



National Institute of Standards & Technology

Certificate of Analysis

Standard Reference Material[®] 2172

S-7 Tool Steel

(In Cooperation with the ASTM)

This Standard Reference Material (SRM) is intended primarily for use in chemical methods of analysis. One unit of SRM 2172 consists of 150 g of material in the form of chips sized between 0.50 mm and 1.18 mm sieve openings (35 mesh and 16 mesh, respectively). Material from the same lot is available in disk form as SRM 1772.

The certified values for ten elements are listed in Table 1. The noncertified values for an additional six elements are provided in Table 2, for information only. All values are reported as mass fractions [1].

Table 1. Certified Mass Fractions with Uncertainties and Methods

Element	(%)	Methods
Carbon	0.480 ± 0.003	COMB-IR
Chromium	3.11 ± 0.06	DCP, ICP, TITR
Copper	0.083 ± 0.003	DCP, FAAS, ICP
Manganese	0.61 ± 0.02	DCP, FAAS, ICP, TITR
Molybdenum	1.37 ± 0.02	DCP, FAAS, ICP, MAS
Nickel	0.104 ± 0.001	DCP, FAAS, ICP
Phosphorus	0.008 ± 0.002	DCP, ICP, MAS
Silicon	0.263 ± 0.004	DCP, FAAS, GRAV, ICP
Sulfur	0.0031 ± 0.0003	COMB-IR
Vanadium	0.234 ± 0.005	DCP, FAAS, ICP

The uncertainty listed for each certified value is expressed as the "combined uncertainty" calculated according to the ISO Guide [2]. Each value listed is the 95 % confidence limit of the "true value", and is intended to represent the combined effect of uncertainty components associated with various analytical factors, such as method imprecision, possible systematic errors among methods, and material variability.

Methods

COMB-IR	Combustion-infrared detection
DCP	Direct current plasma atomic emission spectrometry
FAAS	Flame atomic absorption spectrometry
GRAV	Gravimetry
ICP	Inductively coupled plasma atomic emission spectrometry
MAS	Molecular absorption spectrometry (spectrophotometry)
TITR	Titrimetry

The technical and support aspects involved in the preparation, certification, and issuance of this SRM were coordinated through the Standard Reference Materials Program by P.A. Lundberg and C.M. Beck II.

Gaithersburg, MD 20899

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¹Editorial Revision

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The overall coordination of the measurements leading to certification was performed under the direction of J.I. Shultz, Research Associate, ASTM-NIST Research Associate Program.

Statistical analysis was provided by L.M. Gill and L. Alvarez-Rojas of the NIST Statistical Engineering Division.

Elements other than those certified are present in this material as indicated below. These values are not certified, but are given as additional information on the composition of SRM 2172.

Table 2. Noncertified Mass Fractions

Element	(%)
Boron	<0.001
Calcium	0.001
Cobalt	0.007
Lead	<0.001
Tin	0.008
Tungsten	0.002

PLANNING, PREPARATION, TESTING, ANALYSIS

The material for this SRM was provided by Lukens Steel Co., Coatesville, PA.

Homogeneity testing was performed by J.H. Morris, Lukens Steel Co., Coatesville, PA.

Cooperative analyses for certification were performed in the following laboratories:

Allegheny Ludlum Steel Corp., Technical Center, Brackennidge, PA; R.M. Crain, S.A. Bissell-Seymour, C.M. Bottegall-Farell, J.L. Fleeger, and C.C. Gabrielli.

Armco Research and Technology, Middletown, OH; H.P. Vail and T.M. Minor.

Bethlehem Steel Corp., Homer Research Laboratories, Bethlehem, PA; D.A. Finchbaugh, T.A. Klotz and J.G. Matyas.

General Motors Corp., NAO Research and Development Center, Warren, MI; N.M. Potter, D.F. Esch and T.J. Chapaton.

LTV Steel Co., Indiana Harbor Works, East Chicago, IN; J.M. Hlebak, R.Isenbarger, E. Withrow, P. Logsdon, D.Dotson, A. Shoemaker and R. Behary.

REFERENCES

- [1] Taylor, B.N., "Guide for the Use of the International System of Units (SI)", NIST Special Publication 811, 1995 Ed., (April 1995).
- [2] Guide to the Expression of Uncertainty in Measurement, ISBN 92-67-10188-9, 1st Ed. ISO, Geneva, Switzerland, (1993); see also Taylor, B.N. and Kuyatt, C.E., "Guidelines for Evaluating and Expressing the Uncertainty of NIST Measurement Results", NIST Technical Note 1297, U.S. Government Printing Office, Washington, DC, (1994).