



Mercury- Gold Electrode

(Standard Comparison Method) - Application 2

Application 2 involves the use of an instrument connected to a computer running software for the detection of mercury ions in water samples. It employs a gold electrode and linear sweep voltammetry, utilizing the standard addition method for detection. This method is suitable for detecting mercury in surface water with low organic content and minimal contamination, as organic compounds may adhere to the metal surface and obstruct detection. For heavily polluted wastewater or natural waters, pretreatment, such as digestion, is required prior to detection.

Reproducibility: When detecting a solution containing 100 ppb of the target metal, the standard deviation is less than 5% (with more than 5 measurements).

Peak Position:

Mercury (Hg): 350 mV to 750 mV vs. Ag/AgCl

Electrolyte: Mercury electrolyte.

Standard Solution: Mercury standard solution.

Other Reagents: Buffer B; Buffer C; ultrapure water.

Reagent Addition Reference:

Reagent Addition		Mercury electrolyte	Ultrapure Water	Mercury standard solution (20 ppm)	Water Sample
Blank Sample		10 mL	10 mL	0	0
Mercury standard sample (Range)	10 ppb	10 mL	10 mL	10 µL	0
	50 ppb	10 mL	10 mL	50 µL	0
	200 ppb	10 mL	10 mL	200 µL	0
	1 ppm	10 mL	9 mL	1 mL	0
Sample to be Tested		10 mL	0	0	10 mL

Analysis Steps: The YSHM-200W analyzer is user-friendly. The following are the basic steps required for both standalone and computer-controlled analyses. These seven main steps are:

1. Electrode Pretreatment: For detecting mercury, a gold electrode is used. First, polish and clean the gold electrode on a polishing cloth (no need for sanding paper), then soak it in Buffer B for a few minutes. Afterward, rinse the electrode with ultrapure water, as detailed in the instruction manual. Next, fill the reference electrode's inner tube with fresh 3 M KCl solution and immerse it in the soaking solution (saturated KCl solution) for a few minutes. Then, rinse the reference electrode with ultrapure water. Place all three electrodes in their respective positions on the electrode holder and connect the corresponding color-coded plugs.

2. Electrode Maintenance: Pour Buffer B into the "Maintenance Solution" cup and perform the "Electrode Maintenance" under the "Gold Adjustment" option. This step is crucial. After completion, immediately pour Buffer B back into the bottle for reuse.

3. Preparation of Blank, Standard, and Sample Solutions: Place the analysis cups sequentially on the analysis stand and prepare the blank, standard, and sample solutions according to the order specified in the table.

4. Blank Sample Testing: If the curve obtained after measurement shows a peak, immediately remove the blank sample, replace the analysis cup, and re-prepare the blank sample. Ensure that the electrolyte, electrodes, and analysis cup are not contaminated.

5. Select the Target Metal and Range: Analyze the known concentration standard sample. Immediately after measurement, remove the standard sample and place it in cleaning water.

6. Analyze the Sample: The instrument will compare the signal obtained from the sample with that from the standard sample to display the analytical results.

7. Electrode Cleaning: Polish the gold electrode thoroughly to clean it. Discard the liquid in the reference electrode's inner tube and refill it before the next test to prevent deterioration of the reference electrode.

Notes:

① After each test, immediately separate the electrode from the solution. Since mercury can easily adsorb, leaving it in the solution for an extended period can significantly affect the next test results, often resulting in higher values. For low concentration mercury (below 50 ppb), it

is advisable to use the first detection value as the final result. Each cleaning step should involve stirring in ultrapure water 1, Buffer C, and ultrapure water 2, with fresh ultrapure water for each rinse.

② Before and after mercury testing, it is best to soak the gold electrode in Buffer B for several minutes. If discoloration or dullness is observed on the gold electrode during gold adjustment or testing, it should be polished again. If a mercury peak appears in the blank sample test, it indicates that the gold electrode was not adequately cleaned. Replace the analysis cup, re-prepare the blank sample, and retest. Continue this process until no significant peak is observed before proceeding with standard and sample tests.

③ After each standard sample calibration, you can perform approximately five sample analyses. If reproducibility deteriorates beyond this number, consider recalibrating the standard sample. It is best to re-prepare blank and standard samples during recalibration.

④ Ensure that the three electrodes are connected correctly and not reversed (color-coded).

⑤ Maintenance solutions, cleaning water, blank samples, standard samples, and test samples should be returned to their respective positions on the analysis stand after use to avoid confusion.

⑥ When adding liquids, avoid generating bubbles in the analysis cup. Introduce the liquid along the wall of the cup with the pipette tip and handle carefully to prevent splashing, which could affect the test results.