DIRECT AA MERCURY DETERMINATION IN TISSUES AND BIOSAMPLES

INTRODUCTION

Mercury and its compounds are highly toxic substances for humans. It occurs naturally and exists in various forms: *elemental* (or metallic); *inorganic* (e.g. mercuric chloride); and *organic* (e.g., methyl- and ethylmercury). These forms all have different toxicities and implications for health.

Among naturally occurring mercury compounds, methylmercury exerts a significant influence (neurotoxic action) on human health. The toxic properties of methylmercury are caused by the ability of its ions to bond with sulfhydryl groups of proteins. This changes proteins' structure and properties, resulting in disfunction of the protein metabolism and the course of enzymatic processes. Mercury exposure level is determined by analysis of blood, hair, nails and other biosamples. For an acute type of poisoning, the diagnosis is confirmed both by clinical presentation and by results of analysis of body fluids (urine, blood, saliva). In case of chronic poisoning the situation is complicated. Mercury concentration in urine may rapidly decrease after the termination of exposure to mercury, whereas it may be high in internal organs for a long time because mercury is prone to accumulate in liver, kidneys, spleen, brain, and hair. In this case, the analysis of hair provides more information about mercury concentration in the body because they hold the trapped mercury for much longer time. The use of atomic absorption **mercury analyzer RA-915M** with Zeeman background correction equipped with **PYRO-915**+ pyrolytic attachment provides direct mercury determination in biological samples at a ppb level.

MEASUREMENT METHOD

The measuring method is based on thermal atomization of mercury from a sample using a **PYRO-915+ attachment** and its consequent determination by flameless AAS with Zeeman background correction using a **RA-915M mercury analyzer**.

A sample is placed into the sample boat, which is inserted into the first chamber of the atomizer, where the sample is heated at a temperature of 200–800°C (depending on the selected operation mode). The mercury compounds are evaporated and partially dissociated, forming elemental mercury. All the gaseous products formed are transported into the second chamber of the atomizer by a carrier gas (ambient air). Mercury compounds are totally dissociated and the organic matrix of the sample is burnt out. Downstream from the atomizer the air flow enters the analytical cell heated up to 700°C, and the mercury atoms are detected by RA-915M analyzer.

This approach does not involve preconcentration on a gold trap and "cooling step", thereby eliminating ensuing problems. The use of ZAAS combined with a "dry" converter provides the highest sensitivity with no interferences from the sample matrix. Purified ambient air is used for combustion, so that no cylinders with oxidizer or compressed gases and "clean room" environment are required.

The total time needed for determination of mercury is not longer than 2 minutes.

MEASUREMENT RANGE

Sample	Sample weight, mg	Measurement range, µg/kg
Hair	5–50	0.5–500
Nail	5–50	
Urine	50–200	
Skin	5–300	
Saliva	50–200	
Tissues	5–300	
Whole blood	50–200	

ANALYSIS FEATURES

- Sample digestion process with strong acids is not necessary.
- Sample homogenization is enough as sample preparation.
- Control of non-selective absorption during the measurement process allows optimizing of sample weight and reduces analysis errors.
- Rapid analysis.
- Low running cost (Needs no chemical reagent).
- SRMs with any matrix (both liquid and solid) can be used for calibration.

EQUIPMENT AND REAGENTS

The following equipment and materials are used for analysis:

- Mercury analyzer RA-915M with PYRO-915+ attachment;
- PC with Windows® XP/Vista/7/8 and RAPID software;
- SRM of mercury.

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

NORTH AMERICA
Lumex Instruments Canada
0890278 B.C. Ltd.
E-mail: info@lumexinstruments.com
www.lumexinstruments.com

EUROPE
Lumex Analytics GmbH
E-mail: info@lumexanalytics.de
www.lumexanalytics.de

RUSSIA
Lumex-Marketing LLC
E-mail: sales@lumex.ru
www.lumexinstruments.com

CHINA
Beijing Lumex Analytical Equipment Co. Ltd.
E-mail: lumex@lumex.com.cn
www.lumexcn.com