

U. S. DEPARTMENT OF COMMERCE

National Bureau of Standards

Certificate of Analyses

OF

STANDARD SAMPLE 159

CHROMIUM-MOLYBDENUM-SILVER STEEL

ANALYST*	C	Mn	P		S		Si	COPPER H ₂ S-CuS-CuO	NICKEL Weighed as nickel dimethylglyoxime	Cr	VANADIUM	Mo		Ag		
	Direct combustion	Bismuthate (FeSO ₄ -KMnO ₄)	Persulfate-Arsen...	Gravimetric (weighed as MgP ₂ O ₇ after removal of arsenic)	Alkali-Molybdate ^a	Gravimetric (direct oxidation and precipitation after reduction of iron)	Combustion			Evolution with HCl (sp. gr. 1.18) ZnS-Iodine (theoretical sulfur titre) ^b		Perochloric acid dehydration	FeSO ₄ -KMnO ₄ titration	Gravimetric	Colorimetric	
1.	0.520	0.812	0.814	0.035		0.026 ^d	0.025	0.027	0.258	0.180	0.137	1.00	0.051 ^b	0.411 ⁱ	0.42	0.090
2.	.52		.80		.037	.029		.25		.15	.99	.06		.41	.10	
3.	.53	^m .805			ⁿ .039	.028		.254		.134	1.00	^h .053	ⁱ .405		.085	
4.	.513		.80		.038			^p .258		^r .13	1.00	^s .06	^t .419		.08	
5.	.521		.816	.033	.034	.026	^u .026	^v .025	0.260	^w .180	.132	1.00	^x .046	^y .420	.417	0.089
6.	.524		^m .80		.037		^z .027		.265	¹ .173	^r .136	1.03	² .052		.41	0.098
Averages	0.521	0.809	0.806	0.034	0.037	0.027	0.026	0.026	0.258	0.181	0.137	1.00	0.054	0.414	0.414	0.090
General averages	0.521	0.807		0.036		0.027		0.027	0.258	0.181	0.137	1.00	0.054	0.414		0.090

* 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 Value obtained by standardizing the titrating solution by means of sodium oxalate through KMnO₄ and Na₂S₂O₅ and the ratio 21:15.

^c Chromium removed by selective precipitation with sodium bicarbonate.

^d 1-g sample burned in oxygen at 1400° C, and sulfur dioxide absorbed in 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 Copper-ammonia complex photometric method.

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

^h Vanadium separated from the bulk of iron in a 5-g sample by selective precipitation with sodium bicarbonate, then oxidized with HNO₃ and titrated potentiometrically with ferrous ammonium sulfate.

ⁱ Silver removed as AgBr and molybdenum determined by the α-benzoinoxime method.

^j Silver separated from a 10-g sample by double precipitation with H₂S, precipitated twice as chloride, and weighed as AgCl.

^k Persulfate oxidation method.

^l Silver precipitated and weighed as AgCl.

^m Chromium removed by ZnO precipitation.

ⁿ Molybdenum-blue photometric method.

^o AgCl precipitation, KCN titration method.

^p Nitric-sulfuric acid dehydration.

^q H₂S precipitation, KCN titration.

^r Glyoxime precipitation, KCN titration.

^s KMnO₄ oxidation, ferrous ammonium sulfate titration.

^t H₂S-PbMoO₄ method.

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

^v Absorbed in ammoniacal CdCl₂.

^w Silver removed as AgCl. Copper determined electrolytically.

^x Ferrous sulfate-persulfate-permanganate titration method.

^y α-Benzoinoxime method, silver removed as AgCl.

^z As in (d), except burned at 1320° C, and KIO₃ solution standardized on standard steels.

¹ Finished by electrolysis.

* LIST OF ANALYSTS

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6. Edward Snyder, Carnegie-Illinois Steel Corp., Homestead Steel Works, Munhall, Pa.

The steel for the preparation of this standard was furnished by the Heppenstall Co.

WASHINGTON, October 15, 1948.

E. U. CONDON, *Director*.