

DIRECT AA MERCURY DETERMINATION IN COSMETICS

INTRODUCTION

High mercury concentration can be found in such cosmetic products as skin lightening soaps and creams, makeup cleansing products, and mascara.

Mercury in cosmetics exists as inorganic and organic compounds. Inorganic mercury (e.g. ammoniated mercury) is used in skin lightening soaps and creams. Organic mercury compounds, such as thiomersal, are used as cosmetic preservatives in makeup cleansing products and mascara.

The European Union Directive (EU Regulation 1223/2009) specifies that mercury compounds are not allowed as ingredients in cosmetics (including soaps, lotions, shampoos and skin bleaching products). However, phenyl mercuric salts for use as a preservative in eye makeup and eye makeup removal products are allowed at concentrations equal to or less than 0.007% by weight. The United States FDA (21 CFR Part 700 Subpart B: Requirements for Specific Cosmetic Products - Section 700.13) allows mercury compounds in eye makeup at concentrations at or below 65 mg/kg expressed as mercury. All other cosmetics must contain mercury at a concentration of less than 1 mg/kg.

MEASURING METHOD

The measuring method is based on the direct thermal decomposition of a sample using a PYRO-915+ attachment and its consequent determination by flameless AAS with Zeeman background correction using a RA-915M/RA-915+ mercury analyzer.

A sample is placed into the sample boat, which is inserted into the first chamber of the atomizer, where the sample is heated at a temperature of 200–800°C depending on the selected operation mode of the PYRO-915+ attachment. The mercury compounds are evaporated and partially dissociated, forming elemental mercury. All the gaseous products formed are transported into the second chamber of the atomizer by a carrier gas (ambient air). Mercury compounds are totally dissociated and the organic matrix of the sample is burnt out. Downstream from the atomizer the air flow enters the analytical cell heated up to 700°C, and the mercury atoms are detected by the RA-915M analyzer.

This approach does not involve preconcentration on a gold trap and “cooling step”, thereby eliminating ensuing problems. The use of ZAAS combined with a “dry” converter provides the highest sensitivity with no interferences from the sample matrix. The ambient air is used as a carrier gas, so that no cylinders with oxygen, argon, or other compressed gases are required.

Total time needed for determination of mercury is not longer than 2 minutes.

MEASUREMENT RANGE

The measurement range of the mass concentration of total mercury is **0.001–300 mg/kg** (weight of sample is **10–200 mg**, analyzed using heating Mode 3).

ANALYSIS FEATURES

- Rapid direct determination of total mercury without any sample preparation.
- No sample pre-treatment, no gold traps and/or compressed gases provide very low operating costs.
- Control of non-selective absorption during the measurement process excludes analysis errors.
- Low limit of detection, wide dynamic range of measurements.
- Simple measurement procedure and user-friendly interface enable operation by lab personnel after a short training.
- Long-term calibration stability; SRMs with any matrix (both liquid and solid) can be used for calibration and validation.

EQUIPMENT AND REAGENTS

The following equipment and materials are used for analysis:

- Mercury analyzer RA-915M (RA-915+) with PYRO-915+ attachment;
- PC with Windows® XP/Vista/7/8/10 and RAPID software;
- SRM of mercury;

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

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