



Degradation of nitroaromatic compounds in subcritical water: application of response surface methodology

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Received 4 November 2016; Accepted 3 April 2017

ABSTRACT

In this study, subcritical water has been used as a medium for degradation of 2,4-dinitrotoluene (2,4-DNT), 4-nitrotoluene (4-NT) and 2-amino-4-nitrotoluene (2-A-4-NT). The effect of temperature, oxidant concentration and time were studied and the optimal combination of reaction parameters was established using response surface methodology in a Box-Behnken design. Of all the parameters examined, temperature showed the most positive effect on the degradation of the nitroaromatic compounds. Optimal reaction conditions were found to be a temperature of 240°C, 210°C and 236°C, time of 180, 178 and 172 min, oxidant concentration of 100, 99.64 and 99.61 mM for 2,4-DNT, 4-NT and 2-A-4-NT, respectively. Since high-temperature was applied, the possibility of formation of subcritical degradation products existed; therefore, total amounts of degraded nitroaromatic compounds and formed intermediate products were determined by gas chromatographic–mass spectrometric analysis.

Keywords: Subcritical water; Degradation; Nitroaromatic compounds; Response surface methodology; Box-Behnken

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