UNITED STATES DEPARTMENT OF COMMERCE
WASHINGTON

National Bureau of Standards
Certificate of Analyses

Standard Sample 4H
Cast Iron

ANALYST	C		Mn	P		S			Si	Cu	Ni	Cr	V	Mo	Ti	As	N
	Total	Graphitic	Persulfate-Arsenite	Gravimetric (weighed as $Mg_2P_2O_7$ after removal of arsenic)	Alkali-Molybdate [a]	Gravimetric (direct oxidation and final precipitation after reduction of iron)	Evolution (HCl, sp. gr. 1.18, ZnS-iodine [b] theoretical sulfur titer [c])	Combustion	Sulfuric acid dehydration	H_2S–CuS–CuO	Weighed as nickel dimethylglyoxime	$FeSO_4$–$KMnO_4$ titration		Photometric	H_2O_2 photometric	Distillation-titration	
1	2.46	1.81	[d]0.843	0.122	[e]0.126	0.070	0.070	[f]0.070	[g]1.33	[h]0.244	0.066	[i]0.115	[j]0.010	0.020	[k]0.025	[e]0.012	[l]0.007
2	2.46	1.80	.85		.133	.071	.068	[m].070	[n,g]1.35	.236	.067	[o].117	[j].013	.017	[p].023		
3	2.49	1.76	.83	.120	.121	.071		[f].069	[g] 1.33	.24	.065	[q].122	[r].012	.017	[p].025		
4	2.40	1.76	[s].842	.122	[e].124			[f].069	[n] 1.35	[t].245	.065	[o].117	[r].012	.017	.024		
5	2.47	1.78	.840		.128	.069	[u].068		[g] 1.34	[v].243	.067	[q].116	[r].012		[p].023		
6	2.42	1.83	[s].833	.122	.124	.073	[u].067		[w,g]1.33	[v].243	.064	[q].112	[r].012	.015	[p].021	[x].018	
7	2.42	1.75	[y].842	.122	[s].125	.069	[u].065		[n,g]1.36	.249	[z].064	[s].120	[s].010	[s].016	[s].027		
8	2.43	1.79	[s].838		.122	.071		[z1].072	[g] 1.34	[t].243	.065	[z2].118	[r].010	.020	.024		
Average	2.44	1.79	0.840	0.122	0.125	0.071	0.068	0.070	1.34	0.243	0.065	0.117	0.011	0.017	0.024	0.015	0.007
General average	2.44	1.79	0.840	0.124		0.070			1.34	0.243	0.065	0.117	0.011	0.017	0.024	0.015	

[a] Precipitated at 40° C, washed with a 1-percent solution of KNO_3 and titrated with alkali standardized by the use of acid potassium phthalate and the ratio 23 NaOH:1P.

[b] Sample annealed by covering with a layer of graphite, and heating for 20 minutes at 685° C.

[c] Value obtained by standardizing the titrating solution by means of sodium oxalate through $KMnO_4$ and $Na_2S_2O_3$, and use of the ratio 2I:1S.

[d] Potentiometric titration.

[e] Molybdenum-blue photometric method.

[f] 1-g sample burned in oxygen at 1,425° C, and sulfur dioxide absorbed in starch-iodine solution. The iodine was liberated from iodide by titration, during the combustion, with standard KIO_3 solution based on 93 percent of the theoretical factor.

[g] Double dehydration with intervening filtration.

[h] Diethyldithiocarbamate photometric method. See J. Research NBS 47, 380 (1951) RP2265.

[i] Chromium separated from the bulk of iron in a 10-g sample by hydrolytic precipitation with $NaHCO_3$. Persulfate oxidation and potentiometric titration with ferrous ammonium sulfate.

[j] Vanadium separated as in (i). Nitric acid oxidation and potentiometric titration with ferrous ammonium sulfate.

[k] Cupferron separation after solution of the sample in diluted HCl (1+2). Vanadium separated by treatment with NaOH.

[l] Sulfuric acid digestion for 4 hours of 0.5-g sample. See J. Research NBS 43, 201 (1949) RP2021.

[m] Combustion gases absorbed in NaOH-H_2O_2, and excess NaOH titrated with H_2SO_4.

[n] Perchloric acid dehydration.

[o] Perchloric acid oxidation.

[p] Vanadium separated by Na_2CO_3 fusion.

[q] As in (i), except $FeSO_4$-$KMnO_4$ titration.

[r] Ferrous sulfate-persulfate-$KMnO_4$ titration.

[s] Titrating solution standardized by use of standard steels or irons.

[t] Copper-ammonia complex photometric method.

[u] Solution in diluted HCl (1+1).

[v] KI-$Na_2S_2O_3$ titration.

[w] Nitric-sulfuric acid dehydration.

[x] Distillation-H_2S-As_2S_3.

[y] Bismuthate-$FeSO_4$-$KMnO_4$

[z] Spectrographic.

[z1] As in (f), except burned at 2,500° F, and 79-percent factor.

[z2] Diphenylcarbazide photometric method.

List of Analysts

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