UNITED STATES DEPARTMENT OF COMMERCE
WASHINGTON 25, D. C.

National Bureau of Standards

Certificate of Analyses

Standard Sample 13F
Basic Open-Hearth Steel, 0.6% Carbon

ANALYST	C	Mn	P		S			Si	Cu	Ni	Cr	V	Mo	N
	Direct combustion	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	Evolution with HCl (1+1) ZnS-Iodine (theoretical sulfur titer) [b]	Perchloric acid dehydration		Weighed as nickel dimethylglyoxime	$FeSO_4$-$KMnO_4$ titration		Colorimetric	Distillation-titration
1	0.631	[c] 0.889	0.019	[d] 0.022	0.016	[e] 0.016	0.017	[f] 0.239	[g] 0.100	0.114	[h] 0.131	[i] 0.002	0.035	[j] 0.005
2	.631	[k] .882	.019	.019	.017	.016		[l] .238	[m] .109	.115	.126	[n] .003	.032	
3	.624	[k] .892	[o] .020	.021	.015	.017	[p] .016	[f] .236	[q] .101	.119	[h] .128	[i] .002	[r] .034	.004
4	[s] .631	[t] .893		[k] .021		.016	[u] .015	.238	[v] .101	{[w] .110 / .106}	.130	[n] .003	.032	[x] .004
	.630	[k] .89	.022	.021	.016	.016		[f] .227	[y] .104	[w] .113	[s] .128	[z1] .002	.033	.005
Average	0.629	0.889	0.020	0.021	0.016	0.016	0.016	0.236	0.103	0.113	0.129	0.002	0.033	0.004
General average	0.629	0.889	0.020		0.016			0.236	0.103	0.113	0.129	0.002	0.033	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] Value obtained by standardizing the titrating solution with sodium oxalate through $KMnO_4$ and $Na_2S_2O_3$ and the use of the ratio 2I:1S.
[c] Potentiometric titration.
[d] Molybdenum-blue photometric method. See J. Research NBS 26, 405 (1941) RP1386.
[e] 1-g sample burned in oxygen at 1,450°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.
[f] Double dehydration with intervening filtration.
[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 hydrolytic precipitation with $NaHCO_3$, 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] Sulfuric acid digestion for 4 hours of a 0.5-g sample. See J. Research NBS 43, 201 (1949) RP2021.
[k] Titrating solution standardized with a standard steel.
[l] Double dehydration with H_2SO_4.
[m] H_2S-CuS-CuO
[n] $FeSO_4$-$(NH_4)_2S_2O_8$-$KMnO_4$ method.
[o] Weighed as ammonium phosphomolybdate.
[p] Solution in HCl(3+1), and H_2S absorbed in ammoniaca cadmium chloride.
[q] Copper precipitated with $Na_2S_2O_3$, and the determination completed electrolytically.
[r] H_2S—alpha benzoinoxime-MoO_3 method.
[s] Differential gaseometric method.
[t] KIO_4 photometric method.
[u] Solution in HCl (2+1).
[v] Thioacetamide precipitation—KI-$Na_2S_2O_3$ titration.
[w] Photometric method.
[x] Distillation—photometric with Nessler's reagent.
[y] Copper-ammonia-complex photometric method.
[z] Diphenylcarbazide photometric method.
[z1] Spectrographic determination.

List of Analysts

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The steel for the preparation of this standard was furnished by the Bethlehem Steel Corporation.

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