

HPSEC Application as a New Indicator of Nitrification Occurrence in Water Distribution Systems

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Abstract : In recent years, chloramine has been widely used for both primary and secondary disinfection. However, a major concern with the use of chloramine as a secondary disinfectant is the decay of chloramine and nitrification occurrence. The management of chloramine decay and the prevention of nitrification are critical for water utilities managing chloraminated drinking water distribution systems. The detection and monitoring of nitrification episodes is usually carried out through measuring certain water quality parameters, which are commonly referred to as indicators of nitrification. The approach taken in this study was to collect water samples from different sites throughout a drinking water distribution systems, Tailem Bend – Keith (TBK) in South Australia, and analyse the samples by high performance size exclusion chromatography (HPSEC). We investigated potential association between the water qualities from HPSEC analysis with chloramine decay and/or nitrification occurrence. MATLAB 8.4 was used for data processing of HPSEC data and chloramine decay. An increase in the absorbance signal of HPSEC profiles at $\lambda=230$ nm between apparent molecular weights of 200 to 1000 Da was observed at sampling sites that experienced rapid chloramine decay and nitrification while its absorbance signal of HPSEC profiles at $\lambda=254$ nm decreased. An increase in absorbance at $\lambda=230$ nm and AMW < 500 Da was detected for Raukkan CT (R.C.T), a location that experienced nitrification and had significantly lower chloramine residual (<0.1 mg/L). This increase in absorbance was not detected in other sites that did not experience nitrification. Moreover, the UV absorbance at 254 nm of the HPSEC spectra was lower at R.C.T. than other sites. In this study, a chloramine residual index (C.R.I) was introduced as a new indicator of chloramine decay and nitrification occurrence, and is defined based on the ratio of area underneath the HPSEC spectra at two different wavelengths of 230 and 254 nm. The C.R.I index is able to indicate DS sites that experienced nitrification and rapid chloramine loss. This index could be useful for water treatment and distribution system managers to know if nitrification is occurring at a specific location in water distribution systems.

Keywords : nitrification, HPSEC, chloramine decay, chloramine residual index

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