

CERTIFICATE OF ANALYSIS

95X CDS50 P1 (batch A)

Reference Material Information

Type: TIN / LEAD / CADMIUM (CAST)
Form and Size: Disc 40mm Diameter x 15mm Thickness
Produced by: MBH Analytical Limited
Certified and supplied by: MBH Analytical Limited

Composition

Percentage element by weight

Element	Sb	Sn	As	Cu	Bi	Ag
%	0.113	50.1	0.027	0.26	0.13	0.030

Element	Al	Fe	Zn	Cd	In	Pb
%	<0.002	(0.0022)	0.007	18.1	0.092	31.0

Notes

- ¹ The above values are the present best estimates of the true content for each element. Each value is a panel consensus, based on the averaged results of an interlaboratory testing programme, detailed on page 3.
- ² These values are not certified (as defined by ISO), and should be treated with due caution. Values in parentheses are provided for information only.
- ³ Uncertainty values have not been derived, and are not given as part of this certification. However, the user may estimate uncertainties for each value, by reference to the tabulated data.

Certified by:

MBH ANALYTICAL LIMITED _____ on 28th May 2001
C Eveleigh

Method of Preparation

This reference material was produced from commercial-purity tin, lead and cadmium, and the minor and trace elements were added as individual elements or binary alloys. The melt was cast by sequential transfer of aliquots into iron chill moulds. 2mm has been removed from the working face to minimise any surface effects.

Sampling

Chemical analyses were carried out on turnings taken from the working faces of several discs. At least 10% of all discs were sampled.

Homogeneity

Homogeneity of the batch was checked by multiple wet testing only.

Chemical Analysis

Analysis was carried out on millings taken from samples representative of the product. It was performed by participating laboratories mostly operating within the terms of EN ISO/IEC 17025 - 2000, using documented standard methods of analysis.

The individual values listed overpage are the average of each analyst's results.

Traceability

Most of the analytical work performed to assess this material has been carried out by laboratories with proven competence, as indicated by their accreditation to a national authority. It is part of the requirement for this accreditation that analytical work should be performed with due traceability, via an unbroken chain of comparisons, each with stated uncertainty, to primary standards such as the mole, or to nationally- or internationally-recognised primary reference materials.

Usage

Intended use: With optical emission and X-ray fluorescence spectrometers.

Recommended method of use: Alloys of this type are generally prepared by machining on a lathe. However, users are recommended to follow the calibration and sample preparation methods specified by the relevant instrument manufacturer.

Preparation should be the same for reference materials and the samples for test.

A minimum of four consistent replicate analyses is recommended to optimise precision and accuracy. Users are advised to check against possible bias between reference materials and production samples due to differences in metallurgical history, and be aware of possible inter-element effects.

Analytical Data

Percentage element by weight

Sample	Sb	Sn	As	Cu	Bi	Ag
1	0.108	49.9	0.021	0.242	0.11	0.0285
2	0.109	50.12	0.024	0.25	0.124	0.029
3	0.110	50.38	0.028	0.264	0.127	0.029
4	0.12		0.030	0.27	0.132	0.032
5	0.12		0.030	0.275	0.15	0.034
Mean	0.113	50.13	0.027	0.260	0.129	0.030
Std Dev	0.006	0.24	0.004	0.014	0.014	0.002

Sample	Al	Fe	Zn	Cd	In	Pb
1	0.0002	0.0016	0.0066	17.9	0.088	30.88
2	0.001	0.002	0.0068	18.18	0.091	30.9
3	<0.001	0.0022	0.007	18.34	0.093	31.1
4	<0.001	0.003	0.008		0.094	
5	<0.001					
Mean	<0.002	0.0022	0.0071	18.14	0.092	30.96
Std Dev	-	0.0006	0.0006	0.22	0.003	0.12

Participating Laboratories

Bodycote Materials Testing	Middlesbrough, England	UKAS accreditation 0239
RoTech Laboratories	Wednesbury, England	UKAS accreditation 0366
Sheffield Assay Office	Sheffield, England	UKAS accreditation 0012
Universal Scientific Laboratory Pty Ltd	Milperra, NSW, Australia	NATA accreditation 0492
Laboratory Testing Inc	Hatfield, PA, USA	A2LA accreditation 0117

Note: to achieve National Accreditation (eg UKAS, A2LA, NATA), test houses must demonstrate conformity to the general requirements of EN ISO/IEC 17025 and ISO9002.

Analytical Methods Used

ELEMENT	RESULT No. & METHOD		
	ICP-AES	FAAS	OTHER
Antimony:	2, 3, 4	1, 5	2 volumetric (iodate)
Tin:	3	1	
Arsenic:	1, 2, 3	4, 5	
Copper:	1, 4, 5	2, 3	
Bismuth:	1, 2, 4	3, 5	
Silver:	1, 3, 4	2, 5	
Aluminium:	1, 4, 5	2, 3	
Iron:	1, 3	2, 4	
Zinc:	1, 2	3, 4	
Cadmium:	3	1, 2	
Indium:	2, 4	1, 3	
Lead:	2	1, 3	

Warning

This material contains significant quantities of cadmium, which is highly toxic. As such, it should only be handled by staff who are trained in handling materials of this type. All aspects of its use, storage and disposal should be in accordance with local and national regulations. Refer to your handling instructions prior to use.

Additional Notes

The unidirectional solidification effects associated with semi-chill casting may lead to the formation of inhomogeneous segregates in the rear portion of the disc. The above certification is therefore only applicable from the front face of the disc. Material to the rear of the disc, to a depth of ~5mm, is not certified.

This material is liable to superficial corrosion, and there is some possibility of microstructural changes due to recrystallisation; however, it will otherwise remain stable provided adequate precautions are taken to protect it from cross-contamination, extremes of temperature and atmospheric moisture. All production records will be retained for a period of 20 years from the date of this certificate. This certification will therefore expire in May 2021, although we reserve the right to make changes as issue revisions, in the intervening period.

This sample is also available in the form of chippings.

The manufacture, analysis and certification of this product were supervised by C Eveleigh, PhD, Technical Director, MBH Analytical Ltd.

The material to which this certificate of analysis refers is supplied subject to our general conditions of sale.