



DETERMINATION OF THE MERCURY CONCENTRATION IN NAPHTHA

COMPLIANT WITH ASTM D7622-10(2015)

INTRODUCTION

The mercury concentration in crude oil and petroleum products can vary in a wide range of less than 0.1 ppb to dozens ppm. Direct mercury determination in crude oil and petroleum products at the range above 5 ppb is covered by **ASTM D7622-10(2015) "Standard test method for total mercury in crude oil using combustion and direct cold vapor atomic absorption method with Zeeman background correction"**. Mercury determination in naphtha and light petroleum products (condensate, gasoline and diesel fuel) at a level below 5 ppb is a vital problem for the oil refining and petrochemical industry. Complex organic matrix impedes conventional quantitative analysis for mercury.

MEASURING METHOD

The proposed method of direct mercury determination in naphtha, condensate, and light oil products is based on the atomization of mercury contained in the sample in a **PYRO-915+** attachment and subsequent mercury determination by flameless AAS with a mercury analyzer **RA-915M**.

At the mercury concentration **above 1–5 ppb ($\mu\text{g}/\text{kg}$)**, the analysis is made directly without any sample preparation and mercury accumulation on a sorbent. The sample of 50–200 μl is sufficient for mercury determination in a range of **5 ppb to 100 ppm**. The analysis takes 1–2 min.

If the mercury concentration is **below 1–5 ppb**, a preconcentration step is required. Mercury is extracted to a special solid sorbent from a sample of 1–5 ml that reduces the limit of detection down to **0.02 ppb**. The analysis takes 5–6 min.

ANALYSIS FEATURES

- Simple measurement procedure and user-friendly interface
- No sample preparation is necessary in the case of mercury concentration above 1–5 ppb.
- Preconcentration from a 1–5 ml sample is required for mercury determination at a sub-ppb level.
- Very fast analysis taking from 1 to 5 min.
- Wide dynamic measurement range, no "memory effect".
- The SRM of any composition can be used for calibration and validation of composition.
- The calibration coefficient has long-term (months) stability
- Control of the non-selective absorption during the measurement process excludes analysis errors.
- Visualization of the mercury release from the sample via a user-friendly computer interface.
- No need for cylinders with compressed oxygen or other carrier gas.
- Low running cost.

ANALYTICAL CHARACTERISTICS

	Direct Analysis	Preconcentration
Sample composition	crude oil, condensate, naphtha, gasoline, diesel fuel, lubricants, etc.	condensate, naphtha, gasoline, diesel fuel
Sample volume	20–200 μl	1–5 ml
Detection limit	1–5 ppb	0.1 ppb
Upper limit of the measurement range	10,000 ppb	20 ppb
Measurement time	1–2 min	5–6 min

EQUIPMENT AND REAGENTS

The following equipment and materials are used for analysis:

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

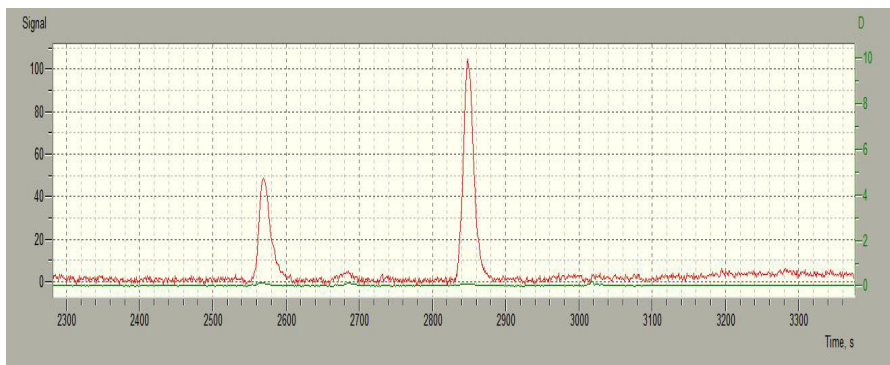




EXAMPLES OF ANALYSIS

Measuring mercury concentration in naphtha using the preconcentration step.

	Sample weight, mg	C, ppb
1	2537	0.70
2	2679	0.77
3	1447	0.72
4	3906	0.74
5	1855	0.79
6	2137	0.78
7	3106	0.72
8	3034	0.70
9	1743	0.68
10	3717	0.70
Cav, ppb		0.730
SD		0.037
RSD, %		5.1



1 – sample weight 1.45 g; (measured value is 0.72 $\mu\text{g}/\text{kg}$)

2 – sample weight 3.03 g; (measured value is 0.70 $\mu\text{g}/\text{kg}$)

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

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