# Iron (total, soluble, ferrous) - Phenanthroline Method

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## Applications and Industries

Industrial wastewater influent and effluent, industrial process waters, surface and ground water, seawater, drinking water; Power generation

## References

APHA Standard Methods, 22nd ed., Method 3500-Fe B (1997). ASTM D 1068-77, Iron in Water, Test Method A

J.A. Tetlow and A.L. Wilson, "The Absorptiometric Determination of Iron in Boiler Feed-Water", *Analyst,* Vol. 89, p. 442 (1964)

## Chemistry

Ferrous iron reacts with 1,10-phenanthroline to form an orange colored complex in direct proportion to the ferrous iron concentration. Soluble iron consists primarily of ferrous iron, but can also contain a small portion of ferric iron.

The **soluble iron reagent** contains hydroxylamine hydrochloride, which converts any dissolved ferric iron to ferrous.

The **ferrous iron reagent** does not contain hydroxylamine hydrochloride and will not measure soluble ferric iron.

**Total iron** is determined by adding a solution of thioglycolic acid and ammonia (A-6000 Activator Solution) to the sample. This solution dissolves most forms of particulate iron and converts ferric iron to ferrous. Certain forms of very insoluble iron (magnetite, ferrite, etc.) require a digestion prior to analysis.

Results are expressed as ppm (mg/L) Fe.

## Available Analysis Systems

*Instrumental colorimetric:* Vacu-vials®
*Visual colorimetric:* CHEMets® and VACUettes®

## Shelf Life

*When stored in the dark and at room temperature:*

*Visual colorimetric*:
CHEMets and VACUettes refills, Activator Solution, color comparators: at least 1 year

*Instrumental colorimetric*:
Vacu-vials kit: at least 1 year

## Interference Information

Iron chelated with EDTA is not measured quantitatively with this test.

Strong oxidizing agents may interfere. To minimize these interferences, excess hydroxylamine hydrochloride has been added to the soluble iron reagent; the ferrous iron reagent does not contain hydroxylamine hydrochloride.

Zinc at levels greater than ten times that of iron as well as chromium, cobalt, copper, and nickel have the potential to interfere. Cadmium, silver, mercury, and bismuth may precipitate the reagent. Excess phenanthroline has been added to the reagents to minimize interferences from these metals.

Cyanide and polyphosphates may interfere.

Molybdate may precipitate the reagent in the test ampoule, causing low results for soluble and ferrous iron. Upon addition of thioglycolic acid solution (A-6000) during total iron analysis, samples containing molybdate will turn blue.

Nitrite may cause a false negative result during soluble and ferrous analysis. Nitrite is also a significant positive interference during total analysis. Samples containing nitrite will turn yellow, orange, or red upon addition of thioglycolic acid solution (A-6000).

Sulfide and ammonia do not interfere.

If necessary, sample pH should be adjusted to fall within the pH range of 2 - 7.

## Accuracy Statement

*CHEMets and VACUettes kits:*

± 1 color standard increment

*Vacu-vials kits*:

K-6003: ≤ 0.05 ppm at 0 ppm, ± 0.09 ppm at 0.30 ppm, ± 0.30 ppm at 1.50 ppm, ± 0.45 ppm at 4.50 ppm

K-6203: ≤ 0.08 ppm at 0 ppm, ± 0.09 ppm at 0.30 ppm, ± 0.30 ppm at 1.50 ppm, ± 0.45 ppm at 4.50 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.

## Storage Requirements

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