National Institute of Standards & Technology

Certificate of Analysis

Standard Reference Material® 1780

Naval Brass WK5

(In Cooperation with the Institute of Non-Ferrous Metals, Gliwice, Poland)

This Standard Reference Material (SRM) is in the form of a disk approximately 39.5 mm in diameter and 20 mm thick intended primarily for use in optical emission and X-ray fluorescence spectrometric methods of analysis. This material is one in a series of five monolithic naval brasses prepared to cover a range of compositions for particular elements of interest. The other naval brasses in this WK series are SRMs 1776, 1777, 1778, and 1779.

These SRMs were produced as part of a joint project between the NIST SRM Program and the Institute of Non-Ferrous Metals (IMN) in Gliwice, Poland under the sponsorship of the Marie Skłodowska-Curie Joint Fund. Actual preparation of these materials was performed at the IMN using specialized production facilities. The melting and casting technology used for the preparation of these materials was provided by M. Lachowski of the IMN [1].

The certified values for six elements are listed in Table 1. The analytical methods used for the characterization of this SRM are given in Table 2. All values are reported as mass fractions [2].

Table 1. Certified Mass Fractions

Element	(%)		
Aluminum	0.004	±	0.001
Antimony	0.002	±	0.001
Copper	64.92	±	0.15
Lead	0.006	±	0.002
Manganese	0.006	±	0.001
Tin	0.47	±	0.05

Certified Values and Uncertainties: The certified values are the means of the results from one or more analytical methods. The uncertainty listed for each certified value is expressed as the "combined uncertainty" calculated according to the ISO Guide [3]. 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.

Expiration of Certification: The certification of this SRM is valid, within the measurement uncertainties specified, until **31 December 2004**. Even though this material will likely remain stable for many years, the period of NIST certification has been abbreviated because the criteria used in the original certification, do not meet current NIST certification requirements [4]. This certification is nullified if the SRM is damaged, contaminated, or otherwise modified.

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Certificate Issue Date: 17 September 2003

John Rumble, Jr., Chief
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See Certificate Revision History on Last Page

The overall coordination of technical measurement and interlaboratory analyses were provided by W. Stankiewicz of the IMN and W.P. Reed of the NIST Office of Measurement Services.

Homogeneity testing was performed by E. Műller and S. Witkowska of the IMN, Gliwice, Poland and by P.A. Pella and M.L. Salit of the NIST Analytical Chemistry Division.

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

The technical and support aspects involved in the preparation, certification, and issuance of this SRM were coordinated through the NIST Standard Reference Materials Program by P.A. Lundberg. Support aspects involved in the issuance of the revised certificate were coordinated through the NIST Standard Reference Materials Program by B.S. MacDonald of the NIST Measurement Services Division.

Alloy Preparation: Each brass alloy was sequentially cast as four billets of material. Homogeneity testing was done prior to further processing. The billets were then heated in a resistance furnace to approximately 800 °C, followed by an extrusion press to the final 39.5 mm diameter. Homogeneity testing was done on each end of every rod and preliminary analysis was done by X-ray fluorescence spectrometry, optical emission spectrometry, and atomic absorption spectrometry. The final samples were then cut from selected samples representing the entire lot, milled into chips, and a composite produced. The certification was done using samples of the composite.

Table 2. Methods Used for the Analysis of SRM 1780

Elements	Methods[a]
Aluminum	FAAS, SPECTRO
Antimony	FAAS, FAAS-Fe
Copper	ELECTRO
Lead	FAAS, FAAS-Fe
Manganese	FAAS
Tin	FAAS

[a]Methods

ELECTRO	Electrolysis:	Copper at 1.5 A/dm^2 to 2.0 A/dm^2 and 2.0 V to 2.5 V Aluminum at 1.5 A/dm^2 to 2.0 A/dm^2 and 5 V to 6 V
FAAS	Flame atomic absorption spectrometry	
FAAS-Fe	FAAS after co-precipitation with $Fe(OH)_3$	
SPECTRO	Spectrophotometry	

Cooperative Analysts and Laboratories

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REFERENCES

[1] Műller, E.; Stankiewicz, W.; Lachowski, M.; *Preparation of the Material for Spectral Reference Materials for the Naval Brasses (MC62 and MC63) - 4th part*; (1992).

[2] Taylor, B.N.; *Guide for the Use of the International System of Units (SI), NIST Special Publication 811* (1995).

[3] *Guide to the Expression of Uncertainty in Measurement,* ISBN 92-67-10188-9, 1st Ed., ISO, Geneva, Switzerland (1993); see also Taylor, B.N.; 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); available at http://physics.nist.gov/Pubs/.

[4] May, W.; Parris, R.; Beck, C.; Fassett, J.; Greenberg, R.; Guenther, F.; Kramer, G.; Wise, S.; Gills, T.; Colbert, J.; Gettings, R.; MacDonald, B.; *Definitions of Terms and Modes Used at NIST for Value-Assignment of Reference Materials for Chemical Measurements*; NIST Special Publication 260-136, U.S. Government Printing Office: Washington, DC (2000).

Certificate Revision History: 17 September 2003 (Removal and de-certification of Bi, Fe, Ni, P, and Si certified values. Addition of expiration date); 18 July 1995 (Original certificate date).

Users of this SRM should ensure that the certificate in their possession is current. This can be accomplished by contacting the SRM Program at: telephone (301) 975-6776; fax (301) 926-4751; e-mail srminfo@nist.gov; or via the Internet http://www.nist.gov/srm.