Direct Thermal Decomposition Mercury Analyzer with Extended Range Triple-Detectors
Sequential Dual-Cells Optics for Pure Performance
Objective of Mercury Analysis --- Ease, Fast and Precise!

With world’s growing industrialization, it is inevitable to environmental pollutions. Therefore, environmental laws, permits and legislations are in place and getting ever more stringent. Mercury, being one of the most toxic and polluting metals, has been strictly monitored and controlled in various areas including environmental (water, waste and air), foods (fish, baby products & etc), commercial (cosmetics, plastics & etc) and many more. With such increase demands of mercury analysis in all kinds of sample matrices, new and improved analytical technologies and techniques are clearly needed to meet such requirements of EASE OF USE: AUTOMATION; SENSITIVITY & PRECISION; INTERFERENCE-FREE.

NIC MA-3000 is a dedicated mercury analyzer which focuses on superlative thermal decomposition, gold amalgamation, cold vapor atomic absorption spectroscopy detection, on virtually any sample matrix - solid, liquid, and gas, enable quick results without any tedious, time-consuming and elaborate sample preparation process. Running cost is reduced as no wet reagents are needed, and less sample re-run with most errors mostly incur during sample preparation. Technique is in compliance with USEPA 7473, ASTM D-6722-01, D-7623-10 test methods. MA-3000 unique dual-cell detector (Patent-pending) design achieves ultra dynamic wide-range with high-precision measurement, without any spectral-interference from low concentration to high concentration range. In addition, the new combustion tube (Patented 5001419) with robust catalysts extends the running life especially with better tolerance to difficult matrices (containing Halogenated and Selenium compounds). Seamless integrated 100-positions auto sampler accomplishes economical efficiency, operational labor saving and laboratory productivity with unmatched versatility. It is a perfect solution to today’s increasing laboratory demand for easily, fast, accurate detection and analysis.

Selective Option Attachments - Multi-Configurable

MA-3000 is available to equip with attachment accessories for Reduction Vaporization / Gas Tube Desorption analysis, allowing a single analyzer for multiple analytical techniques. Reduction vaporization attachment has options for automatic unit (reagent dispenser and auto sample changer) or manual unit for economical saving.
Ultra-Dynamic Extended-Range Detector with Uncompromised-Precision

The unique Dual-Cell Tri-Beam Detector achieves a seamless low to high concentration precise measurement range without cross-range interference seen in other competitive systems. Extended range of up to 70,000 ng (or up to 1000 ppm) measurement allows coverage of more types of applications and sample matrices, offering unmatched versatility.

Extending Analysis and Application to its Limit

The new concept combustion tube (Patented 5001419) with robust catalyst formulation extends analysis applications including samples of complicated matrices with halogens and high selenium, enabling low term stability, low operating cost and minimal maintenance.

Results of Standard Reference Materials

<table>
<thead>
<tr>
<th>Sample name</th>
<th>Certificated values (Total Hg)</th>
<th>N</th>
<th>AV (mg/kg)</th>
<th>CV (%)</th>
<th>Recovery</th>
</tr>
</thead>
<tbody>
<tr>
<td>Coal (NIST 1632c)</td>
<td>0.0901~0.0975 mg/kg</td>
<td>5</td>
<td>0.0954</td>
<td>2.8</td>
<td>99%</td>
</tr>
<tr>
<td>Dogfish liver (DOLT-4)</td>
<td>2.36~2.80 mg/kg</td>
<td>5</td>
<td>2.59</td>
<td>3.2</td>
<td>100%</td>
</tr>
</tbody>
</table>

Results of Difficult Samples

<table>
<thead>
<tr>
<th>Sample</th>
<th>Sample name</th>
<th>Sample size (mg)</th>
<th>Results</th>
<th>STD addition</th>
</tr>
</thead>
<tbody>
<tr>
<td>Salt</td>
<td>NaCl (for experiment)</td>
<td>190~220</td>
<td>3.81 μg/kg</td>
<td>5.3</td>
</tr>
<tr>
<td></td>
<td>High Se containing sample (Se is contained 34~48wt%)</td>
<td>50~60</td>
<td>0.0453 mg/kg</td>
<td>1.9 *NIST1515 0.044±0.004 mg/kg</td>
</tr>
</tbody>
</table>

No Sample Pretreatment /Quick Precise Results

MA-3000 measures samples without tedious and cumbersome acid / alkali pretreatment. It uses environmental friendly technique which eliminates hazardous operation. Typical measuring time in as little as 5 minutes. Total running cost is saving 80~86%, compared to CV-AAS and ICP-MS.

The Comparison of Analysis Time(H) per 6 Samples

MA-3000 Total: 2H
CVAAS Total: 10H
ICP-MS Total: 14H

86% TIME SAVING
80% TIME SAVING

Bench-Top Configuration with Small Foot-Print

Unprecedented multi-tier concept auto sample changer and combustion chambers creates design compactness, allowing overall dimension to be 50% less than previous model and other similar analyzers, maximizing bench space.

Up to 100-positions for unmanned automated analysis

MA-3000 is integrated with a high analysis throughput auto boat sample changer, fully controlled and operated via a user-friendly intuitive graphical interface (GUI) software loaded with numerous beneficial features and 21 CFR Part II compliance to improve laboratory productivity.

Boat size 39 × 11 × 7.2 (mm)
**Applications / Test Methods**

**Thermal decomposition:**
Sediment, Soil, Food, Biological tissue, Blood, Urine, Ore, Coal, Plastics, Crude Oil, Waste water and more.
Methods: USEPA 7473; ASTM D 6722-01; ASTM D 7623-10; UOP 1009-15

**Reduction vaporization:**
Drink water, River water, Sea Water, Waste water, Digested Liquid and more.
Methods: USEPA 245.1, 245.2, 245.5, 7470A, 7471B, ASTM D 3223-02, EN 1483; APHA 3112, JIS K0102

**Gas analysis:**
Ambient air, Working environment air, Fuel gas, Natural Gas, LPG and more.
Methods: ASTM D 5954-98; ISO 6978 , JLPGA-S-07

**Specifications**

**Mercury detecting section**
- Measurement principle: Non-dispersive dual-cell tri-beam CVAAS [Patented (JP No.5596992)]
- Wave length: 253.7nm
- Detectors: Photo tubes (Reference-background : Absorption cell 1; Absorption cell 2)
- Detection limit: < 1ng (<< 0.001ng)
- Maximum measurement range: 70,000ng
- Measuring time: Approx. 5 minutes

**Sample decomposition section**
- Combustion tube: Quartz (Filled with catalyst) [Patented (JP No.5001419)]
- Sample boat: Ceramic (standard supply)
- Maximum decomposition temp: Up to 1,000°C

**Auto sample changer section**
- Sample position: 100 positions
- Sample boat capacity: Solid: up to 1,500mg
- Liquid: up to 1,400μL (Depend on sample matrices/boat type)

**Data processing system (PC-Win / MA-3000) 21 CFR Part II compliance**
- OS: Windows 8
- Display: Peak profile, Calibration, Raw data, Statistics, Flow graphics & Status
- Device control: Analysis condition (Temperature, Decomposition time), Blank check, Standard check
- Data processing: Calibration curve (Linear & Cubic fits), Peak Height & Peak area tabulation, simultaneous LOW & HIGH concentration tabulation, Unit selection, Concentration conversion, Baseline correction, Statistics (mean, S.D., CV%)
- Printing: Memo, Analysis condition, Calibration curve, Measured and Statistical data, Peak profiles

**Dimension & Utility**
- Dimension: 430W × 770D × 470H (mm)
- Weight: 55kg
- Power supply: AC100 ～ 240V, 15A (MAX)
- Power capacity: 1.5kVA
- Gas: Oxygen (>90% purity), 0.1 ～ 0.29MPa (or Compressed purified air-dependent on applications)

**Option**

**Reduction vaporization attachment**
- Auto Reagent dispenser: RD-5
- Auto sample changer: SC-5
- Manual attachment: S-MA (5ml)
- Detection limit: 1ppt (5ml)
- Maximum measurement range: Up to 100ppb (5ml)

**Gas analysis attachment**
- Heating unit for mercury collector tube: RH-MA3
- Detection limit: 0.001ng
- Maximum measurement range: Up to 1,000ng

**Accessories**
Ceramic sample boat, Large capacity ceramic sample boat, Nickel sample boat, Combustion tube (pre-packed with catalysts), Mercury collector tube, Teflon joint set.

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