

## DETERMINATION OF THE MERCURY CONCENTRATION IN NAPHTHA

COMPLIANT WITH ASTM D7622-10(2015) AND UOP-938-10 METHODS

### 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  $\mu\text{l}$  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
<b>Sample composition</b>	crude oil, condensate, naphtha, gasoline, diesel fuel, lubricants, etc.	condensate, naphtha, gasoline, diesel fuel
<b>Sample volume</b>	20–200 $\mu\text{l}$	1–5 ml
<b>Detection limit</b>	1–5 ppb	0.02 ppb
<b>Upper limit of the measurement range</b>	100,000 ppb	100 ppb
<b>Measurement time</b>	1–2 min	5–6 min

### EQUIPMENT AND REAGENTS

The following equipment and materials are used for analysis:

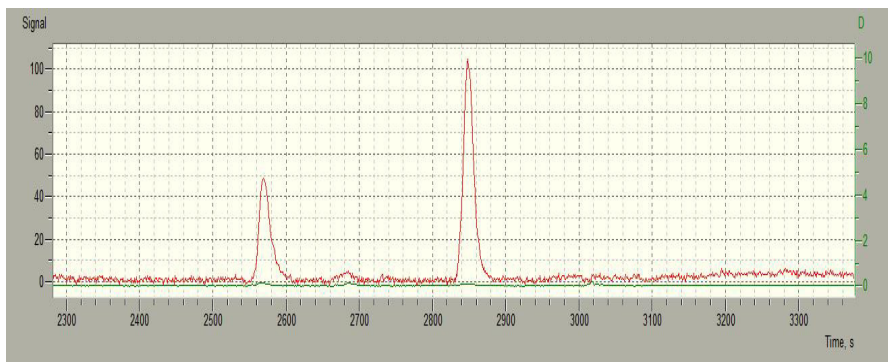
- Mercury analyzer RA-915M or RA-915+ with PYRO-915+ attachment;
- PC with Windows® XP/Vista/7/8 and RAPID software;
- Any certified SRM of mercury;
- Set for mercury preconcentration.



## 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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