



## MEASURING CONTENT OF THE ELEMENTS (Ag, Al, As, Ba, Be, Cd, Co, Cr, Cu, Fe, Li, Mn, Mo, Ni, Pb, Se, Sn, Sr, Ti, V, Zn) IN THE SAMPLES OF NATURAL AND WASTE WATERS

### INTRODUCTION

This analytical procedure is intended for measuring the content of the elements (aluminium, silver, arsenic, barium, beryllium, cadmium, cobalt, manganese, copper, lithium, ferrum, nickel, molybdenum, lead, tin, chromium, selenium, strontium, titanium, zinc, and vanadium) in natural and waste water samples by atomic absorption spectrometry using an "MGA-915M" Graphite Furnace AA Spectrometer.

### MEASUREMENT METHOD

The method is based on measuring resonance radiation absorption that occurs when the radiation passes through a layer of atomic vapor in the electrically heated graphite furnace of the "MGA-915M" AA spectrometer. The concentration of the elements is determined from the integrated analytical signal and is calculated using a preset calibration graph.

### MEASUREMENT RANGE

Measurement ranges (with dilution) are listed in the table below.

Element	Measurement range, µg/l	Element	Measurement range, µg/l
Ag	5 – 500	Mn	1 – 1000
Al	20 – 10000	Mo	1 – 400
As*	5 – 1000	Ni	5 – 1000
Ba*	25 – 8000	Pb	2 – 1000
Be	0.1 – 5	Se	2 – 200
Cd	0.1 – 20	Sn	20 – 200
Co	0.5 – 1000	Sr	1 – 70000
Cr	5 – 1000	Ti	20 – 1000
Cu	0.5 – 1000	V	10 – 1000
Fe (372 nm)	50 – 10000	Zn (213.9 nm) (307.6 nm)	5 – 100 100 – 10000
Li*	1 – 100		

Measured using "MGA-915MD" spectrometer with a PMT for extended wavelength range for determination of As, Ba, and Li.

The mineral content of the sample should be not more than 5 g/l.

### EQUIPMENT AND REAGENTS

The following equipment and reagents are used in measurements:

- "MGA-915M" Atomic Absorption Spectrometer
- SRM for the ionic composition of a solution of analyzed elements
- Bidistilled or deionized water
- Concentrated sulfuric acid, reagent grade
- Concentrated nitric acid, high purity grade
- Hydrogen peroxide (30%), high purity grade
- 10-100 µL dispenser (e.g., «Biohit»).



#### PREOPERATIONAL PROCEDURES

The following procedures should be carried out to prepare for measurements: sampling and sample pretreatment, preparation of chemical glassware, preparation of ancillary and calibration solutions, preparation of the graphite furnace, rapid check-up of the quality of bidistilled water, calibration of the spectrometer and check-up of the calibration characteristic.

Soil and bottom sediment samples are taken according to standard sampling techniques.

The volume of the sample should be not less than 250 ml.

For determination of **soluble forms** of the elements the samples are filtered on the sampling site through a diaphragm filter with 0.45  $\mu\text{m}$  pore diameter or through a paper "blue ribbon" filter and acidified with concentrated nitric acid solution ratio being 3 ml of acid for 1l of water. Determination of concentration of the elements is made directly in this sample.

For determination of **total content** of the elements the non-filtered sample is acidified in the same way as described earlier. Then the two aliquot portions of the sample of 50 ml volume with addition of the concentrated nitric acid and hydrogen peroxide are heated on the oven (but not boiled) for two hours.

Then pretreated samples are filtered through "blue ribbon" filter and the concentration of the elements are determined.

Calibration of the instrument is performed according to the Operation Manual for "MGA-915M" Spectrometer.

#### MEASUREMENT PROCEDURES

Depending on the expected concentrations of the elements, 10 to 40  $\mu\text{L}$  of the analyzed sample is injected into the graphite furnace of the atomizer by a dispenser, and the measurement is made according to a selected operating mode.

All the measurements are performed according to the Operation Manual for "MGA-915M" Spectrometer.

Measurement data are processed and a user friendly measurement report is compiled by dedicated software included in the delivery set.

The information in this leaflet is supplemental. To get more specific information on this method, please contact the developer of this method LUMEX Ltd.

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