Desalination and Water Treatment
www.deswater.com

doi: 10.5004/dwt.2019.23518

143 (2019) 197–207
March

Dichloro-diphenyl-trichloroethane removal via nano zero-valent iron: determination of degradation mechanism using response surface methodology

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Received 4 July 2018; Accepted 23 November 2018

ABSTRACT

Most organochlorine pesticides (OCPs) are considered to be persistent organic pollutants (POPs) as they have characteristics which are resistant to biological degradation and are subject to bioaccumulation. Dichloro-diphenyl-trichloroethane (DDT) continues to be released into the environment because it is the main ingredient of various pesticides, even though its direct use is prohibited. In contrast to the works in the literature using very high concentrations of DDT, this study was carried out with low DDT concentrations that can be found in water. This study aimed to reveal the mechanism for removal by observing whether, other than adsorption, the mechanism of dechlorination was effective. In addition to scanning the GC-MS library, the effects of the variables of nano zero-valent iron (nZVI) concentration, initial DDT concentration and contact time were investigated. The study also examined the highest initial DDT concentration that could be used to achieve an effluent concentration below the carcinogenic effect limit for DDT of 0.23 μg/L. The highest concentration that could be degraded by nZVI was 88.33 mg/L. A contact time of 48.6 min and 550 mg/L adsorbent concentration were required to achieve the carcinogenic effect limit using nZVI.

Keywords: POPs; DDT metabolites; nZVI; OCPs

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