



Glyphosate removal from aqueous solution by an adsorption process on natural zeolite-bearing rock

Justyna Wrzosek*, Barbara Gworek

Institute of Environmental Protection – National Research Institute, Krucza 5/11 d, Warsaw, Poland, Tel. +48 (22) 37 50 539; email: justyna.wrzosek@ios.edu.pl (J. Wrzosek), Tel.+48 (22) 37 50 503; email: barbara.gworek@ios.edu.pl (B. Gworek)

Received 22 January 2018; Accepted 4 May 2018

ABSTRACT

Pollution of groundwater and surface water compartments is one of the major concerns related to the use of glyphosate in plant-protection products, and is attributed to the postulated endocrine-disrupting activity of the compound. There is a consensus that glyphosate cannot be inactivated in water by the addition of other substances that may also be foreign to that compartment. Therefore, a good, environment-friendly solution would involve use of natural zeolite-bearing rock to remove glyphosate from water. The main purpose of this study was to demonstrate that the content of glyphosate in water can be reduced by 50% through its adsorption on natural zeolites. An additional purpose was to identify the mechanism underlying the process – demonstrated to be adequately characterized by Freundlich and Langmuir isotherms. In natural zeolite-bearing rock with grain diameter <0.02 mm, the maximum monolayer adsorption capacity was 3.66 mg glyphosate/g sorbent. Glyphosate was shown to be adsorbed inside medium-sized heulandite channels with internal diameters of 0.4–0.6 nm; moreover, the adsorption of glyphosate onto heulandite crystal was shown to be a physisorption, unaccompanied by the formation of chemical bonds.

Keywords: Glyphosate; Heulandite; Clinoptilolite; Adsorption process; Material studio

* Corresponding author.

Presented at the 13th Conference on Microcontaminants in Human Environment, 4–6 December 2017, Czestochowa, Poland.

1944-3994/1944-3986 © 2018 Desalination Publications. All rights reserved.