Oxygen (dissolved) – Rhodazine D Method

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Applications and Industries

Boiler water, cooling water, seawater
Power generation, petroleum refining, water treatment

References

Developed by CHEMetrics
ASTM D 5543-15, Low Level Dissolved Oxygen in Water
ASTM Power Plant Manual, 1st ed. p. 169 (1984)
Department of the Navy, Final Report of NAVSECPHILADIV Project A-1598, Evaluation of CHEMetrics Feedwater Dissolved Oxygen Test Kit (1975)

Chemistry

Dissolved oxygen reacts with the pale yellow colored leuco form of Rhodazine D to produce a deep rose color. The resulting color is proportional to the dissolved oxygen concentration in the sample. Results are expressed as ppb (µg/L) or ppm (mg/L) O_2.

Sampling Information

The most critical part of any dissolved oxygen test is sampling. The sample stream must be completely leak-free, and new or intermittently used sampling systems must be purged for a minimum of 4 hours prior to sampling. It is necessary to analyze a sample stream that is flowing at a rate of 500-1000 mL/min in order to prevent the introduction of atmospheric oxygen during sampling. To prevent introduction of atmospheric oxygen into the test ampoule at the time of analysis, the sample should be cooled to ambient temperature, and test ampoules should be gently lowered into the color comparator.

Available Analysis Systems

Visual colorimetric: CHEMets®, ULR CHEMets®
Instrumental colorimetric: Vacu-vials®

Storage Requirements

Products should be stored in the dark at room temperature. Storage at elevated temperatures will cause the test reagent to yellow, causing erroneous test results.

Shelf Life

When stored in the dark and at room temperature:
CHEMets refills, color comparators, Vacu-vials kit:
at least 1 year

Interference Information

- Sample temperatures that are more than approximately 20°F warmer than ambient temperature may allow atmospheric oxygen to enter the test ampoule, causing false positive results.
- Sample temperatures below 20 °C may result in a low bias.
- Oxidizing agents, including chlorine, hexavalent chromium (Cr^{+6}), ferric iron (Fe^{+3}), and cupric copper (Cu^{+2}), may cause high test results. Cupric copper and ferric iron concentrations up to 50 ppb do not interfere, while 100 ppb cupric copper may appear as 5 ppb dissolved oxygen, and 100 ppb ferric iron may appear as 7 ppb oxygen.
- High sample pHs are well tolerated. Sample pHs at or below 2 may cause erroneous results.
- Hydrogen peroxide at levels up to 200 ppb, in the absence of boron, does not interfere; there is a positive interference of 3.3 ppb per 100 ppb of hydrogen peroxide above 200 ppb (e.g., a sample containing 300 ppb hydrogen peroxide will read 3.3 ppb oxygen). In the presence of 2200 ppm boron (present as boric acid), hydrogen peroxide at 100 ppb causes a positive interference of 10 ppb, and at 0.5-650 ppm causes a positive interference of 20-25 ppb.
- At pH 6 and above, up to 2200 ppm boron does not interfere with the chemistry in the absence of hydrogen peroxide. At sample pHs below 6, 2200 ppm boron can cause a negative bias (up to 20% low).
- Polysulfides may cause a false positive result.
- Hydroquinone at >200 ppb is a positive interference, and its oxidation product, benzoquinone, causes a false positive result.
- Methyl ethyl ketoxime at normal treatment rates and its byproduct, nitrous oxide, do not interfere.
- DEHA at up to at least 1 ppm does not interfere.
- Carbohydrazide up to 250 ppb does not interfere.
- Morpholine, hydrazine, sulfite, hydrogen sulfide, and ammonia do not interfere.
- Methanol present at up to at least 20% does not interfere. At higher concentrations, methanol causes false positive results.
- Ethylene glycol at concentrations up to 20% can be tolerated with this test.

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Interference Information (continued)

- Ethanolamine at concentrations up to at least 3.5 ppm does not interfere.
- Sample color or turbidity may make a color match difficult during visual colorimetric testing and may cause a false positive result with instrumental colorimetric tests. CHEMetrics' Sample Zeroing Accessory Pack can be used to correct for potential errors during instrumental analysis.
- With the exception of boron at low pHs, no sample constituents are known to cause a false negative result.

Accuracy Statement

Statements of accuracy are based on laboratory tests performed under ideal testing conditions using standards of known concentration prepared in deionized water.

CHEMets & ULR CHEMets kits: ± 1 color standard increment

Vacu-vials kit, K-7553:

≤ 0.025 ppm at 0 ppm
± 0.030 ppm at 0.100 ppm
± 0.044 ppm at 0.220 ppm
± 0.080 ppm at 0.800 ppm

Safety Information

Safety Data Sheets (SDS) are available upon request and at www.chemetrics.com. Read SDS before using these products. Breaking the tip of an ampoule in air rather than water may cause the glass ampoule to shatter. Wear safety glasses and protective gloves.

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