RESEARCH DESCRIPTION

EFECT OF OZONATION ON CHLORINATION BY-PRODUCTS REMOVAL FROM WATER TREATMENT FACILITIES OF QUEBEC (CANADA)

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In the province of Quebec (Canada), the control of THMs in water distribution networks remains a major concern. Unfortunately, the next strengthening of the Quebec regulation on chlorination by-products will probably exacerbate this issue. Indeed, the regulation on the drinking water quality provides the insertion of a standard of 60 μgL^{-1} for HAA_5. So far, only a standard for THMs was adopted indicating an annual maximum average concentration of 80 μgL^{-1}. In addition, the amendment of the regulation will lead to an increase of sampling. Thus, depending on the size of the population served, one to eight quarterly water sampling will be analyzed, against one now. Moreover, for both THMs and HAA_5, standards are verified on the basis of maximum average values determined for the four quarters.

Ozonation is a powerful oxidant recognized for its disinfectant and oxidizing action in water treatment. It is mainly used for iron and manganese removal, improvement in tastes and odors, and organic micropollutants control. This process is commonly implemented in drinking water facilities of Quebec and often recommended to control disinfection by-products formation.

To assess the impact of the ozonation process on chlorination by-products (CBPs) reduction, laboratory chlorination tests were carried out on fifteen (15) facilities treatment waters, using the uniform formation conditions (UFC) standardized method. These tests focused on the one hand, the ozonated water in factories and on the other hand, those of ozonated in the laboratory at a dose of 1 mg O_3/ mg DOC. A large variability in performance of elimination was observed. Thus, the average reduction of +TMH and HAA was 20.4 and 32.2 %, respectively. For some plants, THMs (n = 4/15) and HAA (n = 7/15) concentrations were increased.

Natural organic matter (NOM) present in the waters was characterized. According to their molecular weights, NOM constituents distribution was determined by size exclusion chromatography (HPSEC/UV/TOC) analysis performed in the environmental laboratory of the department of Civil Engineering of the University of British Columbia (Canada). The relationship between CBPs and NOM constituents and other parameters like absorbance at 254 nm, SUVA (specific ultraviolet absorbance), total and dissolved organic carbon (TOC and DOC), biodegradable dissolved organic carbon (BDOC), differential absorbance at 272 nm and chlorine demand (CD) was examined.

Keywords: Ozonation, chlorination, CBPs, HAA, THM, NOM, HPSEC/UV/TOC