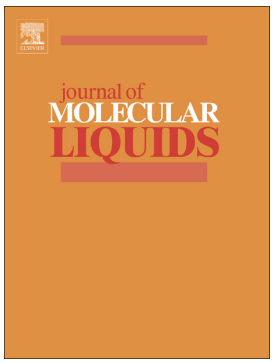

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Simin Nasseri, Amir Hossein Mahvi, Mehdi Seyedsalehi, Kamyar Yaghmaeian, Ramin Nabizadeh, Mahmood Alimohammadi, Gholam Hossein Safari

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Degradation kinetics of tetracycline in aqueous solutions using Peroxydisulfate activated by ultrasound irradiation: Effect of radical scavenger and water matrix

Simin Nasseri[1, 2], Amir Hossein Mahvi [1, 3], Mehdi Seyedsalehi[4], Kamyar Yaghmaeian[1, 3] Ramin Nabizadeh[1,5], Mahmood Alimohammadi[1], Gholam Hossein Safari[6, 7]*

[1]Department of Environmental Health Engineering, School of Public Health, Tehran University of Medical Sciences, Tehran, Iran.

[2]Center for Water Quality Research, Institute for Environmental Research, Tehran University of Medical Sciences, Tehran, Iran.

[3]Center for Solid Waste Research, Institute for Environmental Research, Tehran University of Medical Sciences, Tehran, Iran.

[4] Department of Environmental Engineering, Science and Research Branch, Islamic Azad University, Tehran, Iran

[5]Center for Air Pollution Research, Institute for Environmental Research, Tehran University of Medical Sciences, Tehran, Iran.

[6]Department of Environmental Health Engineering, School of Public Health, Tabriz University of Medical Sciences, Tabriz, Iran.

[7] Health and Environmental Research Center, Tabriz University of Medical Sciences, Tabriz, Iran.

* Corresponding Author; hsafari13@yahoo.com

Abstract

Degradation kinetics of the tetracycline antibiotic in aqueous solution was investigated using sulphate radicals under ultrasound irradiation. The effect of various operational parameters including initial tetracycline concentration, initial peroxydisulfate concentration, solution pH, reaction time, temperature, ultrasound power, the presence of natural organic matter, radical scavenger (tert-butyl alcohol and methanol), as well as the chemical composition of water using ultrapure water, drinking water, and secondary effluent on the degradation efficiency of tetracycline were studied. The preliminary studies were performed using only peroxydisulfate, ultrasound and ultrasound activated peroxydisulfate. The results indicated that tetracycline degradation rate increased with the increase of initial peroxydisulfate concentration, temperature and ultrasonic power, but decreased with the increase of initial tetracycline concentration. The tetracycline degradation rate was highly dependent of initial pH of the solution. The degradation of tetracycline followed the first-order kinetics. The addition of humic acid in concentrations above 10 mg. L^{-1} decreased the degradation rate of tetracycline, although the effect could be compensated using higher concentrations of peroxydisulfate. The role of active radicals (sulfate and hydroxyl radicals) was investigated using radical scavengers of methanol and tert-butyl alcohol. Under optimum operational conditions, 96.5% of tetracycline removal was achieved with chemical oxygen demand and total organic carbon removal of about 74% and 61.2%, respectively. The degradation rate of