

METHOD #: 243.1 Approved for NPDES (Editorial Revision 1974, 1978)

TITLE: Manganese (AA, Direct Aspiration)

ANALYTE: CAS # Mn Manganese 7439-96-5

INSTRUMENTATION: AA

STORET No. Total 01055
Dissolved 01056
Suspended 01054

Optimum Concentration Range: 0.1-3 mg/L using a wavelength of 279.5 nm

Sensitivity: 0.05 mg/L

Detection Limit: 0.01 mg/L

1.0 Preparation of Standard Solution

- 1.1 Stock Solution: Carefully weigh 1.000 g of manganese metal (analytical reagent grade) and dissolve in 10 mL of redistilled HNO₃. When solution is complete, dilute to 1 liter with 1% (V/V) HCl. 1 mL = 1 mg Mn (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 Manganese hollow cathode lamp
- 4.2 Wavelength: 279.5 nm
- 4.3 Fuel: Acetylene
- 4.4 Oxidant: Air
- 4.5 Type of flame: Oxidizing

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 For levels of manganese below 25 $\mu\text{g/L}$, either the furnace procedure, Method 243.2, or the Special Extraction Procedure given in part 9.2 of the Atomic Absorption Methods section is recommended. The extraction is carried out at a pH of 4.5 to 5. The manganese chelate is very unstable and the analysis must be made without delay to prevent its re- solution in the aqueous phase.

6.2 The following line may also be used: 403.1 nm Relative Sensitivity 10.

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

6.4 The persulfate colorimetric method may also be used (Standard Methods, 14th Edition, p 225).

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 manganese 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
77	426	432	70	1.5
78	469	474	97	1.2
71	84	86	26	2.1
70	106	104	31	-2.1
55	11	21	27	93
55	17	21	20	22