

UNITED STATES DEPARTMENT OF COMMERCE
WASHINGTON

National Bureau of Standards
Certificate of Analyses

Standard Sample 14D
Basic Open-Hearth Steel, 0.8% Carbon

ANALYST	C	Mn	P	S		Si	Cu	Ni	Cr	V	Mo	N		
	Direct combustion	Bismuthate (FeSO ₄ -KMnO ₄) Persulfate-Arsenite	Gravimetric (weighed as Mg ₂ P ₂ O ₇ after removal of arsenic)	Alkali-Molybdate ^a	Gravimetric (direct oxidation and precipitation after reduction of iron)	Evolution with HCl (1-1) ZnS-Iodine (theoretical sulfur titer) ^b	Combustion Iodate titration	Perchloric acid dehydration	H ₂ S-CuS-CuO	Weighed as nickel dimethylglyoxime	Persulfate oxidation (FeSO ₄ -KMnO ₄ , titration)	Colorimetric	Distillation-titration	
1	0.836	0.398	0.013	0.014	0.027	0.026	0.026	0.127	0.087	0.041	0.066	0.001	0.007	0.004
2	.836	.397	.015	.014	.026		.026	.127	.083	.044	.061	.001	.007	.003
3	.840	.40	.016	.016	.029	.028		.123	.080	.043	.066		.006	.003
4	.842	.405		.014	.025		.025	.126	.083	.042	.064	.001	.007	.004
5	.834	.400	.397	.014	.029	.029		.129	.083	.040	.067	.002	.006	.004
	.856	.394	.398	.014	.026	.026	.026	.123	.085	.039	.066	.002	.008	.003
	.843		.398	.014	.026		.026	.129	.087	.041	.064	.002	.006	.004
Average	0.841	0.397	0.399	0.014	0.014	0.027	0.027	0.126	0.084	0.041	0.065	0.002	0.007	0.004
General average	0.841	0.399		0.014		0.027		0.126	0.084	0.041	0.065	0.002	0.007	0.004

^a 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 ratio 23NaOH:1P.

^b Value obtained by standardizing the titrating solution by means of sodium oxalate through KMnO₄ and Na₂S₂O₈ and 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 1,425° C, and sulfur dioxide absorbed in starch-iodine solution. Iodine liberated from iodide by titration, during the combustion, with standard KIO₃ solution. Titer based on 93 percent of the theoretical factor.

^f H₂SO₄ dehydration. Double evaporation with intervening filtration.

^g Diethylthiocarbamate 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 NaHCO₃ hydrolysis, oxidized with persulfate and titrated potentiometrically with ferrous ammonium sulfate.

ⁱ Vanadium separated as in (h), oxidized with HNO₃ and titrated potentiometrically with ferrous ammonium sulfate.

^j 0.5-g sample dissolved in dilute H₂SO₄ (1:2), and solution evaporated to fumes of sulfuric acid. See J. Research NBS 43, 201 (1949) RP2021.

^k Titrating solution standardized with a standard steel.

^l Double dehydration.

^m KI-Na₂S₂O₈ titration.

ⁿ Dimethylglyoxime photometric method.

^o Vanadium precipitated with cupferron from a 5-g sample and determined by the H₂O₂-photometric method.

^p Finished photometrically with Nessler's reagent.

^q Absorbed in ammoniacal cadmium chloride solution.

^r H₂S-copper ammonium complex-photometric method.

^s Diphenylcarbazide photometric method.

^t Purified CO₂ frozen in liquid oxygen trap. Oxygen pumped off, and CO₂ vaporized into known volume and the pressure measured.

^u Periodate photometric method. See British Standard 1121, part 23 (1951).

^v 2-2' diquinolyl-colorimetric method.

^w Ether extraction of a 15-g sample. Glyoxime precipitate titrated with cyanide.

^x Vanadium, in a 20-g sample, separated by electrolysis with a mercury cathode, oxidized by the KMnO₄-nitrite-urea method and titrated with ferrous ammonium sulfate.

^y Bismuthate-arsenite method.

^z Finished by electrolysis.

^{aa} Perchloric acid oxidation.

^{ab} KMnO₄-nitrite-urea method.

^{ac} Same value obtained by periodate photometric method.

^{ad} Combustion gases absorbed in neutral H₂O₂, solution titrated with Na₂CO₃, using methyl red indicator.

^{ae} Silico-molybdate photometric method. See Anal. Chem. 21, 589 (1949).

^{af} Vanadium separated with cupferron, and determined photometrically by the phosphotungstovanadate method.

^{ag} Gasometric measurement.

^{ah} As in (w), but 10-g sample used.

^{ai} Preliminary ether extraction of a 10-g sample. See ASTM Method E30-47.

List of Analysts

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