

U. S. DEPARTMENT OF COMMERCE

National Bureau of Standards

Certificate of Analyses

STANDARD SAMPLE 55A

OPEN-HEARTH IRON

ANALYST*	C	Mn	P		S		Si	Cu	NICKEL (weighed as nickel dimethylglyoxime)	CHROMIUM	VANADIUM	MOLYBDENUM	COBALT	ARSENIC	TIN	ALUMINUM (total)	ALUMINUM OXIDE (Al ₂ O ₃)	NITROGEN
	Direct combustion		Gravimetric (weighed as Mg ₂ P ₂ O ₇ after removal of arsenic)	ALKALI-MOLYBDATE*	Gravimetric (direct oxidation and final precipitation in reduced solution)	Evolution with HCl (1:1) ZnS—Iodine (theoretical sulphur titre)*	Sulphuric acid dehydration	H ₂ S—CuS—CuO										
1.....	0.013	{0.022 ^a , .021 ^d }	0.004 ^a	0.005	0.020	0.020	0.000 ₈	0.045	0.019	0.006	<0.0002	0.002	0.007 ^e	0.012	0.006 ^f	0.002	0.002 ^g	
2.....	.013	.020 ^c	.005	.006	.017		.001 ^h	.044	.019	.006	.000	.002						
3.....	.016	.022 ^c	.005	.004	.021	.019 ⁱ		.049 ^j	.019	.006	Trace	.003		.010				
4.....	.012	.020 ^c		.004	.021	.021	.001	.048	.019	.006								
5.....	.014	.023 ^k		.004 ^l	.018	.018 ^l	<.001	.042 ^m										
6.....	.013	.024 ^o		.005	.020	.021 ^p	.001	.043	.020 ^q	.005								
7.....	.015	.020 ^c		.004	.019	.019	<.0005	.046 ^m	.019	.005								
	.013	.020 ^k	.004	.004	.020	.021 ^l	.001 ^o	{.049 .047 ^m }	.019	.005	<.001	.003				.001		
9.....	.012	.025 ^c		.005	.020	.020	.001											
10.....	.013	.023 ^p		.005	.020	.021	.000 ₈	.046	.020	.005	.001	.002		.013	.007	.002	.004 ^a	
11.....	{.012 .014 ^r }	.022	.004	.005	.020	.020	.000 ₈	.049 ^m	.019	.006	<.0002		.003					
12.....	.015 ^s	.021		.006	.018	.020	.001 ^o	.044 ^t						.012				0.004 ^u
Averages.....	.014	.022	.004	.005	.020	.020	.001	.046	.019	.006	<.0005	.002	.008	.012	.007	.002 ^v	.003	
Recommended values.....	.014	.022	.004		.020		<.001	.046	.019	.006	<.0005	.002	.008	.012	.007	.002	.002	.004

* Precipitated at 40° C., washed with a 1-percent solution of KNO₃ and titrated with alkali standardized by the use of National Bureau of Standards acid potassium phthalate and the 23:1 ratio.

^b Value obtained by standardizing titrating solution by means of sodium oxalate through KMnO₄ and Na₂S₂O₄.

^c Bismuthate (FeSO₄-KMnO₄) method.

^d Persulphate-arsenite method.

^e Bulk of the iron removed from a 10-g sample by extracting with ether, acid extracted-solution treated with cupferron, and cobalt precipitated in filtrate with α-nitroso β-naphthol, and ignited to Co₂O₃. See BS J. Research 8, 659 (1932) RP415.

^f Tin precipitated as sulphide in HNO₃ solution, then separated from copper and molybdenum by precipitation with NH₄OH, and finally reduced with lead and titrated with iodine. See BS J. Research 8, 309 (1932) RP415.

^g 100-g sample treated with 1,000 ml of diluted H₂SO₄ (1+9) and aluminum determined in the separated insoluble residue.

^h Nitric-sulphuric acid method.

ⁱ Titrating solution standardized by the use of a standard steel.

^j Precipitated as sulphide, titrated with Na₂S₂O₄.

^k Bismuthate-arsenite method.

^l H₂S absorbed in ammoniacal CdCl₂ solution.

^m Finished by electrolysis.

ⁿ Ignited and weighed as NiO.

^o Dehydration with perchloric acid.

^p Bulk of the iron removed from a 10-g sample by extracting with ether, manganese then determined by bismuthate (FeSO₄-KMnO₄) method.

^q 50-g sample decomposed with I-KI and aluminum determined in the residue.

^r Special determination by Dr. T. D. Yensen, using the vacuum-liquid-air method (Am. Electrochem. Soc. Trans. 56, 251, 1929).

^s Manganese oxidized with lead peroxide, and HMnO₄ titrated with arsenite.

^t Precipitated as thiocyanate, ignited to oxide, and titrated with KCN.

^u Solution of steel in HCl, distillation from NaOH solution, and absorption of evolved ammonia in a standard solution of diluted H₂SO₄.

^v The term "total aluminum" refers to all of the aluminum in the sample, i. e., oxide, metallic, nitride, or any other form. Analyst 1 obtained 0.0008 percent of aluminum soluble in diluted H₂SO₄ (1+9).

LIST OF ANALYSTS*

1. Ferrous Laboratory, National Bureau of Standards, H. A. Bright, in charge; analysis by R. M. Fowler and J. L. Hague.

2. Bowser-Morner Testing Laboratories, Dayton, Ohio.

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6. Eckert, A. M. Byers Co., Pittsburgh, Pa.

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9. Dr. M. E. McDonnell, The Pennsylvania Railroad, Altoona, Pa.

10. Armco Research Chemical Laboratory—A. H. Thomas, in charge; analysis by O. B. Ellis and P. E. Ramseyer.

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