UNITED STATES DEPARTMENT OF COMMERCE
WASHINGTON

6000

National Bureau of Standards
Certificate of Analyses

Standard Sample 19F
Acid Open-Hearth Steel, 0.2% Carbon

ANALYST	C	Mn		P		S			Si	Cu	Ni	Cr	V	Mo	Sn
	Direct combustion	Bismuthate ($FeSO_4$-$KMnO_4$)	Persulfate-Arsenite	Gravimetric (weighed as $Mg_2P_2O_7$ after removal of arsenic)	Alkali-Molybdate [a]	Gravimetric (direct oxidation and precipitation after reduction of iron)	Combustion Iodate titration [b]	Evolution with HCl (1-1) ZnS-Iodine sulfur titer) [c]	Perchloric acid dehydration	H_2S-CuS-CuO	Weighed as nickel dimethylglyoxime	$FeSO_4$-$KMnO_4$ titration		Colorimetric	
1	0.190		[d] 0.501	0.028	[e] 0.027	0.043	0.043	0.040	[f] 0.204	[g] 0.151	0.316	[h] 0.054	[i] 0.007	0.059	[j] 0.021
2	.195	[k] 0.503			.029		.042		.202	[l] .154	.315	[m] .052	[n] .006	.059	
3	.191		[o] .490		[e] .029		.042	[p] .039	[q] .211	[r] .151	.314	[s] .050	[t] .009	.060	
4	.192	.496	[o] .494		.028		[o] .043	[p] .042	[q] .205	[u] .149	[v] .322	[s] .052	[w] .008	[x] .060	
5	.196		[o] .495		[o] .029		[o] .043		.205	[y] .150	.321	[s] .055	[n] .008	.056	
6	.193	.498			.030		.041		[q] .205	[l] .156	.314	[z] .051	[z1] .007	.057	[z2] .023
7	.190		[o] .496		[e] .028		.045		.201	[z3] .152	.322	.054	[n] .005	.057	
8	.195		[o] .504	.028	.030	.044		[o] [p] .044	[f] .200	.149	.316	[z4] .054		.057	
Average	0.193	0.499	0.497	0.028	0.029	0.043	0.043	0.041	0.204	0.151	0.317	0.053	0.007	0.058	0.022
General averages	0.193	0.497		0.029		0.042			0.204	0.151	0.317	0.053	0.007	0.058	0.022

[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 23NaOH:1P.

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

[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] Double dehydration with H_2SO_4.

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

[h] Chromium separated from the bulk of the iron in a 10-g sample by $NaHCO_3$ hydrolysis oxidized with persulfate and titrated potentiometrically with ferrous ammonium sulfate.

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

[j] Sulfide-iodine method. See J. Research NBS **8**, 309 (1932) RP415.

[k] Potentiometric titration with $HgNO_3$.

[l] Thiosulfate precipitation-electrolytic method.

[m] Persulfate oxidation, potentiometric titration with ferrous ammonium sulfate.

[n] Nitric acid oxidation, potentiometric titration with ferrous ammonium sulfate.

[o] Titrating solution standardized with a standard steel.

[p] Absorbed in ammoniacal cadmium chloride.

[q] Double dehydration.

[r] H_2S – NH_4OH – diethyldithiocarbamate photometric method.

[s] Perchloric acid oxidation.

[t] $FeSO_4$–$(NH_4)_2S_2O_8$–$KMnO_4$ titration.

[u] $Na_2S_2O_3$ precipitation, iodide method.

[v] Dimethylglyoxime precipitation, KCN titration.

[w] Ether-cupferron–$KMnO_4$ titration.

[x] Molybdenum precipitated with H_2S, reduced with Zn, and titrated with $KMnO_4$.

[y] 10-g sample dissolved in HNO_3 (sp gr 1.13). Solution digested after the addition of 5-g of $(NH_4)_2S_2O_8$, cooled, an excess of NH_4OH added, and diluted to 500 ml. A 250-ml portion filtered off and copper deposited electrolytically.

[z] Diphenylcarbazide photometric method.

[z1] $NaHCO_3$ hydrolysis followed by mercury cathode. Vanadium oxidized by the $KMnO_4$-nitrite-urea method and titrated with $FeSO_4$ using sodium diphenylbenzidine sulfonate indicator.

[z2] Stanreduce-iodate titration method.

[z3] Copper-ammonia complex photometric method.

[z4] As in (h), but $FeSO_4$–$KMnO_4$ titration.

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