ANALYTICAL EQUIPMENT
LUMEX

DETERMINATION OF ALUMINIUM CONTENT IN WATER SAMPLES BY FLUOROMETRIC METHOD

INTRODUCTION

The method is designed to measure mass concentration of aluminum in samples of natural, drinking and waste water by fluorometric method using the FLUORAT®-02 analyzer.

MEASUREMENT METHOD

The measurement method is based on interaction of aluminum ions with lumogallion in the acetate buffer medium (pH 4.6–4.9). In the presence of a masking agent, ascorbic acid, this reaction results in formation of a fluorescent complex and is followed by determination of aluminum concentration using the FLUORAT®-02 analyzer.

CONCENTRATION RANGES

The range of measured concentrations in samples of natural, drinking and waste water is **0.01–5.0 mg/ml**. The table gives acceptable contents of other ions.

Ions	**Maximum content, mg/l**
Phosphates	Up to 100
Fluorides	Up to 5
Ammonium, alkaline and alkaline-earth elements	Up to 1
Iron	Up to 2
Copper	Up to 0.1
Lead	Up to 10
Chromium	Up to 0.5
Zinc	Up to 10

In the case of larger content of interfering agents, it may be necessary to use another method.

EQUIPMENT AND REAGENTS

The following equipment and reagents are used for measuring:

- FLUORAT®-02 Analyzer
- Certified aluminum ion solution with a mass concentration of 1 g/l
- Distilled water
- 36% Hydrochloric acid UPG
- Sodium acetate trihydrate, UPG
- Acetic acid UPG
- Lumogallion, UPG
- Ascorbic acid
- 66% Nitric acid UPG
- 30% Hydrogen peroxide solution (non-stabilized) UPG

PREOPERATIONAL PROCEDURES

Prior to measurements, the following preparation procedures are required: collection and conservation of the sample, preparation of solutions for calibration of the analyzer and calibration of the FLUORAT®-02 analyzer.

Sample collection

Polyethylene or PTFE containers are used for storage and transportation of samples. The sample volume should be 100 ml.
During general aluminum determination procedure, the sample is conserved by addition of concentrated hydrochloric acid (1 ml for 1 l of the sample), kept for 8–12 hours and filtered through “blue ribbon” dry filter (Whatman No 44 or S&S No 589 Blue Ribbon) or membrane filters with pore size of 0.45 μm. The first quarter of the filterate should be discarded.

Calibration of the device

Calibration of the device is performed for analysis of each set of samples by measuring fluorescence signals of standard solutions with known aluminum content (0.0 and 0.1 mg/l). Solutions with known content of aluminum ions are mixed with solutions of ascorbic acid (2 g/ml), lumogallion (0.25 mmol/l), acetate buffer (pH 4.6–4.9) and distilled water in proportion 4:1:2:2:1. The luminesncence rate is measured in 45 minutes.

Sample processing

The sample volume should be 10 ml. When analyzing drinking and natural, as well as some kinds of purified waste water, an aliquot portion of the conserved and filtered sample is boiled for 15 minutes, cooled and mixed with reagents the same way as in standard solutions procedures.
For measurements of aluminum levels exceeding 1.0 ml, the prepared sample is diluted so that the aluminum concentration in the diluted sample be between 0.2 and 0.8 mg/l.
If a complex organic matrix is present in the sample, it should be diluted with bi-distilled water 10 times. The diluted sample is analyzed, and the obtained result is verified by an addition.

EXAMPLE OF REAL ANALYSIS

Calibration diagram

Aluminum (FLUORAT®-02-3M)

C	J
0.00	0.0728
0.10	0.2994

Measurement results:

Sample	Content, mg/l		
	Sample	Additive	Sample with additive
The Viatka river, within the city limits of Kirov city	0.084	0.100	0.174
Drinking water, Novy Urengoy city	0.001	0.050	0.051
Automobile facility sewer, Stavrovo	0.014	0.020	0.031
Kovdorsky State Purification Facility	0.009	0.020	0.026
Purified sewer of perfumery (St Petersburg), diluted 10 times	0.233	0.200	0.455

The contents on this paper are subject to change without notice.