Challenges of NOM on-line fluorescence monitoring in drinking water treatment


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Abstract: Research has highlighted a need for a rapid and robust method of natural organic matter (NOM) monitoring during drinking water treatment. Although it has been shown that fluorescence spectroscopy has the potential for on-line application in drinking water treatment plants, there has been no in-situ NOM fluorescence monitoring study conducted during drinking water treatment. The aim of the study was to determine a suitable NOM monitoring protocol for application at water treatment plants using fluorescence spectroscopy in order facilitate treatment process optimisation. A monitoring protocol was developed and successfully applied in a water treatment plant that utilised coagulation/membrane filtration treatment processes.

Keywords: on-line; fluorescence; monitoring

Introduction

It has been demonstrated that fluorescence spectroscopy has the potential to be applied for on-line monitoring of NOM in drinking water treatment plants. Fluorescence PARAFAC components were found to be useful for identifying suitable probes to use for the monitoring of NOM concentrations in raw and treated water and for characterisation of raw water NOM character in order to assess raw water treatability. Fluorescence probes have been applied for monitoring of NOM in freshwater systems (Downing et al., 2012). This study demonstrates their application for the optimisation of drinking water treatment plants

Material and Methods

Two currently available fluorescence probes were chosen for the on-line study of CDOM and Tryptophan (Cyclops, Turner Designs): referred to as Cyclops C and Cyclops T, correspondently. Cyclops C probe fluorescence was linked to terrestrially-delivered NOM. Cyclops T represented microbially-delivered NOM. Probes were installed at two sampling points at a coagulation/membrane filtration treatment plant, measuring raw water and treated water over one month. Probe and sampling point specific temperature and inner filter effect correction factors were calculated and applied to all fluorescence data. Since the observed turbidity was lower than 5 FNU, the effect of turbidity was considered to be insignificant (Downing et al., 2012) and turbidity correction was not applied.
Results and Conclusions

- Fluorescence intensity measured by Cyclops C had a significant correlation with DOC concentration and therefore, could be used to monitor DOC concentrations in raw water and treated water.

- Fluorescence changes corresponded to water quality changes and operational conditions (Figure 1) enabling NOM characterisation.

- It was demonstrated that fluorescence can be monitored real-time and in-situ.

![Figure 1](image)

**Figure 1** Fluorescence intensity in raw water and treated water for: (a) Cyclops C and (b) Cyclops T probes

References