San Luis Potosí, Mexico and its zinc-modified form (Zeo-Zn). The municipal wastewater, which was from Saltillo, Coahuila, Mexico, was treated for FC analysis for four months. The physicochemical properties of zeolite were analyzed, and their behavior as filter media for FC removal with an IMI system was studied using X-ray diffraction (XRD), scanning electron microscopy (SEM), energy-dispersive X-ray spectroscopy (EDX) and X-Ray fluorescence techniques (XRF). At the conditions under which natural zeolite was treated to functionalize its surface with a bactericide agent (Zn^{2+}), there were no significant structural and chemical changes in the clinoptilolite contained in the natural zeolite. Thus, Zeo-Zn could be regenerated by treatment with a zinc salt after a long-term IMI process. The use of Zeo-Zn resulted in an average FC removal efficiency (2.99 ± 0.92 log) and FC reduction ($99.44 \pm 1.04\%$) that were significant better than those obtained with natural zeolite (approximately 47.44%). Zeo-Zn enhanced the removal of FC in the IMI system more than natural zeolite and thus complied with Mexican regulations for unrestricted reuse during the study period. The study showed that Mexican natural zeolite functionalized with zinc can be used as a disinfectant to achieve the antibacterial effect in an IMI system for wastewater treatment.

Key words: bacteria, column, modification, wastewater reuse, zeolite

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