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Distribution and generation characteristics of halogenated acetic acids disinfection by-products in reclaimed water

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ABSTRACT

In this study, the secondary effluent organic matter (EfOM) was divided into hydrophobic acid (HOA), hydrophobic base, hydrophobic neutral (HON), and hydrophilic components by using the wastewater from a sewage treatment plant as reclaimed water. The correlation between the type and structure of each component and the possible by-products of halogenated acetic acids (HAAs) produced within 30 min and 5 d after chlorination was investigated. The number of disinfection by-products and conventional water quality indicators were assessed. The results showed that the main HAAs species formed at 30 min were dominated by bromochloroacetic acid, dichloroacetic acid (DCAA), and monobromoacetic acid (accounting for 93.05% of the total generation). However, the main HAA species formed at 5 d were trichloroacetic acid, bromodichloroacetic acid, and DCAA (accounting for 88.76% of the total generation). HON in EfOM has a molecular weight of 5–10 kDa. Soluble microbial products (SMPs) carrying hydroxyl groups, amine groups, and benzene rings are the primary source of HAAs, accounting for 61.56% of the 30-min generation amount and 37.52% of the 5-day yield. Following HOA component, the molecular weight is similar to HON component, containing unsaturated carboxyl COO–, SMPs of aromatic hydrocarbons, humic acid, and fulvic acid organic compounds. The theoretical results of exploring the existence and related characteristics of disinfection by-products in EfOM can offer practical advice.

Keywords: Effluent organic matter; Component separation; Disinfection by-products; Molecular weight; Fluorescence spectroscopy

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