外 国 語 要 旨

学位論文題目　Evaluation of Organic Matter in tap water Using Fluorescence Analysis and Dissolved Organic Matter Fractionation Method

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DOM (Dissolved organic matter) contained in resource water such as lake water, river water, etc. has a difference in place and seasonal variation. When considering use as drinking water, it is necessary to understand not only quantitative variation but also qualitative one. However, DOM is composed of various kinds of organic matters which are complicated and heterogeneous, and it is practically difficult to fully understand. In this study, it was examined to investigate the characteristic of DOM using fractionation by the chemical properties such as hydrophilic, hydrophobic, acid and alkali. In addition, fluorescence analysis which can be easily measured by a small amount of sample and estimate the qualitative features by selecting proper combination of excitation wavelength and fluorescence wavelength.

On the other hands,TOC (Total Organic Carbon), AOC (Assimilable Organic Carbon), THMFP (Trihalomethane Formation Potential), and the indexes which are conventionally used to evaluate DOM in water supply field. Although, AOC and THMFP are meaningful for practical purposes relating to biofilm forming potential and toxicity of by-products, they are not suitable for constant monitoring methodology due to their complicated and time consuming measurement. The quick and convenient methods such as fractionation and fluorescence analysis which was examined in this research is used as alternative way, it becomes extremely helpful for water supply management.

In this research, the relationship between AOC & THMFP and the qualitative change on DOM caused by ozonation artificially with the fractionation and fluorescence analysis was investigated The target water samples were derived from Tone River (Tone Ozeki) from December 2013 to May 2015 .

The fractionation of DOM into hydrophobic acid and hydrophilic matter in the target samples were conducted. And the fluorescence intensity (FIs) of the fractionated samples were also measured as quantitative analysis.Fluorescence intensity was measured by selected 5 combinations of excitation / fluorescence wavelengths referring the previous report. They were 250 nm /435 nm and 335 nm /435nm as excitation/emission for detecting fulvic acid or humic acid-like substance, 230 nm /345 nm and 270 nm /350 nm for protein like substance, and 495/515 nm for sewage drainage substance. And TOC, THMFP, AOC of the target samples were also measured according to the standard methods for water supply.

As a result, there was no correlation between the fluorescence intensity and THMFP, TOC and AOC of the samples. However, the samples after ozonation with 0.5 mg min L^{-1} as CT value indicated a strong negative correlation between THMFP and the FI decrease in two excitation / emission combinations such as 230nm/345nm for protein like substance and 495nm/515nm for sewage drainage substance with correlation coefficient r = - 0.84 and - 0.74.

It was considered that it was difficult for proteinaceous substances and sewage wastewater which is related to THM production in DOM in this river to be decomposed by ozonation. Besides, it was considered that the component susceptible to oxidative decomposition of ozone was not relevant to THM production.

The decrease of FIs of the hydrophilic fractionated samples by the same ozonation had highly correlation with AOC with correlation coefficient r = 0.85 and 0.74 in the two excitation / emission combination such as 250nm/435nm for fulvic acid or humic acid-like substance and 335nm/435nm for similar substance. Additionaly, those correlation were observed in case of AOC determined by the *Pseudomonas fluorescens* P17 strain and not by the *Aquaspirillum sp.* NOX strain. It was suspected that the correlation between AOC and the decrease of FI by ozonation was based on the correspondence of bio-degradable organic matter for P17 strain with ozone reactive matter.

Consequently, it could be predicted by fluorescence analysis, the lower the decrease of FIs due to ozone oxidation treatment at 230 nm / 345 nm and 495 nm / 515 nm at excitation / emission wavelength was, the higher THMFP was and the more the difference was the lower THMFP was lower. Besides, it could be predicted the larger the difference in FIs of the hydrophilic fraction by ozone oxidation treatment at excitation / emission for fulvic or humic substances was large, raw water with the higher AOC. Therefore, it was shown that the complicated and time consuming AOC measurement or THMFP measurement could be substituted by combining fluorescence analysis with fraction and ozone oxidation treatment in terms of water quality management.