Removal performance of faecal indicators by natural and silver-modified zeolites under dynamic batch experiments

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The use of natural zeolites (NZs) in waste-water treatment plants is one of the oldest and most promising applications. Modified natural zeolites (MZs) have shown improved ion exchange and adsorption capacities and have been extensively applied for the removal of pollutants (metalloid ions, ammonia etc) from aqueous solutions. However, MZs application in biological pollutants such as indicator organisms or pathogens has not been extensively explored. This study examines the antimicrobial effect of both natural Greek zeolite (NZ), with clinoptilolite content up to 85% (OLYMPOS SA), and modified Greek zeolite by incorporation with silver ions (Ag-MNZ) on the survival of two selected bacteria. The chosen organisms, *Escherichia coli* and *Enterococcus faecalis*, constitute indicators of fecal contamination in both soils and water. Scanning electron microscopy and energy dispersive X-ray detection (SEM-EDX) were used for the surface morphology and elemental composition of the NZ and Ag-MNZ samples, respectively. A series of dynamic batch experiments were conducted at constant room temperature (22°C) in order to examine the inactivation of the above bacteria by NZ and Ag-MNZ. It was found that the Ag-MNZ resulted in much higher reduction of the bacterial numbers when compared to the NZ and control (absence of zeolites). Moreover, the reduction in the bacterial numbers was affected by NZ particle size with higher reduction observed for coarse (1-3 mm) than fine (0-1) NZ. Finally, the *E. faecalis* was found to be more resistant than *E.coli* to Ag-MNZ.