

**METHOD #:** 218.1 Approved for NPDES and SDWA (Editorial Rev. 1974, 1978)

**TITLE:** Chromium (AA, Direct Aspiration)

**ANALYTE:** CAS # Cr Chromium 7440-47-3

**INSTRUMENTATION:** AA

**STORET No.** Total 01034  
Dissolved 01030  
Suspended 01031

**Optimum Concentration Range:** 0.5-10 mg/L using a wavelength of 357.9 nm  
**Sensitivity:** 0.25 mg/L  
**Detection Limit:** 0.05 mg/L

## 1.0 Preparation of Standard Solution

- 1.1 Stock Solution: Dissolve 1.923 g of chromium trioxide ( $\text{CrO}_3$ , reagent grade) in deionized distilled water. When solution is complete, acidify with redistilled  $\text{HNO}_3$  and dilute to 1 liter with deionized distilled water. 1 mL = 1 mg Cr (1000 mg/L).
- 1.2 Prepare dilutions of the stock solution to be used as calibration standards at the time of analysis. The calibration standards should be prepared using the same type of acid and at the same concentration as will result in the sample to be analyzed either directly or after processing.

## 2.0 Sample Preservation

- 2.1 For sample handling and preservation, see part 4.1 of the Atomic Absorption Methods section of this manual.

## 3.0 Sample Preparation

- 3.1 The procedures for preparation of the sample as given in parts 4.1.1 thru 4.1.4 of the Atomic Absorption Methods section of this manual have been found to be satisfactory.

## 4.0 Instrumental Parameters (General)

- 4.1 Chromium hollow cathode lamp
- 4.2 Wavelength: 357.9 nm
- 4.3 Fuel: Acetylene
- 4.4 Oxidant: Nitrous oxide
- 4.5 Type of flame: Fuel rich

## 5.0 Analysis Procedure

5.1 For analysis procedure and calculation, see "Direct Aspiration", part 9.1 of the Atomic Absorption Methods section of this manual.

## 6.0 Notes

6.1 The following wavelengths may also be used:

359.3 nm Relative Sensitivity 1.4

425.4 nm Relative Sensitivity 2

427.5 nm Relative Sensitivity 3

428.9 nm Relative Sensitivity 4

6.2 The fuel rich air-acetylene flame provides greater sensitivity but is subject to chemical and matrix interference from iron, nickel, and other metals. If the analysis is performed in a lean flame the interference can be lessened but the sensitivity will also be reduced.

6.3 The suppression of both Cr (III) and Cr (VI) absorption by most interfering ions in fuel rich air-acetylene flames is reportedly controlled by the addition of 1% ammonium bifluoride in 0.2% sodium sulfate [Talanta 20, 631 (1973)]. A 1% oxine solution is also reported to be useful.

6.4 For levels of chromium between 50 and 200  $\mu\text{g/L}$  where the air-acetylene flame can not be used or for levels below 50  $\mu\text{g/L}$ , either the furnace procedure or the extraction procedure is recommended. See Method 218.2 for the furnace procedure and Method 218.3 for the chelation-extraction procedure.

6.5 For quality control requirements and optional recommendations for use in drinking water analyses, see part 10 of the Atomic Absorption Methods section of this manual.

6.6 Data to be entered into STORET must be reported as  $\mu\text{g/L}$ .

## 7.0 Precision and Accuracy

7.1 An interlaboratory study on trace metal analyses by atomic absorption was conducted by the Quality Assurance and Laboratory Evaluation Branch of EMSL. Six synthetic concentrates containing varying levels of aluminum, cadmium, chromium, copper, iron, manganese, lead and zinc were added to natural water samples. The statistical results for chromium were as follows:

Number of Labs	True Values $\mu\text{g/Liter}$	Mean Value $\mu\text{g/Liter}$	Standard Deviation $\mu\text{g/Liter}$	Accuracy as % Bias
74	370	353	105	-4.5
76	407	380	128	-6.5
72	74	72	29	-3.1
70	93	84	35	-10.2
47	7.4	10.2	7.8	37.7
47	15.0	16.0	9.0	6.8