UNITED STATES DEPARTMENT OF COMMERCE

National Bureau of Standards

Certificate of Analyses

Standard Sample 82 A

Nickel-Chromium Cast Iron

ANALYST	C		Mn	P		S			Si	Cu	Ni	Cr	V	Mo	Ti	
	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)	Combustion	Evolution (HCl, sp. gr. 1.18, ZnS-iodine [b] theoretical sulfur tiber [c])	Sulfuric acid dehydration	H_2S-CuS-CuO	Weighed as nickel dimethylglyoxime	$FeSO_4$-$KMnO_4$ titration		Colorimetric	Colorimetric	
1	2.24	1.72	[d] 0.648	0.052	[e] 0.055	0.104	[f] 0.106	0.095	[g] 2.08	0.071	1.07	[h] 0.325	[i] 0.018	0.007	[j] 0.065	
2	2.26	1.72	[k] .644	.051	[k] .050	.099	[f] .098		[l] 2.06	[m] .080	1.05	[k,n] .314	[d] .017		.062	
3	2.29	1.74	.656		.055		[k,o] .104		[l] 2.05	[m] .080	1.07	[n] .335	[i] .022	.009	[j] .066	
4	2.22	1.70	[k] .646	.053	[k] .054	.103	[k,o] .103	.096	[g,l] 2.07	.076	1.08	.329	[p] .018		.063	
	2.19	1.71	[q] .648	[r] .054	[k] .053	.100		[s] .092	[g] 2.07	.074	1.07	.326	[t] .019	[t] .008	.064	
6	2.23	1.68	.648	.052	[k] .053	.102	[k] .102	.094	[l] 2.08	.072	[u] 1.08	.31	[p] .021	.008	[j] .067	
7	2.23	1.69	.653		[e] .054	.104			[g,l] 2.06	.076	1.05	.324	[v] .016		[j] .068	
Average	2.24	1.71	0.649	0.052	0.053	0.102	0.103	0.094	2.07	0.076	1.07	0.323	0.019	0.008	0.065	
General average	2.24	1.71	0.649	0.053		0.102			2.07	0.076	1.07	0.323	0.019	0.008	0.065	

[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:1 P.

[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 1,400° 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] Chromium separated from the bulk of the iron in 5-g sample by hydrolytic precipitation with $NaHCO_3$. Persulfate oxidation and potentiometric titration with ferrous ammonium sulfate.

[i] Nitric acid oxidation and potentiometric titration with ferrous ammonium sulfate.

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

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

[l] Perchloric acid dehydration.

[m] Finished by electrolysis.

[n] Perchloric acid oxidation.

[o] As in (f), except burned at 2,300° F.

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

[q] Bismuthate method.

[r] Weighed as ammonium phosphomolybdate.

[s] Absorbed in ammoniacal cadmium chloride.

[t] Spectrographic method.

[u] Dimethylglyoxime-KCN titration method.

[v] SO_2 reduction-$KMnO_4$ titration after separation by cupferron and NaOH from 10-g sample.

List of Analysts

1. Ferrous Laboratory, National Bureau of Standards, John L. Hague in charge. Analysis by J. I. Shultz, C. Litsey and J. Baldwin.
2. J. E. Spittle, Ford Motor Co., Dearborn, Mich.
3. C. H. Flickinger and R. L. Horn, Republic Steel Corp., Cleveland, Ohio.
4. O. W. Baldwin, Carnegie-Illinois Steel Corp., Gary Works, Gary, Ind.
5. H. J. Wolthorn, Carnegie-Illinois Steel Corp., Ohio Works, Youngstown, Ohio.
6. L. P. Chase, Carnegie-Illinois Steel Corp., South Works, Chicago, Illinois.
7. L. E. Harper, Jr., Campbell, Wyant and Cannon Foundry Co., Muskegon, Mich.

The iron for the preparation of this standard was furnished by The International Nickel Company.

INGTON, D. C., October 15, 1949.

E. U. CONDON, *Director*.

U. S. GOVERNMENT PRINTING OFFICE 16—60632-1