

National Bureau of Standards

Certificate of Analyses

OF

STANDARD SAMPLE 155

CHROMIUM—TUNGSTEN STEEL

ANALYST*	C	Mn		P		S		Si	COPPER HS-CuS-CuO	NICKEL Weighed as nickel dimethylglyoxime	Cr	VANADIUM	MOLYBDENUM Colorimetric	W	
	Direct combustion	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 precipitation after reduction of iron)	Combustion	Perchloric acid dehydration			FeSO ₄ -KMnO ₄ titration			Gravimetric	Colorimetric
1.....	0.931	^b 1.23	1.25	0.015	^c 0.013	0.010	^d 0.008	^e 0.318	0.083	0.098	^f 0.479	^g 0.014	0.039	^h 0.525	
2.....	.908		ⁱ 1.24	.015	^e .015	.010	^j .010	^k .326	^l .078	^m 1.102	ⁿ .488	.015	.038	^h .517	ⁿ .518
3.....	.906		^o 1.23		^p .015	.010	^j .011	^q .325	^q .082	^l 1.101	^m .490	^r .013	.039	^h .521	
4.....	.904		1.25		.016		.012	^r .323	^r .087	^l 1.099	^m .489	.011	^r .043	^h .514	
5.....	.905		1.24		.016		^s .011	^r .323	^t .091	^l 1.098	^m .48		^r .040	^h .526	ⁿ .52
6.....	.902	1.25	1.25		.015	.008	^s .008	^r .331	^r .08	^l 1.105	^m .484	^u .017	^r .041	^v .509	
7.....	.906		1.24		^p .018	.012	^s .012	^{w,e} .321	^r .073	^x .087	^l .493	^y .010	.035	^h .519	
8.....	.91		^z 1.22	^z .018	^p .016		^j .012	^q .313	^q .079	^l 1.105	^p .473	^r .022	.042	^h .508	
9.....	.904	^z 1.26		.014	.013	.009	^d .012	^e .319	^z .095	^l 1.103	^l .492	^r .013	.038	^z .515	
Averages.	0.905	1.25	1.24	0.016	0.015	0.010	0.011	0.322	0.083	0.100	0.485	0.014	0.039	0.517	0.519
General average.	0.905	1.24		0.015		0.010		0.322	0.083	0.100	0.485	0.014	0.039	0.517	

^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 Chromium removed by bicarbonate hydrolysis.

^c Molybdenum-blue photometric method. See J. Research NBS 26, 405 (1941) RP1386.

^d 1-g sample burned in oxygen at 1,400° C, and sulfur dioxide absorbed in acidified starch-iodine solution. The iodine was liberated from iodide by titration, during the combustion, with standard KIO₃ solution based on 93 percent of the theoretical factor.

^e Double dehydration with intervening filtration.

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

^g Nitric acid oxidation and potentiometric titration with ferrous ammonium sulfate.

^h Single precipitation with HCl-HNO₃ and cinchonine. Ignited precipitate corrected for R₂O₃, SiO₂, and MoO₃.

Unprecipitated tungsten in filtrate determined by α -benzoioxime-hydroquinone colorimetric method.

ⁱ Periodate photometric method.

^j Sulfur gases absorbed in NaOH-H₂O₂ and excess NaOH titrated with H₂SO₄.

^k Diethyldithiocarbamate photometric method.

^l Glyoxime-cyanide titration method

^m Perchloric acid oxidation.

ⁿ Hydroquinone photometric method.

^o Red lead oxidation.

^p Titrating solution standardized by use of a standard steel.

^q CuCNS precipitation, iodide titration method.

^r α -Benzoioxime method.

^s Combustion at 2,220° to 2,400° F with tin, titration as in (4) with iodate standardized on standard steels.

^t CuCNS precipitation, KCN titration.

^u Mercury cathode-KMnO₄ titration method.

^v As in (b), except recovery made by second evaporation and precipitation with cinchonine.

^w Nitric-hydrochloric acid dehydration.

^x Glyoxime precipitate ignited to NiO.

^y FeSO₄-(NH₄)₂S₂O₈-KMnO₄ titration method.

^z Chromium volatilized as CrO₂Cl₂.

¹ Weighed as (NH₄)₂PO₄·12MoO₃.

² Chromium removed by ZnO precipitation.

³ Finished by electrolysis.

⁴ As in (b), except α -benzoioxime precipitate added to main precipitate.

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