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Consul Multiphasic 3.5a Package for Modeling of Groundwater Protection from Amoxicillin using Modified Bentonite

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***Abstract*:** This study investigates the performance of modified bentonite (MB) as a reactive medium in the permeable reactive barrier (PRB) for remediation of simulated groundwater contaminated with amoxicillin. It is evident that the natural bentonite (NB) modified with hexadecyl trimethyl ammonium (DK1) can effectively remove amoxicillin from aqueous solution. The effect of different parameters such as contact time, initial pH of the solution, agitation speed, initial amoxicillin concentration and MB dosage was studied. The maximum removal (97%) of amoxicillin using MB for 4 hr, pH 11, 250 rpm, 50 mg l^{-1}, and 0.6 g 100 ml^{-1}, respectively. The adding glass waste (GW) to the reactive medium (MB) led to an increase the hydraulic conductivity and decrease the effectively of amoxicillin removal, at the same time. The isotherm study showed that th sorption of amoxicillin onto GW&MB mixture fitted the Freundlich isotherm model with coefficient of determination (R2) equal to 0.9432 The leaching test indicated that the dissolution of amoxicillin bearing-MB is very low. A two-dimensional groundwater numerical model was developed under equilibrium condition using COMSOL Multiphysics 3.5a software to evaluate the performance of GW&MB-PRB in two configurations namely continuous (C-PRB) and funnel and gate (FG-PRB). The experimental results proved that the GW and MB-PRB was efficient in the restriction of contaminant plume and both configurations of PRBs can be used successfully to treat amoxicillin-contaminated groundwater with operation time equal to 87 and 75 day for C-PRB and FG-PRB, respectively.

Keywords: COMSOL Multiphysics 3.5a, Groundwater, Amoxicillin