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"Gheorghe Asachi" Technical University of Iasi, Romania

WATER QUALITY ASSESSMENT, STATISTICAL ANALYSIS AND KINETICS OF TRIHALOMETHANES FORMATION IN DRINKING WATER SUPPLIES - A COMPLETE BATCH STUDY

Minashree Kumari[1]*, Sunil Kumar Gupta[2]

[1]Department of Environmental Science and Engineering, Indian Institute of Technology (ISM) Dhanbad-826004, Jharkhand, India
[2]Indian Institute of Technology (ISM) Dhanbad-826004, Jharkhand, India

Abstract

The study attempted to identify the best suited models to determine the kinetics of chlorine decay and trihalomethanes (THMs) formation in drinking water supplies. Batch experiments were conducted on synthetic water samples to simulate the characteristics of raw water collected from Maithon water treatment plant (MWTP), Dhanbad, Jharkhand, India. Influence of various parameters like total organic carbon (TOC), reaction time, pH and chlorine dose on the rate of THMs formation were analysed. The studies revealed that above 50% of THMs were formed within the first 83.65 min. Later on the reaction rate decreases and it takes 7.32-9.26 hours for 99% formation of total THMs. Pearson correlation matrix dictated strong correlation of reaction time followed by pH, dose and TOC with THMs formation. Principal component analysis (PCA) demonstrated that dissolved organic carbon (DOC) is the most influencing parameter for THMs formation. Chlorine decay kinetics followed second order reaction and the rate constant was found to be 0.0131 L/mg.min^{-1}. THMs formation kinetics was analysed by Clark and Kavanaugh model. Validation results indicated lower error of prediction (< 6%) for Clark's model than Kavanaugh model (< 20%). Thus, it was observed that Clark's model more suitably predict the formation of THMs in Indian drinking water supplies.

Key words: chlorine decay, drinking water, kinetics, model, trihalomethanes, validation

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* Author to whom all correspondence should be addressed: e-mail: minashreekumari2501@gmail.com; Phone: +91-3262235474; Fax: +91-3262296624