Geophysical Research Abstracts
Vol. 15, EGU2013-924, 2013
EGU General Assembly 2013

Zeolite in horizontal permeable reactive barriers for artificial groundwater recharge

María Leal (1), Virtudes Martínez-Hernández (1), Javier Lillo (2), Raffaella Meffe (1), and Irene de Bustamante (3)

(1) IMDEA Water, Alcalá de Henares, Spain (maria.leal@imdea.org, +348305961), (2) University Rey Juan Carlos, Móstoles, Spain (,+34914887016), (3) University of Alcalá, Alcalá de Henares, Spain (+34918854921)

The Spanish Water Reuse Royal Decree 1620/2007 considers groundwater recharge as a feasible use of reclaimed water. To achieve the water quality established in the above-mentioned legislation, a tertiary wastewater treatment is required. In this context, the infiltration of effluents generated by secondary wastewater treatments through a Horizontal Permeable Reactive Barrier (HPRB) may represent a suitable regeneration technology. Some nutrients (phosphate and ammonium) and some Pharmaceutical and Personal Care Products (PPCPs) are not fully removed in conventional wastewater treatment plants. To avoid groundwater contamination when effluents of wastewater treatments plants are used in artificial recharge activities, these contaminants have to be removed. Due to its sorption capacities, zeolite is among the most used reactive materials in Permeable Reactive Barrier (PRB). Therefore, the main goal of this study is to evaluate the zeolite retention effectiveness of nutrients and PPCPs occurring in treated wastewater.

Batch sorption experiments using synthetic wastewater (SWW) and zeolite were performed. A 1:4 zeolite/SWW ratio was selected due to the high sorption capacity of the reactive material.The assays were carried out by triplicate. All the bottles containing the SWW-zeolite mixture were placed on a mechanical shaker during 24 hours at 140 rpm and 25 ºC. Ammonium and phosphate, as main nutrients, and a group of PPCPs were selected as compounds to be tested during the experiments. Nutrients were analyzed by ion chromatography. For PPCPs determination, Solid Phase Extraction (SPE) was applied before their analysis by liquid chromatography–mass spectrometry time of flight (LC-MS/ TOF).

The experimental data were fitted to linearized Langmuir and Freundlich isotherm equations to obtain sorption parameters. In general, Freundlich model shows a greater capability of reproducing experimental data. To our knowledge, sorption of the investigated compounds on zeolite has rarely been addressed and this holds true especially for PPCPs. Therefore, the obtained results will be useful for the design and characterization of those HPRBs in which zeolite will be employed to regenerate treated wastewater for artificial recharge activities.