Degradation of iohexol by UV irradiation: kinetics, pathways and iodinated trihalomethanes formation during post-chlorination

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The photodegradation of iohexol by UV irradiation and the formation of iodinated trihalomethanes (I-THMs) during subsequent chlorination were investigated in this study. Iohexol can be photodegraded by UV with pseudo-first order kinetics and the quantum yield was determined to be 0.0385 mol einstein⁻¹. The degradation rate of iohexol was linear along with the increase of UV intensity while effects of solution pH and Br⁻ were negligible. The main photodegradation intermediates including deiodinated and hydroxylated products were identified by UPLC-ESI-MS. Then the UV photodestruction pathways of iohexol were proposed. The I-THMs formation in UV-chlorination of iohexol was evaluated in terms of UV fluence, pH, Br⁻ concentration and raw water matrix. The increase of UV fluence and Br⁻ concentration significantly enhanced the I-THMs formation and iodine substitution factor (ISF) while effect of pH was negligible. Raw freshwater matrix can appreciably influence the photodegradation rate of iohexol and I-THMs formation due to the presence of natural organic matter and Br⁻. It was found that the UV removal of iohexol in real waters was depressed while I-THMs formation and ISF values were greatly enhanced. The results of the current study led to some practical concerns on toxic I-THMs in the UV application of iohexol-containing raw waters.

Keywords: Iohexol; UV irradiation; Iodinated trihalomethanes (I-THMs); Chlorination

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