A/ Isotachophoretic determination of nitrates and sulphates in the drinking water

The requirements on the quality of drinking water are given by the regulation of European Union 98/83/ES.

The content of the anorganic anions in drinking, surface, mineral and waste water is the concentration range from tenths to tens milligrams per liter. Chlorides, nitrates and sulphates are present in surface and mineral water in thousand-fold excess than nitrites, fluorides and phosphates.

Isotachophoretic determination of nitrates and sulphates represents the separation of monovalent and divalent acid. We can perform the separation due to the increased retardation effect of Mg^{2+}on sulphates. Mg^{2+} (co-counterion of leading electrolyte), thanks to its electrophoretic and relaxation effect, decreases the mobility of the sulphates more than the mobility of nitrates.

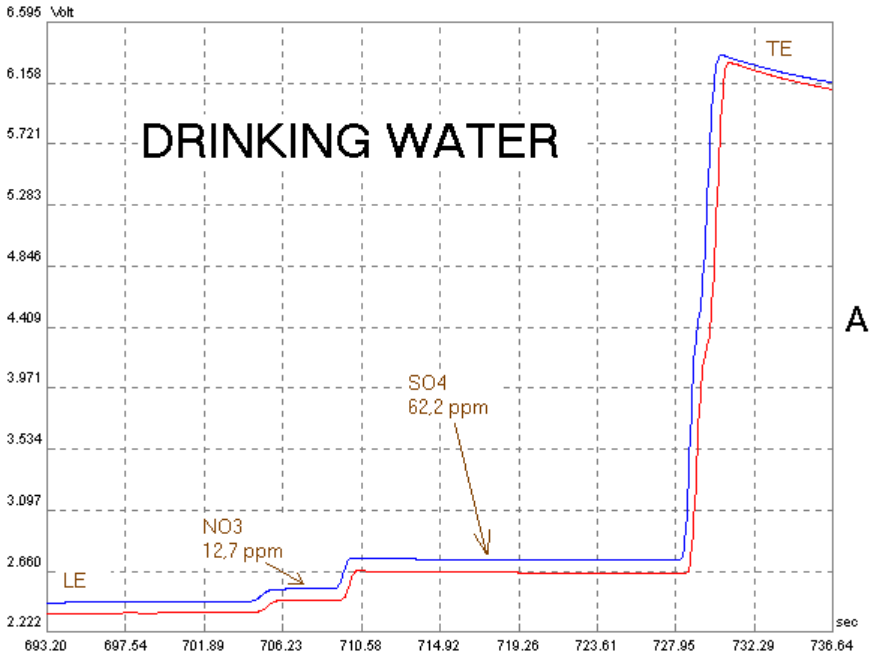


Figure 1.2.9. ITP analysis of nitrates and sulphates in the drinking water.

Chemicals.

The standard solution of KNO_3 (100 mg/l).

The standard solution of K_2SO_4 (100 mg/l).

Leading electrolyte (LE): hydrochloric acid (6 mmol/l); histidin (12 mmol/l); $MgCl_2.6H_2O$ (2 mmol/l); hydroxyethylcellulose (0.1%), pH 6.2

Terminating electrolyte (TE): citric acid (5 mmol/l).

Demineralized water.

Separation conditions.

column – 0.8 mm (ID), the length – 90 mm

separating current - 250 μA

injected volume – 30 μl

Leading electrolyte (LE)		**Terminating electrolyte (TE)**	
Leading anion	Cl^-	Terminating anion	citrate
Concentration (mmol/l)	6	Concentration (mmol/l)	5
Counter ion	HIS	Counter ion	H^+
Concentration (mmol/l)	12		
Co-counter ion	Mg^{2+}		
Concentration (mmol/l)	2		
additive	HEC		
Concentration (%)	0.1		
pH	6.2		

HIS – histidine, HEC – hydroxyethylcellulose

Procedure.

Preparation of the calibration solutions.

Measure by the byrette 5, 10, 20, 30 and 40 ml of the standard solution of KNO_3 into the 50 ml volumetric flasks and fill it with demineralized water up to the mark. In the same way, prepare the solutions of K_2SO_4.

Measurement of the calibration curve.

Inject the calibration solutions into the analyser and run the analysis. Measure the zone length of the calibration solutions and make the calibration curve (dependence of the zone length on the concentration) for the both components – nitrates and sulphates.

Determination of the nitrates and sulphates in the drinking water.

We analyze the samples of drinking water undiluted (surface, waste and mineral water defined diluted). Inject the sample into the analyser and run the analysis. Measure the zone length of the nitrates and sulphates, respectively, and from the calibration curves determine their content in the sample.

B/ Isotachophoretic determination of amino acids in the infusion solutions

Amino acids are compounds the body produces when breaking down ingested protein. The body uses these essential amino acids to carry out various key functions needed to maintain optimal body functions. Amino acid injection infused by peripheral vein infusion is indicated as a source of nitrogen in the nutritional support of patients with adequate stores of body fat, in whom, for short periods, oral nutrition cannot be tolerated, is undesirable, or inadequate.
Lysine plays an important role in muscle building throughout the body, helps to maintain bone health and strength, improves wound healing and it may also help reduce anxiety.
Histidine helps to facilitate growth, the creation of blood cells and tissue repair. It has also been found to be helpful with rheumatoid arthritis.
Glutamic acid is an amino acid used to form proteins. In the body it turns into glutamate, a chemical that helps nerve cells in the brain send and receive information from other cells. It may be involved in learning and memory.
Aspartic acid helps every cell in the body work. Aspartic acid is one of the building-block amino acids that are responsible for synthesizing proteins and regulating hormones in the human body.

Chemicals.
Separation of acidic amino acids.
The standard solution of glutamic acid (100 mg/l).
The standard solution of aspartic acid (100 mg/l).
Leading electrolyte (LE1): acetic acid (10 mmol/l); histidine (20 mmol/l); hydroxyethylcellulose (0.1%), pH 5.8
Terminating electrolyte (TE1): MES (5 mmol/l), pH 4.2.
Demineralized water.

Separation of basic amino acids.
The standard solution of lysine (100 mg/l).
The standard solution of histidine (100 mg/l).
Leading electrolyte (LE2): potassium acetate (10 mmol/l); acetic acid (20 mmol/l); hydroxyethylcellulose (0.1%), pH 4.0
Terminating electrolyte (TE2): BALA (10 mmol/l).
Demineralized water.

Separation conditions.
column – 0.8 mm (ID), the length – 90 mm
separating current - 250 μA
injected volume – 30 μl

Separation of acidic amino acids.

Leading electrolyte (LE1)		**Terminating electrolyte (TE1)**	
Leading anion	acetate	Terminating anion	MES
Concentration (mmol/l)	10	Concentration (mmol/l)	5
Counter ion	HIS	pH	4.2
Concentration (mmol/l)	20		
additive	HEC		
Concentration (%)	0.1		
pH	5.8		

MES – 4-morpholineethanesulfonic acid, HIS – histidine, HEC – hydroxyethylcellulose

Separation of basic amino acids.

Leading electrolyte (LE2)		**Terminating electrolyte (TE2)**	
Leading cation	K^+	Terminating cation	BALA
Concentration (mmol/l)	10	Concentration (mmol/l)	10
Counter ion	acetate		
Concentration (mmol/l)	20		
additive	HEC		
Concentration (%)	0.1		
pH	4.0		

BALA – beta-alanine, HEC – hydroxyethylcellulose

Procedure.

Preparation of the calibration solutions.

Measure by the byrette 2, 3, 6 and 8 ml of the standard solution of aminoacids into the 10 ml volumetric flasks and fill it with demineralized water up to the mark.

Measurement of the calibration curve.

Inject the calibration solutions into the analyser and run the analysis. Measure the zone length of the calibration solutions and make the calibration curve (dependence of the zone length on the concentration).

Determination of the aminoacids in the infusion solution.

We analyse the samples of injection solutions undiluted. Inject the sample into the analyser and run the analysis. Measure the zone length of the particular amino acids and from the calibration curves determine their content in the sample.