U. S. DEPARTMENT OF COMMERCE
WASHINGTON

National Bureau of Standards
Certificate of Analyses

Standard Sample 7F
Cast Iron
(High-Phosphorus)

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 Iodate titration	Sulfuric acid dehydration	H_2S–CuS–CuO	Weighed as nickel dimethylglyoxime	$FeSO_4$–$KMnO_4$ titration	Colorimetric	Colorimetric	H_2O_2 photometric	Distillation-titration	
1	2.79	2.48	[d]0.441	0.880	[e]0.884	0.078	0.079	[f]0.077	[g]1.89	[h]0.021	0.009	[i]0.016	[j]0.049	0.002	[k]0.066	[l]0.087	[m]0.004
2	[n]2.79 / 2.80	2.49	.442		.88	.079	[o].078	[p].080	[q, g]1.91	.021	.012	[r].013	.049	.003	.059	[s].088	.004
3	2.81	2.51	.449	.875		.079	.079		[g]1.88	.021	[t].009	[u].014	[v].048	.004	[w].063	[s].088	
4	2.80	2.55	[x].453	[y].89	.89		.077	[x].081	[g]1.88	.021	[t].012	[z, x].015	[z1, x].046	.003	.062	[s].089	
5	2.79	2.46	[x].45	.874	.877	.077		[x].076	[g]1.88	.023	.011	[z2].017	[z3].046	.003	[w].058		.004
Averages	2.80	2.50	0.447	0.880	0.883	0.078	0.078	0.078	1.89	0.021	0.011	0.015	0.048	0.003	0.062	0.088	0.004
General average	2.80	2.50	0.447	0.881		0.078			1.89	0.021	0.011	0.015	0.048	0.003	0.062	0.088	0.004

[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. See J. Research NBS **26**, 405 (1941) RP1386.

[f] 1-g sample burned in oxygen at 1,425° C, and sulfur dioxide absorbed in starch-iodide solution. Iodine liberated from iodide by titration, during the combustion, with standard KIO_3 solution. Titer 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 the iron in a 10-g sample by hydrolytic precipitation with $NaHCO_3$, oxidized with persulfate, and titrated potentiometrically with ferrous ammonium sulfate.

[j] Vanadium separated as in (i), oxidized with HNO_3 and titrated potentiometrically with ferrous ammonium sulfate.

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

[l] Molybdenum-blue photometric method. See J. Research NBS **24**, 7 (1940) RP1267.

[m] Sulfuric acid digestion for 3 hours of a 1-g sample. See J. Research NBS **43**, 201 (1949) RP2021.

[n] Volumetric method.

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

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

[q] Perchloric acid dehydration.

[r] Bicarbonate hydrolysis-perchloric acid oxidation.

[s] Distillation–H_2S-As_2S_3.

[t] Dimethylglyoxime-photometric method.

[u] Diphenylcarbazide photometric method.

[v] Bicarbonate hydrolysis–$(NH_4)_2S_2O_8$-$KMnO_4$ method.

[w] As in (k), except vanadium separated by Na_2CO_3 fusion.

[x] Titrating solution standardized by use of a standard iron or steel.

[y] Weighed as ammonium phosphomolybdate.

[z] Persulfate oxidation, potentiometric titration with $Fe(NH_4)_2(SO_4)_2$.

[z1] Five-gram sample as in (j).

[z2] As in (i), except $FeSO_4$-$KMnO_4$ titration.

[z3] $FeSO_4$-$(NH_4)_2S_2O_8$-$KMnO_4$ method.

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