Ozone - Indigo Method

Version 17 / May 2023

Applications and Industries

Potable water, bottled water; Not applicable for seawater
Food & beverage and pharmaceutical industries

References

Bader H. and J. Hoigné, "Determination of Ozone in Water by the Indigo Method," Water Research Vol. 15, p. 449-456, 1981.
APHA Standard Methods, 23rd ed., Method 4500-O_3 B - 1997

Chemistry

Ozone reacts quantitatively with indigo trisulfonate reagent, bleaching the blue color in direct proportion to the ozone concentration. Results are expressed as ppm (mg/L) O_3.

Analyte-Specific Information

Because ozone decays rapidly in water, analysis should be performed immediately upon sample collection. Similarly, manipulation of the sample during collection should be minimized to avoid dissipation of ozone from the sample. Residual ozone is most stable in clean waters with pHs of less than 6. It is particularly unstable in samples with pHs above 7, as ozone rapidly reacts with and is consumed by hydroxide ion.

Available Analysis Systems

Instrumental colorimetric: Vacu-vials®

Storage Requirements

Products should be stored in the dark and at room temperature.

Reagent Specifications

This reagent is blue. Ampoules containing reagent that is a significantly lighter blue than other ampoules should not be used. Dark blue reagent in ampoule tips is acceptable.

Shelf Life

When stored in the dark and at room temperature:
Vacu-vials kit: at least 1 year

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.

Interference Information

- The indigo chemistry is relatively selective for ozone. The test reagent is formulated with malonic acid to prevent interference from up to at least 10 ppm chlorine.
  Note: Addition of malonic acid directly to the sample to prevent interference from > 10 ppm chlorine is not recommended, as erroneous results may be obtained.
- Alkalinity is an increasing negative interference but can be tolerated up to approximately 500 ppm as $CaCO_3$.
- Hardness is an increasing negative interference but can be tolerated up to approximately 1200 ppm as $CaCO_3$.
- Sample pHs between 2 and 7 can be tolerated with this chemistry. See "Analyte-Specific Information" regarding stability of ozone at various pHs.
- Ferric iron (Fe^{+3}) does not interfere.
- Manganese II (Mn^{+2}) does not interfere. Oxidized forms of manganese (e.g. permanganate) may cause a false positive result.
- Bromine and iodine interfere positively.
- Hydrogen peroxide, chlorite, chlorate, and perchlorate should not interfere if the sample is collected and analyzed immediately, and if present only at levels comparable to the ozone concentration.
- Organic peroxides may read positively.
- This test kit is not applicable for the analysis of seawater. The formation of oxidized halogenated by-products resulting from ozonation of seawater prevents quantitative ozone measurement.

Product Performance

Precision

This precision data is based on replicate analyses of ozone standards prepared in deionized water. Standards were analyzed on a spectrophotometer or CHEMetrics Single Analyte Photometer (I-2022 SAM) during ideal testing conditions. The 95% confidence interval of the distribution was determined from the standard deviation.

- Precision at 0.16 mg/L, 95% CI:
  with spectrophotometer and I-2022 SAM: 0.15-0.17 mg/L
- Precision at 0.54 mg/L, 95% CI:
  with spectrophotometer: 0.52-0.56 mg/L
  with I-2022 SAM: 0.52-0.57 mg/L

Sensitivity with a Spectrophotometer

Concentration change per 0.010 Abs change: 0.02 mg/L