



# National Institute of Standards & Technology

## Certificate of Analysis

### Standard Reference Material 27f Iron Ore (Sibley)

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

This Standard Reference Material (SRM) is in the form of fine powder for use in checking chemical methods of analysis and calibration with instrumental methods of analysis. Results are given below and are based on samples that were dried for one hour at 105°C.

Constituent	Total Fe	SiO <sub>2</sub>	Al <sub>2</sub> O <sub>3</sub>	P	S	TiO <sub>2</sub>	MnO	CaO	MgO	Na <sub>2</sub> O	K <sub>2</sub> O
Certified <sup>1</sup> Value, % by wt.	65.97	4.17	0.82	0.041	0.005	0.019	0.011	0.039	0.019	0.012	0.008
Estimated <sup>2</sup> Uncertainty	0.05	0.03	0.03	0.001	±0.001	0.002	0.002	0.003	0.004	0.003	0.002
Method <sup>3</sup>											
Labs											
A	66.01	4.12	0.78	0.042	0.005	0.020	0.009	0.042	0.02	0.012	0.006
B	65.98	4.18	0.83	0.042	0.006	0.018	0.014 0.012	0.041 0.042	0.013 0.015	0.012 0.010	0.011 0.009
C	65.95	4.18	0.87 0.84	0.039	0.005	0.019	0.010 0.011	0.039	0.018	0.009	0.008
D	65.92	4.14	0.82	0.041	0.006	0.02	0.006	0.036	0.023	0.016	0.008
E	65.96	4.17	0.79	0.040	0.005	0.021	0.011	0.035	0.021	0.010	0.009
F	66.04	----	-----	0.042	----	0.017	0.011	-----	0.027	0.015	0.007
G	65.96	4.20	0.82 0.81	0.040	0.005	0.018	0.011 0.013	0.035	0.018	0.009	0.007

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

<sup>2</sup>Estimated uncertainty includes method imprecision, bias among methods, and material variability for samples 0.5g or more.

<sup>3</sup>A detailed description of many of the methods of analysis employed in the certification program for this SRM may be found in Part 12, Chemical Analysis of Metals Metal Bearing Ores, Annual Book of ASTM Standards.

NOTE: Laboratory C reported a value of 0.002 percent ZrO<sub>2</sub> by the pyrocatechol photometric method.

<sup>4</sup>Sample fused in Na<sub>2</sub>O<sub>2</sub>.

<sup>5</sup>Alkalimolybdate method.

<sup>6</sup>X-ray spectrometric method.

<sup>7</sup>Flame emission spectrometry.

<sup>8</sup>H<sub>2</sub>S reduction-K<sub>2</sub>Cr<sub>2</sub>O<sub>7</sub> titration.

<sup>9</sup>Chromotropic acid photometry.

<sup>10</sup>Spectrographic method.

<sup>11</sup>Sample dissolved in HCl, silica removed by double dehydration with HCl. Ignited silica treated with H<sub>2</sub>SO<sub>4</sub> and HF.

<sup>12</sup>Aluminum separated by anion-exchange and determined by chelometric titration using 1,2-diaminocyclohexane-tetraacetic acid and back titration with standard zinc solution.

<sup>13</sup>Combustion-chromatography.

<sup>14</sup>Titanium separated by anion-exchange and determined photometrically with diantipyryl methane.

<sup>15</sup>Photometry.

<sup>16</sup>Aluminum separated by anion-exchange and determined gravimetrically with phenylhydrazine.

<sup>17</sup>SnCl<sub>2</sub> reduction - KMnO<sub>4</sub> titration.

<sup>18</sup>H<sub>2</sub>O<sub>2</sub> photometry.

<sup>19</sup>Peroxydisulfate-arsenite.

<sup>20</sup>Atomic absorption spectrometry.

<sup>21</sup>Mercury cathode-NH<sub>4</sub>OH-Cupferron-ALPO<sub>3</sub>.

Gaithersburg, MD 20899

December 30, 1991

(Revision of Certificate dated 5-31-77)

(over)

William P. Reed, CI  
Standard Reference Materials Prog

*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 values or any technical data presented in this certificate.*

PLANNING, PREPARATION, TESTING, ANALYSIS: The iron ore material for this SRM was provided to NIST by the United States Steel Corporation, Pittsburgh, Pennsylvania, through the courtesy of R.H. Colin.

The "as received" material was crushed, dry ground, and sieved under contract with the Colorado School of Mines Research Institute, Golden, Colorado, under direction of M.G. Pattengill and H.O. VanMole. The final product passed a 150 mesh (105  $\mu\text{m}$ ) sieve, with about 50% passing a 200 mesh (74 $\mu\text{m}$ ) sieve.

At NIST, the material was sieved and thoroughly blended. Homogeneity testing of selected samples representative of the final lot was performed at NIST by R.K. Bell, Assistant Research Associate, ASTM/NIST Research Associate Program. The observed range of values is as follows:

<u>Constituent</u> <u>grams</u>	<u>Range, %</u>	<u>No. of determinations</u>	<u>Sample size,</u> <u>grams</u>
Fe	$\pm 0.05$	16	0.5
SiO <sub>2</sub>	$\leq \pm 0.02$	4	1.0
P	$\leq \pm 0.001$	4	0.5

It is concluded that the material variability is within the method imprecision.

Chemical analyses for certification were performed in the following laboratories:

- Alan Wood Steel Company, Conshohocken, Pennsylvania, V.J. Mercaldo.
- Andrew S. McCreath and Son, Inc., Harrisburg, Pennsylvania, R.F. Lippi.
- Booth, Garrett and Blair, Inc., Ambler, Pennsylvania, J.H. Ormsbee.
- Ledoux and Company, Teaneck, New Jersey, S. Kallman.

National Institute of Standards and Technology, Analytical Chemistry Division, Gaithersburg, MD by T.C. Rains and S.A. Wicks, and by R.K. Bell, ASTM Assistant Research Associate.

United States Steel Corporation, Research Laboratory, Monroeville, Pennsylvania, by J.D. Selvaggio, D.G. Cunningham, J. DiNardi, J.B. Ferons, A.V. Fioravanti, J.E. Friedline, J.R. Lucas, II, K.G. Mikos, C.W. Ponsorby, D. Shafferman, and R.J. Wargo.

Weirton Steel Division, Weirton, West Virginia, R.L. Zickefoose.

The overall direction and coordination of the technical measurements leading to certification were performed jointly by R.E. Michaelis, Standard Reference Materials Program, and by J.I. Shultz, Research Associate, ASTM/NIST Research Associate Program.

The technical and support aspects involved in the preparation, certification and issuance of this Standard Reference Material were coordinated through the Standard Reference Materials Program by W.P. Reed. Revision of the certificate was coordinated through the Standard Reference Materials Program by J.S. Kane.