

Bundesanstalt für Materialforschung
und -prüfung (BAM)

in cooperation with Fachhochschule Münster,
Fachbereich Chemieingenieurwesen, Steinfurt

Certified Reference Material

BAM-H010

Acrylnitrile-Butadiene-Styrene-Copolymerisate (ABS)

Certified Values

Element	Mass Fraction in µg/g	Uncertainty U^* in µg/g
Lead	479	17
Bromine	240	21
Cadmium	93	5
Chromium	470	36

* The Uncertainty U is the expanded uncertainty with a coverage factor $k = 2$ and was determined according to the 'Guide to the expression of uncertainty in measurement' (GUM, ISO) 1993.

Informative Value

Element	Mass Fraction in µg/g
<i>Mercury</i>	<i>415</i>

The mass fraction of Mercury may be lower due to changes in temperature.

Material Description

The material is available in form of granulate (100 g in 250 mL glasses) and in the form of discs with a diameter of 4 cm and heights of 1, 2, or 6 mm.

Recommended Use

This reference material is especially intended for calibration, recalibration and checking of X-ray fluorescence spectrometers and for analytical methods, which require a wet chemical digestion step. The recommended minimum sample intake should be 0.2 grams.

This **certificate is valid for 2 years after dispatch.**

Date of dispatch:

Handling

It should be avoided to touch the sample surface with bare hands. If not possible otherwise, the surfaces can be cleaned with ethanol and a dust-free wipe. If the samples are exposed to high power X-ray tubes, as they are used in wavelength dispersive X-ray instruments, the sample material can take on a brownish colour. As soon as the sample material shows a distinct brown colour, it should not be used anymore and should be replaced. Further information on this topic can be found in the certification report.

Transport and Storage

To maintain the stability of the sample material it needs to be stored in the dark at room temperature and must not be exposed to excessive heating.

Participating Laboratories

BAM Bundesanstalt für Materialforschung und -prüfung, Berlin

AG Anorganische Prozessanalytik - RFA

AG Metallanalytik, anorganische Referenzmaterialien

AG Anorganische Umweltanalytik

AG Primärkalibriersubstanzen, Elementspurenanalytik

AG Isotopenanalytik

Helmholtz-Zentrum Berlin für Materialien und Energie GmbH, Abteilung

Elementanalytik, Berlin

Currenta GmbH & Co. OHG Services Analytik Elementanalytik / Kennzahlen,

Leverkusen

ThyssenKrupp Steel AG Werkstoffkompetenzzentrum

Prüfung und Analyse, Chemische Analytik Duisburg

California Department of Public Health (CDPH), Environmental Health Laboratory

Branch Richmond, CA, USA

Analytical Methods

Elements	Line No.		
Pb	1, 2, 4, 5, 10	ICP OES	
	3, 9	F AAS	
	6	IDMS	
	7	ICP MS	
	8	ET AAS	
	11	HR ICP MS	
	Br	1	Pyrohydrolysis with IC
		2, 3	NAA
		4	O ₂ Pressure
	Cd	1, 11	NAA
		2	F AAS
3, 4, 6, 7, 9		ICP OES	
5		ET AAS	
8		IDMS	
10		HR ICP MS	
Cr	1, 2	F AAS	
	3, 6, 8, 9	ICP OES	
	4	IDMS	
	5, 7	NAA	
Hg	1, 2, 11	CV AAS	
	3	IDMS	
	4	AMA	
	5, 7	NAA	
	6	HR ICP MS	
	8, 9, 10	ICP OES	
			Plasma Optical Emission Spectrometry
		Electrothermal Atomic Absorption Spectrometry	
		Flame Atomic Absorption Spectrometry	
		Neutron Activation Analysis	
		Combustion with Oxygen	
		Pyrohydrolysis with Ion Chromatography	
		Isotope Dilution Mass Spectrometry	
		High Resolution Inductively Coupled Plasma Mass Spectrometry	
		Advanced Mercury Analyser	
		Cold Vapour Atomic Absorption Spectrometry	
		Inductively Coupled Plasma Mass Spectrometry	

Means of Accepted Data Sets

Certified Values
Mass Fraction in $\mu\text{g/g}$

Line No.	Lead	Bromine	Cadmium	Chromium
1	452.7	226.5	86.0	407.1
2	470.8	231.4	90.0	410.0
3	475.0	234.0	90.8	442.0
4	475.4	266.2	91.0	480.0
5	476.3		91.4	485.8
6	480.3		91.5	494.8
7	481.2		94.2	510.0
8	485.2		94.2	526.5
9	486.8		94.7	–
10	508.6		100.8	
11	–		101.9	
M	479.2	239.5	93.3	469.5
s_M	14.0	18.1	4.6	44.9

Informative Value
Mass Fraction in $\mu\text{g/g}$

Mercury
374.6
396.7
406.7
407.8
421.0
422.3
423.2
424.5
428.3
446.1
–

Results labelled with "–" represent results, which were, after a statistical test (Grubbs-Test, 95 %) recognized as outliers and were not taken into account for the final result.

The series of measurements comprise the single measurement results of a lab (as a rule 6 single measurements).

M: Arithmetic mean of the series of measurements.

s_M: Standard deviation of the averages of the series of measurements.

Metrological Traceability

For the elements Cr, Cd and Pb traceability has been achieved using high purity back spikes for IDMS providing traceability directly to the SI.

The contribution $u_{\text{calibration}}$ to the traceability chain to the whole uncertainty of the CRM consists of the uncertainty of the back spikes and half of the remaining difference between certified values and the values ascertained with IDMS. For the element Br the basis of the traceability is established by NAA. The inquiry of the contribution to the whole uncertainty of the CRM occurs in the same manner.

Literature

Bericht zur Zertifizierung der Massenanteile von Chrom, Brom, Cadmium und Blei in Acrylnitril-Butadien-Styrol Copolymerisat (ABS), 2010, M. Ostermann,
<http://www.rm-certificates.bam.de/en/certificates/index.htm>

BAM:2006 "Guidelines for the Production of BAM Reference Materials"
<http://www.bam.de/en/fachthemen/referenzmaterialien/index.htm>

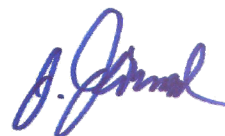
Accepted as BAM-CRM on

Bundesanstalt für Materialforschung und -prüfung (BAM)



Dr. F. Emmerling
Head of Department 1

Analytical chemistry,
reference materials



Dr. M. Maiwald
Head of Division 1.4

Process analytics

This Reference Material is offered by:

Bundesanstalt für Materialforschung und -prüfung (BAM)

Richard-Willstätter-Straße 11, 12489 Berlin, Germany

Tel: +49 30 8104 2061

E-Mail: sales.crm@bam.de

Fax: +49 30 8104 1117

Internet: www.webshop.bam.de