Application of ion chromatography in drinking water analysis

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Foreword

Water is the source of life. We must make all people satisfied (adequate, safe and easy to get) water supply. Improving access to safe drinking water can bring tangible benefits to public health, and every effort should be made to ensure the safe use of drinking water. The World Health Organization (WHO) has also formulated the "Drinking Water Quality Guidelines" on the safety of drinking water, in which substances affecting human health in drinking water are described and explained which is also our benchmark for ensuring the safety of drinking water.According to the investigation, hundreds of chemical substances have been identified in drinking water, some of which are disinfection by-products, such as bromate, chlorite, chlorate, and other inorganic anions, such as fluoride, chloride, nitrite, nitrate and so on.

Ion chromatography is the preferred method for the analysis of ionic compounds. After more than 30 years of development, ion chromatography has become an indispensable detection equipment for water quality detection. Ion chromatography is also used as an important method to detect fluoride, nitrite, bromate and other substances in the Drinking Water Quality Guidelines.

1.Determination of cations from drinking water

According to ISO 14911:1998,soluble cations such as Li^+，Na^+，$NH4^+$，K^+，Ca^{2+}，Mg^{2+} in water can be detected.

IC determination conditions:

- Analysis column:SH-CC-3
- Guard column:SH-G-1
- Eluent: 5.0mM Methanesulfonic acid(MSA),prepare by hand or by eluent generator with methanesulfonic acid eluent.
- Suppressor：Cation suppressor(Self-regenerating electrolytic micro-Membrane suppressor)
- Detector:Conductivity detector

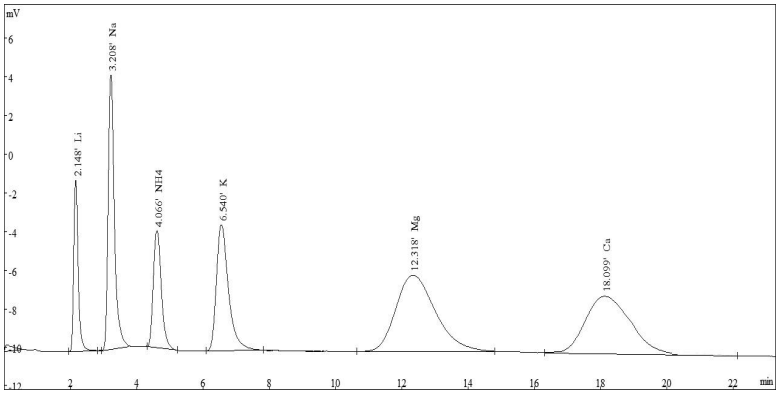

Figure 1 Spectrogram of cation analysis column (SH-CC-3)

2.Determination of conventional anions in drinking water

According to EPA 300.0 and the appendix A method of EPA 300.1, 7 kinds of anions such as F^-、Cl^-、NO_2^-、Br^-、NO_3^-、PO_4^{3-}、SO_4^{2-} in drinking water can be detected.

IC determination conditions

- Analysis column：SH-AC-4
- Guard column：SH-G-1
- Eluent：2.0 mMNa_2CO_3 /10.0 mM$NaHCO_3$
- Suppressor：Anion suppressor(Self-regenerating electrolytic micro-Membrane suppressor)
- Detector:Conductivity detector

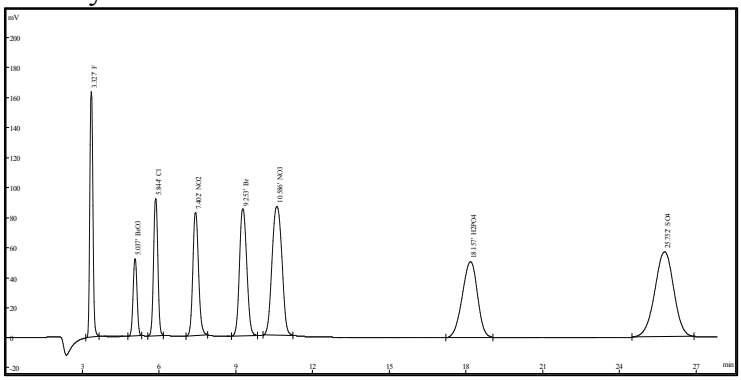

Figure 2 Spectrogram of anion analysis column (SH-AC-4)

3.Determination of disinfection by-products in drinking water

Chlorine dioxide is a common disinfectant which has a high killing effect on microorganisms in water.But using chlorine dioxide to disinfect can produce disinfection by-products such as chlorate and chlorite which cause hemolytic anemia and other diseases in animals.Bromate is a disinfection by-product produced when ozone is used to disinfect drinking water.Due to the carcinogenic effect of bromate, governments and international organizations have paid great attention to the toxicity of bromate.The maximum allowable concentration of chlorite and chlorate in EPA is 1000μg/L, and the maximum allowable concentration of BrO_3^-in drinking water is 10 μg/L.The “Drinking Water Quality Guidelines”(4th edition) which WHO published in 2014 stipulates that the chlorite and chlorate targets are 0.7mg/L and BrO_3^- target is 25μg/L.

According to the appendix B method of EPA 300.1,4 kinds of disinfection by-products including ClO_2^-, ClO_3^-, BrO_3^-, Br^- in drinking water can be detected.

IC determination conditions

- Analysis column：SH-AC-3
- Guard column：SH-G-1
- Eluent：2.0 mMNa_2CO_3 /8.0 mM$NaHCO_3$
- Suppressor： Anion suppressor(Self-regenerating electrolytic micro-Membrane suppressor)
- Detector:Conductivity detector

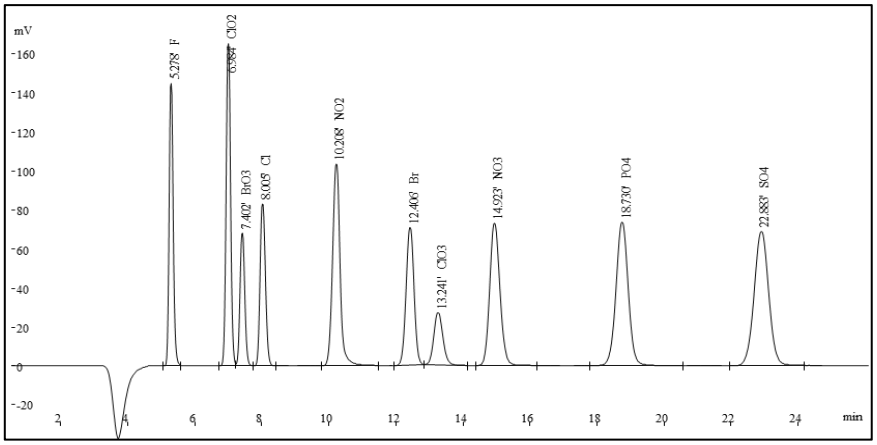

Figure 3 Spectrogram of anion analysis column (SH-AC-3)