



Certificate of Analysis

Standard Reference Material 346

Valve Steel

ANALYST	C	Mn	P	S	Si	Ni	Cr	V	N
	Direct combustion	Persulfate-arsenite	Molybdenum-blue photometric	Combustion Iodate titration	Perchloric acid dehydration	Weighed as nickel dimethylglyoxime			Distillation-titration
1.....	0.540	^a 9.14	^b 0.020	^c 0.062	^d 0.236	3.95	^e 21.58	^f 0.059	^g 0.443
2.....	.539	^h 9.13	{ ⁱ 0.016 ^j 0.017 }	{ ^k 0.062 ^l 0.058 }	^m 0.236	3.92	21.55	ⁿ 0.059	.439
3.....	.539	^o 9.14	^p 0.022	.068	.235	3.94	^q 21.65	^r 0.059	.445
4.....	.546	^s 9.14	^t 0.018	.064	.242	^u 3.92	^v 21.56	^w 0.055	.446
5.....	.538	^x 9.15	^y 0.018	.067	^z 0.241	^{aa} 3.94	^{ab} 21.64	^{ac} 0.059	.434
6.....	.543	^{ad} 9.18	^{ae} 0.018	{ ^{af} 0.057 ^{ag} 0.064 }	.242	^{ah} 3.96	^{ai} 21.67		.439
Average.....	0.541	9.15	0.018	0.063	0.239	3.94	21.61	0.058	0.441

^a Chromium removed by hydrolytic precipitation with NaHCO₃. Manganese determined on an aliquot portion by potentiometric titration.
^b Molybdenum—blue photometric method. See J. Res. NBS 26, 405 (1941) RP1386.
^c 1-g sample burned in oxygen at 1,425 °C, and sulfur dioxide absorbed in starch-iodide solution. Iodine is liberated from iodide by titration, during the combustion, with standard KIO₃ solution. Titer is based on 93 percent of the theoretical factor.
^d Double dehydration with intervening filtration.
^e Persulfate oxidation, potentiometric titration with ferrous ammonium sulfate.

^f Nitric acid oxidation, potentiometric titration with ferrous ammonium sulfate.
^g Sulfuric acid digestion for 4 hr of a 0.5 g sample. See J. Res. NBS 43, 201 (1949) RP2021.
^h KIO₃ photometric method.
ⁱ Gravimetric method (weighed as Mg₂P₂O₇).
^j Gravimetric method. Sulfur precipitated with BaCl₂, ignited to BaSO₄ and weighed.
^k Phosphotungstovanadate photometric method.
^l Chromium removed by precipitation with ZnO.
^m Alkali—molybdate method.

ⁿ Perchloric acid oxidation, titration with FeSO₄-KMnO₄.
^o Vanadium separated with mercury cathode and determined by FeSO₄-(NH₄)₂S₂O₈-KMnO₄ method.
^p Chromium removed as in (1) and manganese determined by bismuthate-FeSO₄-KMnO₄ method.
^q Ammonium vanadate—ammonium molybdate photometric method.
^r Dimethylglyoxime—electrolytic method.
^s Vanadium separated with mercury cathode and determined photometrically with 3,3'-diaminobenzidine hydrochloride.
^t Chromium volatilized as CrO₂Cl₂.
^u Dimethylglyoxime—NaCN titration method.

List of Analysts

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| <ol style="list-style-type: none"> 1. B. B. Bendigo, E. J. Maienthal, A. Skapars and J. I. Shultz, Division of Analytical Chemistry, National Bureau of Standards. 2. M. D. Cooper, A. H. Jones, R. E. Kohn, W. R. Lee, R. B. Loranger, and H. E. Vergosen, General Motors Corp., Research Laboratories, Warren, Mich. 3. E. R. Vance, The Timken Roller Bearing Co., Canton, Ohio. | <ol style="list-style-type: none"> 4. D. P. Bartell, Allegheny Ludlum Steel Corp., Brackenridge Works, Brackenridge, Pa. 5. H. A. Patterson, United States Steel Corp. South Works, Chicago, Ill. 6. R. C. Host and J. Kosek, Universal-Cyclops Steel Corp., Bridgeville, Pa. |
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The steel for the preparation of this standard was furnished by the Allegheny Ludlum Steel Corporation.