

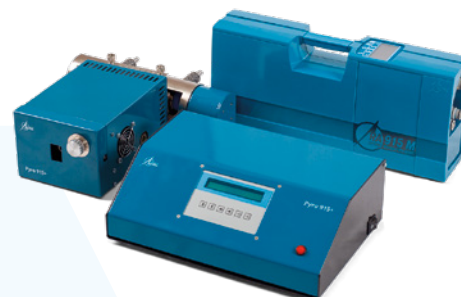
RA-915M

Zeeman mercury analyzer



Direct mercury determination in coal

ASTM D6722
EPA 7473



INTRODUCTION

Mercury is one of the most toxic trace elements naturally occurring in the coals. During coal combustion at the coal-fired plants mercury is released into the environment. In order to manage the stack gas cleaning process effectively, it is necessary to know the mercury content in the coal, as well as in stack gas, liquid, and solid wastes.

The use of **RA-915M mercury analyzer** combined with **PYRO-915+ thermal decomposition attachment** provides fast direct determination of mercury in coal without sample digestion and intermediate amalgamation/sorption steps.

Conventional methods of mercury determination in coal using atomic absorption spectrometry (ASTM D6414 and ISO 15237) involve preliminary digestion of the sample that takes from 0.5 to 8 hours depending on the digestion conditions, consuming significant amount of reagents.

Other procedures for coal analysis (ASTM D6722 and EPA 7473) involve thermal decomposition of the sample combined with amalgamation on a sorbent trap and catalytic conversion.

Lumex Instruments proposes the simplified procedure of direct analysis without sample digestion and amalgamation.

MEASUREMENT METHOD

This method for mercury determination in coal is based on the atomization of mercury contained in the sample in **PYRO-915+** attachment and subsequent mercury determination by differential atomic absorption spectroscopy in **RA-915M** mercury analyzer. Interference from the remaining impurity compounds is eliminated due to the high selectivity of **RA-915M** analyzer with Zeeman background correction.

ANALYSIS FEATURES

The proposed method of analysis by thermal decomposition shows the following advantages as compared to the common two-stage mercury determination (digestion + AAS or combustion + amalgamation + AAS):

- No laborious sample pretreatment with wet chemistry
- Direct mercury determination without preliminary accumulation on a gold /sorbent trap
- Low limit of detection, high selectivity
- Wide dynamic measurement range: more than 5 orders of magnitude
- No «memory» effect
- Monitoring of the nonselective absorption during measurements
- High analysis throughput (1–3 minutes per sample)
- No need for reagents and carrier gas
- Low running cost
- Calibration and QA/QC with the certified SRM of any composition
- Possibility of mercury thermospeciation (the gradual heating of the sample for detection of mercury thermospecies in coal)

MEASUREMENT RANGE

Detection limit: **1 ppb (1 µg/kg)**.

Upper limit of the measurement range: **500 ppm (500 mg/kg)**.

PREOPERATIONAL PROCEDURES

Sample preparation is done in accordance with the ISO 5069-2 standard; a 0.5–1-mm size fraction from a homogenized coal sample is taken for analysis.

MEASUREMENT PROCEDURE

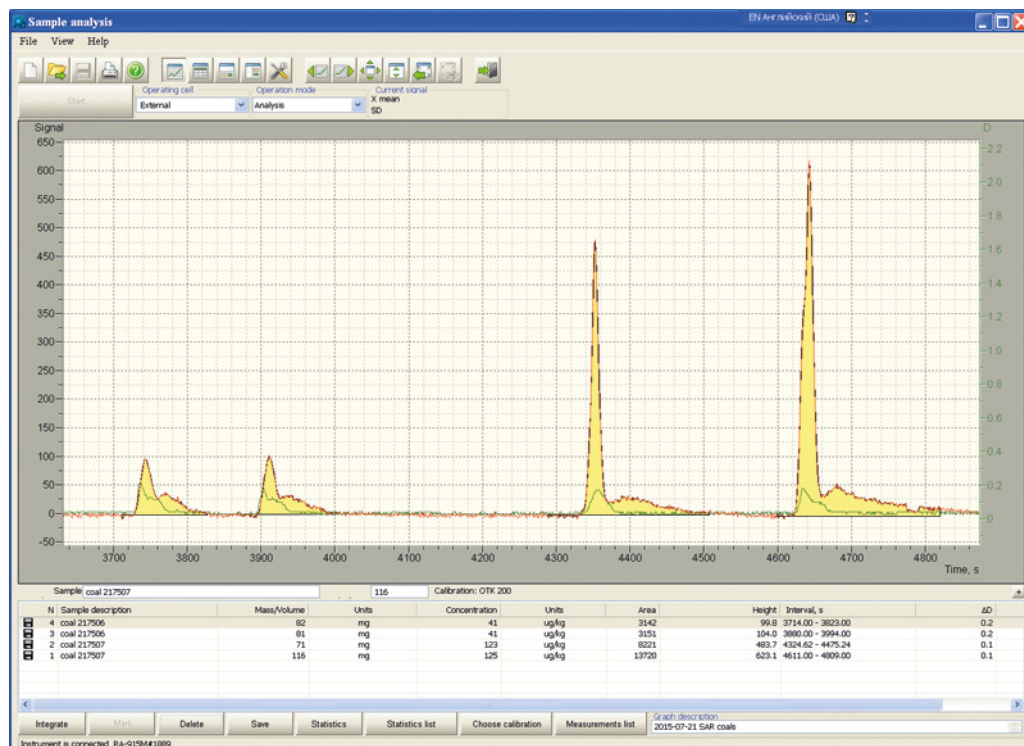
Depending on the expected concentration of mercury in the sample, an appropriate heating mode of the PYRO-915+ attachment is selected (either slow or fast heating). The homogenized coal sample (50–500 mg) is placed into a quartz dosing unit, then mercury is thermally atomized in PYRO-915+ attachment, and the concentration of mercury is measured by flameless Zeeman AAS with RA-915M mercury analyzer using a pre-established calibration. The analyzer is calibrated using a solid SRM or calibration solutions.

EQUIPMENT AND REAGENTS

The following equipment and materials are used for analysis:

- RA-915M mercury analyzer combined with PYRO-915+ attachment;
- PC with Windows® and RAPID software;
- any solid or liquid certified SRM of mercury;
- Lumex Instruments kit, order No 0300003293.

EXAMPLES OF ANALYSIS



Samples:

coal sample 217506 ($m_1 = 82$ mg, $C_1 = 41$ ppb; $m_2 = 81$ mg, $C_2 = 41$ ppb), $C_{av} = 41$, RSD = 0%

coal sample 217507 ($m_1 = 71$ mg, $C_1 = 123$ ppb; $m_2 = 116$ mg, $C_2 = 125$ ppb), $C_{av} = 124$, RSD = 1%

