U. S. DEPARTMENT OF COMMERCE

National Bureau of Standards

Certificate of Analyses

OF

STANDARD SAMPLE 68A

FERROMANGANESE

ANALYST*	Mn		C	P		S		Si	
	Bismuthate ($FeSO_4$-$KMnO_4$)	Other methods	Direct combustion	Gravimetric (weighed as $Mg_2P_2O_7$ after removal of arsenic)	Alkali-molybdate [a]	Gravimetric (direct oxidation and final precipitation in reduced solution)	Evolution with HCl ZnS-iodine (theoretical sulfur titre)	Sulfuric acid dehydration	
1	80. 02		[e] 6. 86	0. 289		0. 014	0. 017	[d] 0. 82	
2	80. 04		[e] 6. 83	. 298		[f] 0. 009		[dg] . 79	
3	80. 10		[h] 6. 90		[i] 0. 285	. 015	[j] . 017	[d] . 81	
4		[k] 80. 16	[e] 6. 84	. 294			[l] . 014	[dm] . 82	
5	[i] 80. 10		6. 87					[d] . 82	
6	[n] 80. 19			[o] . 283				. 79	
7	80. 01		[e] 6. 81	. 287		. 012	[i] . 013	[dg] . 84	
8	80. 00		[p] 6. 79	[o] . 288		. 019		[g] . 79	
9		[q] 79. 95	[p] 6. 86		. 297		. 015	[g] . 80	
10	80. 11	[q] 80. 13	[e] 6. 84		. 300			. 81	
11	80. 07		6. 78		. 311	. 009		[d] . 78	
12	80. 05	[k] 79. 98	6. 69	. 294		. 017		. 81	
13		[r] 80. 14	[eh] 6. 84		. 297	. 013		[g] . 81	
Averages	**80. 07**	**80. 07**	**6. 83**	**0. 290**	**0. 298**	**0. 013**	**0. 015**	**0. 81**	
General averages	**80. 07**		**6. 83**	**0. 294**		**0. 014**		**0. 81**	

Values for constituents not as accurately determined as the above are: cobalt, 0.02; chromium, 0.025; vanadium, 0.045; and arsenic, 0.035 percent.

[a] Precipitated at 40° C, washed with a 1-percent solution of KNO_3 and titrated with alkali standardized by the use of National Bureau of Standards acid potassium phthalate and the ratio 23NaOH:1P.

[b] Value obtained by standardizing the titrating solution by means of sodium oxalate through $KMnO_4$ and $Na_2S_2O_3$, and the use of the ratio 2I:1S.

[e] Sample mixed with ingot iron.

[d] Double dehydration.

[e] Sample mixed with ingot iron and copper oxide.

[f] Meineke method.

[g] Perchloric acid dehydration.

[h] Sample mixed with red lead.

[i] Titrating solution standardized by use of a standard.

[j] Evolution with diluted hydrochloric acid (2+1).

[k] Basic acetate separation, weighed as $Mn_2P_2O_7$.

[l] Sample ignited in oxygen with tin, gases passed into H_2O_2, and H_2SO_4 titrated with standard alkali.

[m] Hydrochloric acid dehydration.

[n] Bismuthate-arsenite method. *See* Ind. Eng. Chem., Anal. Ed. 7, 427 (1935).

[o] Weighed as ammonium phosphomolybdate.

[p] Sample mixed with tin.

[q] Volhard method.

[r] Manganese dioxide precipitated in acid solution with ammonium persulfate. Solution filtered, and the dioxide titrated with $FeSO_4$-$KMnO_4$.

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