

DIRECT MERCURY DETERMINATION IN FOODSTUFF AND MIXED FEED

INTRODUCTION

Direct (without any pre-treatment) atomic absorption or atomic fluorescence mercury determination in food and feed is difficult due to complex organic matrix. That is the reason why conventional AFS and AAS methods include sample digestion by acids and require compressed gases such as argon or oxygen. This makes analysis more complicated and costly and extends analysis time. Sample pre-treatment can also increase measurement errors. The use of a **RA-915M/RA-915M+** mercury analyzer with a **PYRO-915+** pyrolytic attachment or **RA-915F** mercury analyzer provides direct mercury determination in foodstuff, food/feed products and similar samples at a ppb level thereby saving time due to elimination of the sample preparation stage.

MEASUREMENT METHOD

The principle of the method is based on the reduction of Hg(II) to the atomic state due to the thermal decomposition of the mercury compounds and the follow-up transporting of mercury atoms into the analytical cell of the analyzer by the air flow. The mercury concentration is then determined from the absorption of the 254-nm resonance radiation by mercury atoms measured using differential atomic absorption spectroscopy with Zeeman correction for background absorption.

ANALYTICAL CHARACTERISTICS

Mass of homogenized sample	20–400 mg
Measurement range of the mass concentration	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;
- EU Regulation (EC) No 1881/2006 Maximum levels for certain contaminants in foodstuffs;
- Commission Regulation (EU) 2017/2229 Maximum levels for lead, mercury, melamine and decaquinate;
- GB 2762-2017 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) Regulations 2011;
- Australia New Zealand Food Standards Code – Standard 1.4.1 – 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. № 12/11 Technical regulation on maximum residue levels of Inorganic contaminants in foods;
- Argentine Food Code. Chapter III.

ANALYSIS FEATURES

- Sample homogenization and weighing suffice for sample preparation.
- Control of the non-selective absorption during the measurement allows optimizing the sample weight and reduces analysis errors.
- Direct rapid analysis.
- The SRM of any composition (both liquid and solid) can be used for calibration and QA/QC.
- No need for cylinders with compressed oxygen or other carrier gas.
- Low running cost (needs no chemical reagents).

EQUIPMENT AND REAGENTS

The following equipment and materials are used for analysis:

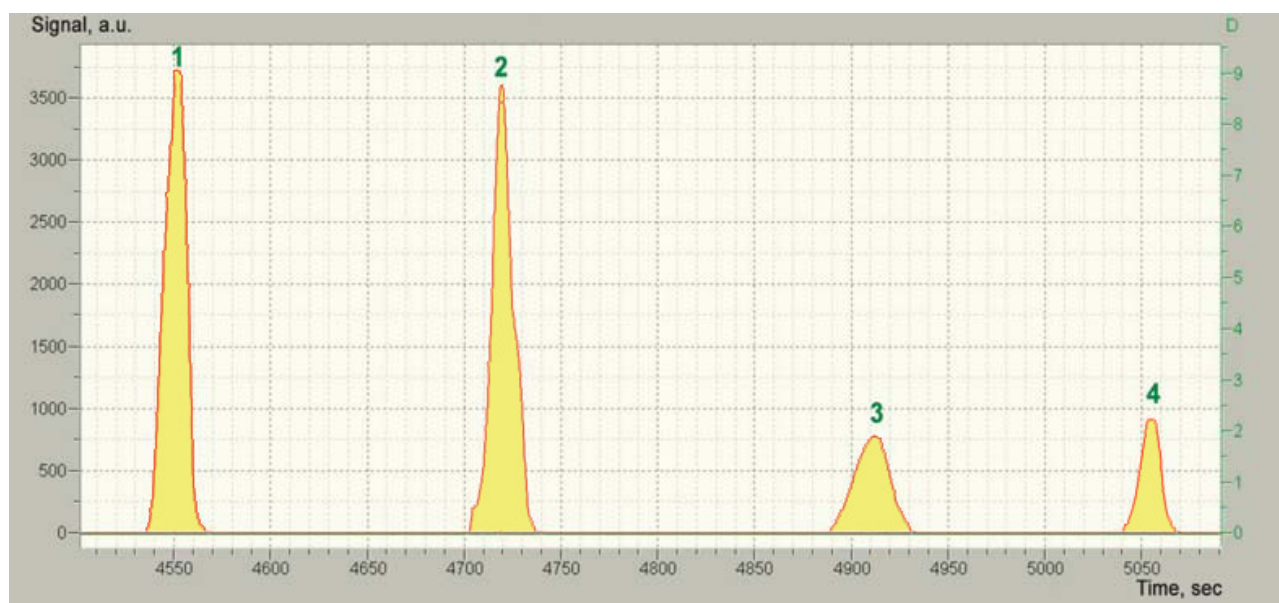
- Mercury analyzer RA-915M with PYRO-915+ attachment or RA-915F;
- PC with Windows® XP/Vista/7/8/10 and RAPID software;
- Lumex Instruments kit, order **No 0300003053**.



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 (Beef)	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.

CVAAS METHODS

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

- AOAC Official method 971.21 Mercury in food;
- EN 13806:2002 Foodstuffs – Determination of trace elements – Determination of mercury by cold-vapour atomic absorption spectrometry (CVAAS) after pressure digestion;
- EN 16277:2012 Animal feeding stuffs – Determination of mercury by cold-vapour atomic absorption spectrometry (CVAAS) after microwave pressure digestion (extraction with 65% nitric acid and 30% hydrogen peroxide);
- Manual of methods of analysis of foods. FSSAI Lab. Manual 8: Metals.

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To get more specific information, please contact the representative at sales@lumexinstruments.com