

U. S. DEPARTMENT OF COMMERCE

National Bureau of Standards

Certificate of Analyses

OF
STANDARD SAMPLE 4G
CAST IRON

ANALYST*	C		Mn		P		S			Si	COPPER H ₂ S-CuS-CuO	NICKEL Weighed as nickel dimethylglyoxime	CHROMIUM FeSO ₄ -KMnO ₄ titration	VANADIUM	MOLYBDENUM Colorimetric	TITANIUM Colorimetric	ARSENIC
	Total	Graphitic	Bismuthate (FeSO ₄ -KMnO ₄)	Persulfate-Arsenite	Gravimetric (weighed as MgP ₂ O ₇ after removal of arsenic)	Alkali-Molybdate ^a	Gravimetric (direct oxidation and final precipitation after reduction of iron)	Evolution with HCl (sp or 1.18) ^b ZnS-Iodine (theoretical sulfur titre) ^c	Combustion	Sulfuric acid dehydration							
1.....	2.46	1.81	0.838	0.837	0.121	^d 0.123	0.073	0.070	-----	^e 1.33	0.239	0.065	^f 0.116	^g 0.010	0.019	^h 0.024	ⁱ 0.012
2.....	2.46	1.79	.841	.832	.121	^j .121	.071	^k .071	-----	^l 1.33	^m .242	.061	.118	ⁿ .016	.016	-----	-----
3.....	2.46	1.85	-----	.84	.124	.122	.072	^o .072	-----	^e 1.34	.248	.065	.115	-----	-----	^p .027	-----
4.....	2.47	1.80	.836	-----	.118	.120	.071	^o .067	-----	^{e,1} 1.34	^m .236	^q .064	.115	-----	-----	^p .023	-----
	2.48	1.80	-----	.843	-----	^j .123	-----	^o .072	^r 0.073	^{e,1} 1.33	^s .246	^t .064	.119	-----	-----	^p .019	-----
	2.46	1.81	-----	.862	-----	^d .124	-----	.069	-----	^{e,1} 1.34	^u .22	^t .067	^{v,1} .127	-----	.017	.025	-----
	2.50	1.83	.848	.852	.123	.122	.069	^o .070	^w .070	^l 1.32	.247	.070	^f .114	-----	-----	^x .027	-----
8.....	2.48	1.83	.833	-----	^y .124	^j .124	.071	^o .071	-----	^{z,e} 1.32	.244	.066	.122	^{z1} .007	-----	^{z2} .025	-----
9.....	2.44	1.77	^{z3} .855	-----	.122	^j .126	.070	^{z4} .070	-----	^l 1.34	^{z5} .242	^t .066	^{z6} .114	-----	-----	^p .024	-----
Averages...	2.47	1.81	0.842	0.844	0.122	0.123	0.071	0.070	0.072	1.33	0.240	0.065	0.118	0.011	0.017	0.024	0.012
General averages...	2.47	1.81	0.843	-----	0.122	-----	0.071	-----	-----	1.33	0.240	0.065	0.118	0.011	0.017	0.024	-----

^a Precipitated at 40° C, washed with a 1-percent solution of KNO₃ and titrated with alkali standardized by the use of acid potassium phthalate and the ratio 23NaOH: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 KMnO₄ and Na₂S₂O₃ and use of the ratio 21:18.

^d Molybdenum-blue photometric method.

^e Double dehydration with intervening filtration.

^f Persulfate oxidation and potentiometric titration with ferrous ammonium sulfate.

^g Vanadium separated from the bulk of iron in a 10-g sample by selective precipitation with sodium bicarbonate, then oxidized with nitric acid and titrated potentiometrically with ferrous ammonium sulfate.

^h Solution in HCl (1:2), and a few ml of a 6-percent solution of cupferron added. Precipitate ignited, fused in bisulfate, and vanadium separated with NaOH.

ⁱ Distillation-molybdenum-blue photometric method.

^j Titrating solution standardized by the use of a standard iron or steel.

^k Solution in diluted HCl (1:1).

^l HClO₄ dehydration.

^m Precipitated and weighed as CuCNS.

ⁿ Ferrous sulfate-persulfate-KMnO₄ titration method.

^o Absorbed in ammoniacal cadmium chloride solution.

^p As in (h), except vanadium separated by Na₂CO₃ fusion and leaching with water.

^q Glyoxime-NaCN titration method.

^r Gases absorbed in neutral H₂O₂ and H₂SO₄ titrated with NaOH.

^s Finished by electrolysis.

^t Dimethylglyoxime colorimetric method.

^u Diethyldithiocarbamate colorimetric method.

^v Perchloric acid oxidation.

^w Gases absorbed in AgNO₃ and titrated with NaOH.

^x As in (p), final precipitation with *p*-hydroxyphenyl-arsonic acid.

^y Weighed as ammonium phosphomolybdate.

^z Nitric-sulfuric acid dehydration.

^{z1} Differential titration with FeSO₄-KMnO₄ using *o*-phenanthroline.

^{z2} Acid-soluble titanium precipitated by hydrolysis with NH₄OH and Na₂S₂O₃, and combined with acid insoluble titanium.

^{z3} Bismuthate-arsenite method.

^{z4} Sample not annealed.

^{z5} KI-Na₂S₂O₃ titration method.

^{z6} Diphenylcarbazide colorimetric method.

* LIST OF ANALYSTS

1. Ferrous Laboratory, National Bureau of Standards, John L. Hague in charge. Analysis by R. A. Watson, J. I. Shultz, and Florence Yenchius.
2. R. E. Dehart and J. L. Graham, Lynchburg Foundry Co., Radford, Va.
3. R. H. Rouse, Bethlehem Steel Co., Steelton, Pa.
4. O. Perkins, Allis-Chalmers Mfg. Co., Milwaukee, Wis.
5. V. W. K. Murray, and E. F. Jacobson, Watertown Arsenal, Watertown, Mass.

6. W. K. Aites, Westinghouse Air Brake Co., Wilmerding, Pa.
7. C. O. Geyer, Inland Steel Co., Indiana Harbor Works, East Chicago, Ind.
8. H. J. Wolthorn, Carnegie-Illinois Steel Corp., Ohio Works, Youngstown, Ohio.
9. ARMCO Research Chemical Laboratory, A. H. Thomas in charge; analysis by O. H. Fritzsche, L. C. Ikenberry and Charles Perrine, Middletown, Ohio.

The iron for the preparation of this standard was furnished by the Lynchburg Foundry Co.

WASHINGTON, D. C., August 29, 1947.

E. U. CONDON, *Director*.