National Institute of Standards & Technology

Certificate of Analysis

Standard Reference Material 64c

High-Carbon Ferrochromium

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

This Standard Reference Material (SRM) is in the form of fine powder* less than 150 μm, (100 mesh) for use in checking chemical methods of analysis and in calibration with instrumental methods of analysis.

Element	Cr	C	Mn	P	S	Si	Cu	Ni	V	Co	Ti	N	Fe
Certified[1] Value	68.00	4.68	0.16	0.020	0.067	1.22	0.005	0.43	0.15	0.051	0.02	0.045	24.98
Estimated[2] Uncertainty	0.08	0.06	≤0.01	0.002	0.001	0.03	0.001	0.02	≤0.01	0.003	0.005	0.002	0.08
Method / Labs		Combustion-Chromatographic		Photometric	Combustion-Chromatographic	Perchloric Acid Dehydration	Atomic Absorption	Atomic Absorption		Atomic Absorption	Photometric		
1	[a]67.97	4.68	[b]0.17	[c]0.018	[d]0.066	[e]1.26	[f]0.004	[g]0.45	[h]0.16	[i]0.055	[j]0.025	—	[k]25.08
2	[a]68.03	4.70	[b]0.17	0.021	0.067	1.18	0.006	[g]0.41	[j]0.15	0.048	[j]0.015	[m]0.044	—
3	[a]67.98	4.70	[n]0.16	0.019	0.069	[o]1.22	[n]<0.005	[n]0.43	[n]0.15	[n]0.054	[n]0.021	[p]0.046	[k]24.96
4	—	4.66	0.16	0.022	0.067	1.22	0.005	0.43	0.15	0.049	0.015	0.047	—
5	[q]68.00	4.67	[r]0.16	[c]0.017	0.067	[e]1.21	0.006	0.42	0.15	0.051	[s]0.013	[p]0.047	[t]25.00
6	[a]68.00	4.68	—	[n]0.020	0.068	1.20	—	—	—	—	—	[p]0.040	[v]24.90
7	—	4.68	—	—	0.068	—	—	—	—	—	—	—	—

*CAUTION: The user should obtain a representative sample of the coarse and fine particles to ensure precise and accurate measurements.

[1]The values listed are the present best estimate of the "true" value based on the results of the cooperative analytical program.
[2]Estimated uncertainty includes method imprecision, bias among methods, and material variability for samples 0.5 g or more.

NOTE: Laboratory 5 reported the following values on additional elements not certified: Al - 0.006%, As - 0.003%, Mo - <0.001%, O_2 - 0.12%, Sn - <0.001%.

[a]Na_2O_2 fusion - $FeSO_4$ - $KMnO_4$
[b]Peroxydisulfate - arsenite titration
[c]Gravimetric method
[d]Combustion - Iodate titration
[e]Double dehydration
[f]Diethyldithiocarbamate photometric method
[g]Weighed as nickel dimethylglyoxime
[h]$FeSO_4$ - $(NH_4)_2S_2O_8$ - $KMnO_4$
[i]Nitroso R photometric method
[j]H_2O_2 photometric method
[k]Na_2O_2 fusion - NH_4OH - $SnCl_2$ - $KMnO_4$
[l]KIO_4 photometric method
[m]Distillation-titration
[n]Spectrographic method
[o]Silicon precipitated as K_2SiF_6, titrated with standard NaOH
[p]Inert gas fusion - thermal conductivity
[q]Na_2O_2 fusion - $(NH_4)_2S_2O_8$ oxidation - potentiometric titration with standard $Fe(NH_4)_2(SO_4)_2$
[r]Atomic absorption spectrometry
[s]Titanium separated by anion - exchange and determined photometrically with H_2O_2
[t]Acid dissolution - NH_4OH precipitation - potentiometric titration with ceric sulfate
[u]Ammonium phosphovanadate photometric method
[v]Na_2O_2 fusion - $Fe(OH)_3$ filtered and dissolved in HCl - $KMnO_4$ - $SnCl_2$ - $K_2Cr_2O_7$

Gaithersburg, MD 20899
February 20, 1992
(Revision of Certificate dated 8-24-77)

William P. Reed, Chief
Standard Reference Materials Program

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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 to NIST by Airco Alloys, Niagara Falls, New York through the courtesy of J.E. Cumbo.

The crushing, grinding, and sieving was performed by the Mining and Metals Division, Union Carbide Corporation, Marietta, Ohio, through the courtesy of G. Porter.

At NIST, the material was sieved and thoroughly blended. Homogeneity testing of selected samples representative of the final lot was performed by J.E. Cumbo, Airco Alloys, Niagara Falls, New York, and J.C. Cline, Interlake, Inc., Beverly, Ohio.

Chemical analyses for certification were performed in the following laboratories:

- Airco Alloys, Niagara falls, New York, J.E. Cumbo.

- Armco Steel Corp., Middletown, Ohio, M. Dannis.

- Huntington Alloys, Inc., Huntington, West Virginia, F.A. Blair, J.R. Carson, J.M. Arritt, D.E. Howells, F.E. Lowry, E.L. Montgomery, A.H. Roberts, E.B. Sharps, L.J. Sites and W.L. Stickler.

- Interlake, Inc., Beverly, Ohio, J.C. Cline.

- National Institute of Standards and Technology, Analytical Chemistry Division, Gaithersburg, Maryland, S.A. Wicks.

- Shieldalloy Corporation, Newfield, New Jersey, L. Risi.

- Union Carbide Corporation, Metals Division, Marietta, Ohio, H.H. Hall.

The overall direction and coordination of the technical measurements leading to certification were performed by 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.