

# RA-915 Series

Zeeman mercury analyzer



## Direct mercury determination in foodstuff and feed

### INTRODUCTION

The World Health Organization (WHO) lists mercury as one of the top ten chemicals that pose the greatest threat to public health. The main ways mercury enters the human body are ingestion with food and inhalation of mercury vapor.

Direct approach to mercury determination in food and feed is difficult due to complex organic matrix. That is why conventional AAS (atomic absorption spectroscopy) and AFS (atomic fluorescence spectroscopy) methods include sample digestion by acids and/or require compressed gases such as argon or oxygen. This makes analysis complicated, costly and time-consuming. Laborious sample pre-treatment also increases the measurement inaccuracy.

Lumex Instruments offers the procedure and instrumentation for rapid direct analysis without sample pre-treatment and intermediate steps. The RA-915 series mercury analyzers use thermal decomposition method and atomic absorption spectroscopy with Zeeman correction of the background absorption (ZAAS) that provides direct determination of the mercury concentration in foodstuff and feed and similar samples from ppb level. This allows to omit elaborate and time-consuming procedures of the sample preparation.

### MEASUREMENT METHOD

The sample is heated in the thermal decomposition chamber. The mercury compounds are evaporated and dissociated forming elemental mercury. All the gaseous products are transported into the heated analytical cell by Hg-free ambient air, and the mercury atoms are detected by ZAAS. This method does not involve intermediate preconcentration of mercury on a gold trap, thereby eliminating ensuing problems. Zeeman background correction provides the highest selectivity without interference from the sample matrix.

### ANALYTICAL CHARACTERISTICS

Object of analysis	Food, raw food, feed, fodder and raw materials for their production
Mass of homogenized sample	20–400 mg
Measurement range	2.0–5000 ppb
Measurement time	2 min

Using the Lumex Instruments technique, one can easily determine the content of mercury at a level below the MRL specified in such standards and directives as:

- CODEX STAN 193-1995 General standard for contaminants and toxins in food and feed;
- Commission Regulation (EU) 2023/915 Maximum levels for certain contaminants in food;
- Commission Regulation (EU) 2017/2229 Maximum levels for lead, mercury, melamine and deoquinatate;
- GB 2762-2022 National food safety standard – Maximum levels of contaminants in foods;
- GB 13078-2017 Hygienical standard for feeds;
- FSSAI Food Safety and Standards (Contaminants, Toxins and Residues) Regulation 2011;
- Australia New Zealand Food Standards Code – Schedule 19 – Maximum levels of Contaminants and Natural Toxicants;
- US FDA Guidance for Industry: Action Levels for Poisonous or Deleterious Substances in Human Food and Animal Feed;
- MERCOSUR/GMC/RES. Nº 12/11 Technical regulation on maximum residue levels of inorganic contaminants in foods;
- Argentine Food Code. Chapter III, Annex, pt. II.

## ANALYSIS FEATURES

- no sample pretreatment with wet chemistry;
- low limit of detection, high selectivity;
- wide dynamic measurement range;
- no amalgamation step;
- high analysis throughput (1–5 minutes per sample);
- no reagents and compressed gases required;
- low running cost;
- no memory effect;
- CRM of any matrix can be used for calibration and QA/QC.

## EQUIPMENT AND REAGENTS

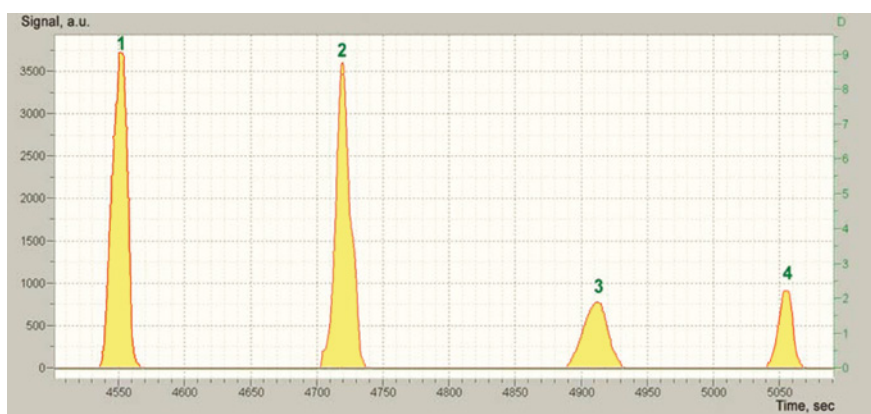
The following equipment and materials are used for analysis:

- RA-915 series mercury analyzer (RA-915 Lab, RA-915M combined with PYRO-915+ attachment, or RA-915F);
- PC with Windows® OS and RAPID software;
- any solid or liquid CRM of mercury;
- Lumex Instruments kit, order **No 0300003053**.

## EXAMPLES OF ANALYSIS

The validity of the Lumex Instruments method is proved by the agreement between the measured and certified concentrations in various standard complex-matrix samples.

Reference material	Mass, mg	Measured value, ppb	Certificate value, ppb	Deviation, %
BCR-150 (Dry milk)	52 / 96 / 109	8.4 / 7.9 / 7.9	9.4±1.7	-14
DORM-1 (Fish)	50 / 100	860 / 780	798±74	+4
BCR-184 (Meat)	29 / 59 / 100	2.3 / 2.5 / 3.1	2.6±0.6	0



Mercury determination in dried mushrooms (1), (2) and raw fish (3), (4):  
(1) and (2) – sample weights 43 and 48 mg, C(Hg) found 1426 and 1492 ppb;  
(3) and (4) – sample weights 121 and 85 mg, C(Hg) found 188.1 and 189.5 ppb.

## INSTRUMENTS FOR ANALYSIS



RA-915 Lab



RA-915M with PYRO-915+



RA-915F

## CVAAS METHODS

Using RA-915M mercury analyzer with the RP-92 attachment, it is possible to implement CVAAS method to quantify mercury in food, feed, and raw materials according to standard test methods, for example:

- AOAC Official method 971.21;
- EN 13806;
- EN 16277;
- Manual of methods of analysis of foods. FSSAI Lab. Manual 8: Metals.

