U. S. Department of Commerce
Frederick B. Dent
Secretary

National Bureau of Standards
Richard W. Roberts, Director

National Bureau of Standards Certificate of Analysis

Standard Reference Material 1157

Tool Steel (AISI M2)

This material is available in solid form primarily for application in optical emission and x-ray spectrometric methods of analysis. A companion material, SRM 132b, is available in chip form primarily for use in checking chemical methods of analysis.

Analyst	C	Mn	P	S	Si	Cu	Ni	Cr	V	Mo	W	Co
	Combustion-Chromatographic	Photometric	Photometric	Combustion-Titration		Photometric	Gravimetric			Gravimetric	Gravimetric	Photometric
1	0.837	[a]0.34		[b]0.006	[c]0.17		[d]0.226	[e]4.35	[f]1.84	[g]4.82	[h]6.28	
2	[i] .834	[j] .35	[k]0.010	[l] .003, .004	[m]19	[n]0.090, [j] .088	.223	[e]4.33	[f]1.81	[g]4.89	[h]6.26	[o]0.028, [j] .030
3	[i] .836	[p] .34	[k] .011	.005	.19	.087	.235	[q]4.38	1.84	[g]4.86	[h]6.28	[j] .029
4	.836	[a] .35	[r] .012	.004	[c] .18	[s] .087	.228	[q]4.36	1.81	[t]4.89	[u]6.29	[v] .027
Average	0.836	0.34	0.011	0.004	0.18	0.088	0.228	4.36	1.82	4.86	6.28	0.028

[a] Periodate spectrophotometric method.

[b] 1-g sample burned in oxygen at 1450°C and sulfur dioxide absorbed in starch-iodide solution. Iodine is liberated from iodide by titration, during the combustion, with standard KIO_3 solution.

[c] Double dehydration with perchloric acid.

[d] Dimethylglyoxime spectrophotometric method.

[e] Persulfate oxidation, potentiometric titration with standard ferrous ammonium sulfate solution.

[f] Nitric acid oxidation, potentiometric titration with standard ferrous ammonium sulfate solution.

[g] Ion-exchange, alpha-benzoinoxime, MoO_3 gravimetric method.

[h] Ion-exchange, cinchonine, WO_3 gravimetric method.

[i] Combustion-gravimetric method.

[j] Atomic absorption.

[k] Molybdenum-blue spectrophotometric method.

[l] Combustion-spectrophotometric method using pararosaniline.

[m] Double dehydration with perchloric and sulfuric acids.

[n] 2-2′ biquinoline spectrophotometric method.

[o] Tetraphenylarsonium chloride spectrophotometric method.

[p] Persulfate-arsenite titration.

[q] Persulfate oxidation, $FeSO_4$-$KMnO_4$ titration method.

[r] Alkali-Molybdate method.

[s] Neocuproine spectrophotometric method.

[t] H_2S, alpha-benzoinoxime gravimetric method.

[u] Acid digestion, cinchonine, WO_3 gravimetric method.

[v] Nitroso-R spectrophotometric method.

Washington, D. C. 20234
August 6, 1973

J. Paul Cali, Chief
Office of Standard Reference Materials

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SIZE AND METALLURGICAL CONDITION: Annealed disks, 32 mm (1 1/4 in) in diameter and 19 mm (3/4 in) thick.

The overall direction and coordination of the technical measurements leading to certification were performed under the direction of O. Menis and J. I. Shultz.

The technical and support aspects involved in the preparation, certification, and issuance of this Standard Reference Material were coordinated through the Office of Standard Reference Materials by R. E. Michaelis.

PLANNING, PREPARATION, TESTING, ANALYSIS: For many metal SRM's, it is desirable to make the material available in the form of chips primarily for chemical methods of analysis, and solids primarily for optical emission and x-ray spectrochemical methods of analysis. Prior to the preparation of SRM 132b (chip form) plans were also made to provide this material as SRM 1157 (solid form).

The material for this standard was vacuum melted and cast at the Carpenter Technology Corporation, Reading, Pa. Selected sections were rolled to rounds approximately 130 mm (5 1/4 in) in diameter. At NBS these were lathe cut to a diameter of about 85 mm (3 1/4 in) to provide chips for SRM 132b. The remaining cores were processed at Carpenter Technology Corporation to the final solid size by rolling, annealing, and centerless grinding.

Homogeneity testing was performed at NBS by J. L. Weber, Jr., and was found to be satisfactory.

List of Analysts

1. R. K. Bell, S. A. Wicks and E. R. Deardorff, Analytical Chemistry Division, Institute for Materials Research, National Bureau of Standards.

2. A. L. Sloan, Carpenter Technology, Reading, Pennsylvania.

3. S. Kallman, Ledoux and Company, Teaneck, New Jersey.

4. F. G. Fick and W. Selig, Bethlehem Steel Corporation, Sparrows Point, Maryland.