



# National Institute of Standards & Technology

## Certificate of Analysis

### Standard Reference Material 68c

#### High-Carbon Ferromanganese

(In Cooperation with the American Society for Testing and Materials)

This Standard Reference Material (SRM) is in the form of powder (0.15 to 0.25 mm) intended primarily for use in checking chemical methods of analysis and in calibration with instrumental methods of analysis.

Element	Mn	Fe	C	P	S	Si	As	Cr
Certified <sup>1</sup> Value	80.04	12.3	6.72	0.19	0.008	0.225	0.021	0.074
Estimated <sup>2</sup> Uncertainty	0.08	0.2	0.05	0.01	0.002	0.007	0.002	0.006
Method								
Labs	Volumetric	Volumetric	Combustion	Photometric	Combustion titration	Perchloric acid dehydration	Photometric	
A	<sup>a</sup> 80.05	12.5	<sup>b</sup> 6.72	<sup>c</sup> 0.20	<sup>b</sup> 0.006	0.023	0.023	<sup>d</sup> 0.073
B	<sup>e</sup> 80.02	12.2	<sup>b</sup> 6.76	<sup>f</sup> 0.18	0.006	0.22	0.019	0.080
C	<sup>g</sup> 80.00	12.2	<sup>b</sup> 6.70	<sup>h</sup> 0.19	0.010	0.23	<sup>i</sup> 0.022	<sup>k</sup> 0.074
D	<sup>g</sup> 80.04	12.3	<sup>b</sup> 6.68	0.19	0.008	<sup>l</sup> 0.22	<sup>m</sup> 0.020	<sup>n</sup> 0.075
E	<sup>g</sup> 80.08	12.1	6.74	<sup>c</sup> 0.20	0.009	<sup>l</sup> 0.22	0.022	<sup>k</sup> 0.07
F	<sup>g</sup> 80.04	—	<sup>b</sup> 6.73	—	<sup>b</sup> 0.008	0.23	—	—
G	—	12.1	<sup>b</sup> 6.72	—	—	—	—	—

<sup>1</sup>The certified value listed for a constituent is the present best estimate of the "true" value based on the results of the cooperative program for certification.

<sup>2</sup>The estimated uncertainty listed for a constituent is based on judgement and represents an evaluation of the combined effects of method imprecision, possible systematic errors among methods, and material variability for samples of 0.2 g or more. (No attempt was made to derive exact statistical measures of imprecision because several methods were involved in the determination of most constituents.)

<sup>a</sup>Potentiometric titration with  $\text{KMnO}_4$  in neutral pyrophosphate solution.

<sup>b</sup>Combustion-infrared detection.

<sup>c</sup>Alkalimetric.

<sup>d</sup>Atomic absorption.

<sup>e</sup>Bismuthate- $\text{FeSO}_4$  -  $\text{KMnO}_4$ .

<sup>f</sup>Molybdivanadophosphate photometric.

<sup>g</sup>Manganese oxidized with perchloric-phosphoric.

<sup>h</sup>Combustion-Chromatographic.

<sup>i</sup>Weighed as ammonium phosphomolybdate.

<sup>j</sup>Distillation -  $\text{H}_2\text{S}$  -  $\text{As}_2\text{S}_3$ .

<sup>k</sup> $\text{Na}_2\text{O}_2$  oxidation -  $\text{FeSO}_4$  -  $\text{KMnO}_4$ .

<sup>l</sup> $\text{K}_2\text{SiF}_6$  precipitation followed by NaOH titration.

<sup>m</sup>X-ray fluorescence spectrometric.

<sup>n</sup>Sulfuric acid dehydration.

<sup>o</sup>DC plasma emission spectrometric.

Note 1. Laboratory B reported values of 0.12 percent nickel and 0.18 percent cobalt.

Note 2. Laboratory E reported a value of 0.11 percent oxygen.

Gaithersburg, MD 20899

February 20, 1992

(Revision of Certificate dated 8-15-79)

(over)

William P. Reed, Chief  
Standard Reference Materials Program

*This Certificate of Analysis has undergone editorial revision to reflect program and organizational changes at NIST and at the Department of Commerce. No attempt was made to reevaluate the certificate value or any technical data presented in this certificate.*

PLANNING, PREPARATION, TESTING, ANALYSIS: The material for this SRM was provided and processed by Union Carbide Corporation, Metals Division, Marietta, Ohio, through the courtesy of H.H. Hall.

At NIST, a test portion was subjected to a sieve fraction study. This was followed by sieving the material, primarily to remove fines, and by subsequent blending.

Homogeneity testing was performed at NIST by E.R. Deardorff, B.I. Diamondstone, and R.F. Fleming. The material variability was determined to be within the method imprecision.

Cooperative analyses for certification were performed in the following laboratories:

- Allegheny Ludlum Steel Corp., Brackenridge, Pennsylvania, A.I. Fulton and C.W. Hartig.
- Inland Steel Co., Indiana Harbor Works, East Chicago, Indiana, J.E. Joyce.
- Interlake Inc., Beverly Plant, Beverly, Ohio, J.C. Cline and R.A. Pontella.
- National Institute of Standards and Technology, Inorganic Analytical Research Division, Gaithersburg, Maryland 20899, R.I. Diamondstone and E.R. Deardorff.
- Shieldalloy Corp., Newfield, New Jersey, L.F. Risi.
- SKW Alloys, Inc., Niagra Falls, New York, J.E. Cumbo, E.W. Linton and P.J. Butry.
- Union Carbide Corp., Metals Division, Marietta, Ohio, H.H. Hall.

The overall coordination of the technical measurements leading to the certification was performed under the direction of J.I. Shultz, Research Associate, ASTM-NIST Research Associate Program.

The technical and support aspects involved in the original preparation, certification, and issuance of this Standard Reference Material were coordinated through the Standard Reference Materials Program by R.E. Michaelis. Revision of the Certificate was coordinated through the Standard Reference Materials Program by P.A. Lundberg.