



**Slovenský metrologický ústav**  
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# CATALOGUE

**OF CERTIFIED REFERENCE MATERIALS**

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Slovak Institute of Metrology (SMU) is providing the role of national metrology system in Slovakia.

SMU has responsibility for the realization, maintenance and improvement of standards and standard equipment and their international comparisons to assure uniformity, compatibility and accuracy of the measurement accomplished in the Slovakia Primary responsibilities of the Department of Chemistry metrology are research and maintenance of national and other standards, provision of metrological services, preparation, and certification of reference materials (CRM) production

The need for CRMs is increasing with introduction of certification and accreditation systems (e.g. according to ISO 9001 and ISO 17025 standards) and ISO/IEC recommendations to calibration and testing laboratories.

## DEVELOPMENT, PREPARATION AND DISTRIBUTION OF CRM

In the process of CRM development the homogeneity and stability are evaluated according to ISO 17034, resp. The uncertainty of each CRM value includes stability contribution for a declared expiration time.

Standards which are used in certification measurements of CRMs:

### **National standard of mole fraction in gaseous phase**

is based on the preparation of gas mixture of defined composition by weighing pure substances and validation of these mixtures according to ISO 6142 and ISO 6143. It serves for providing traceability of gas mixtures measurement, certification of gas mixtures as well as for metrology assurance of exhaust gases and natural gas measurements.

### **National standard of spectral transmittance**

is based on absolute measurement of spectral transmittance and absorbance of optically permeable substances in the spectral range (180 – 800) nm. The standard provides metrology assurance for measurements of spectral transmittance and derived quantities.

### **Other standard of refractive index**

consists of the spectrogoniometer and standard prisms. It serves for spectrogoniometric measurement of the refractive index in visible range. Transfer of the refractive index scale is realised via certified reference materials or via a set of standard prisms calibrated on the national standard.

### **National standard of electrolytic conductivity**

is based on the absolute measurement of conductivity in an electrolytic cell with calculable value of the cell constant.

### **National standard of pH**

is based on the primary pH measurement using Harned cell, consisting of hydrogen and Ag/AgCl electrodes. The pH values are further transferred by primary certified reference materials.

### **National standard of amount of substance**

works on the principle of equivalence of the electric charge and amount of substance described by Faraday's law. It serves for the realisation of unit of amount of substance and its transfer by primary certified reference materials.

### **National standard of density**

consists of a set of quartz immersion bodies that have their volume determined by hydrostatic weighing method, performed on high precision primary balances and by means of weight standards at a defined temperature.

## DEFINITIONS

### **Reference material (RM):**

material, sufficiently homogeneous and stable with reference to specified properties, which has been established to be fit for its intended use in measurement or in examination of nominal properties.

### **Certified reference material (CRM):**

reference material, accompanied by documentation issued by an authoritative body and providing one or more specified property values with associated uncertainties and traceabilities, using valid procedures.

### **Primary reference material (PRM):**

reference material established using a primary reference measurement procedure.

### **Secondary reference material:**

reference material established through calibration with respect to a primary reference material for a quantity of the same kind.

### **Expiry date:**

A date, stated by the manufacturer and confirmed by the certifying authority, supplied together with a reference material, indicating the end of the period of validity of use of the material for reference purposes when it is stored under specified conditions.

### **Uncertainty of measurement:**

non-negative parameter characterizing the dispersion of the quantity values being attributed to a measurand, based on the information used.

Unless otherwise stated, all uncertainties given in this catalogue are expanded uncertainties with coverage factor  $k=2$ .

### **Metrological traceability:**

property of a measurement result whereby the result can be related to a reference through a documented unbroken chain of calibrations, each contributing to the measurement uncertainty.

### **Calibration:**

operation that, under specified conditions, in a first step, establishes a relation between the quantity values with measurement uncertainties provided by measurement standards and corresponding indications with associated measurement uncertainties and, in a second step, uses this information to establish a relation for obtaining a measurement result from an indication.

### **Measurement standard:**

realization of the definition of a given quantity, with stated quantity value and associated measurement uncertainty, used as a reference.

### **Certified value:**

value, assigned to a property of a reference material, that is accompanied by an uncertainty statement and a statement of metrological traceability, identified as such in the RM certificate.

## SYMBOLS

$U$  – expanded uncertainty - quantity defining an interval about the result of a measurement that may be expected to encompass a large fraction of the distribution of values that could reasonably be attributed to the measurand

$u_C$  – combined standard uncertainty

$w$  – mass fraction

$\nu$  – kinematic viscosity

$\eta$  – dynamic viscosity

$n_D^{20}$  – refractive index at 20°C and wavelength 589.29 nm

## EXPIRY DATE

The stability of values represented by any reference material is always limited. Expiration dates are listed in the CRM certificates. Expiration dates are calculated from the certification dates. Current expiry dates of CRMs are given in price offers from SMU. Many CRMs are prepared in larger batches, in order to be always in stock. A new batch of RMs is usually prepared before the expiration date of the previous batch. A special batch can be prepared on request so that full validity period is available; price for such a batch will be calculated individually.

Type	Code	Validity period from certification (years)
Primary CRM of composition	A01, A04, A07	5
Primary CRM of composition	A02, A03, A05, A08	10
Single element solutions	B01 to B37	2
Anion solutions	B50 to B54	2
PRM of gases	D01 to D23	2
Primary CRM of pH	E10 to E14	3
Secondary CRM of pH	E20, E21, E22, E25 E30, E31, E32, E35	2
Secondary CRM of pH	E23, E24 E33, E34	1
Electrolytic conductivity	F03 to F10 F31, F32	0.5
Electrolytic conductivity	F21 to F30, F33	1
Refractive index	H01 to H07	5
CRM for UV-VIS spectrometry	J01, J01a, J02, J02a, J03, J04	5
Carbon steels	M01 to M03	10
Blast furnace slags	M11 to M21	15
Density	T02	1
Density	T05	2

## ORDERING

Purchase orders for all CRM from our catalogue should be sent to:

**Slovak Institute of Metrology**  
**Department of services and**  
**business activities**  
**Karloveská 63**  
**SK-842 55 Bratislava 4**  
**Slovak Republic**

Contacts:

[cenoveponuky@smu.gov.sk](mailto:cenoveponuky@smu.gov.sk) (requests for price proposals)

[crm@smu.gov.sk](mailto:crm@smu.gov.sk) (orders)

Tel.: +421 2 602 94 521

When placing an order please state on the order:

1. brief description of RM
2. catalogue code
3. quantity required
4. price

### **Warranty:**

SMU warrants declared values presented in the certificates of our CRM during their validity. If a material proves to be defective, SMU must be notified within 30 days from receipt of the material and the SMU will replace this CRM or refund its price.

### **Toxicity and Hazards:**

Due to hazardous nature of some products, they should be handled by trained personnel only and some restrictions on the delivery mode may apply.

### **Delivery:**

CRMs will be shipped after processing the order (see also General terms and conditions). For CRMs prepared individually the delivery date will be agreed with the customer. CRM shipment's cost is paid by the customer. Subject, size, weight, and category of material limitation of shipment may apply.



# CRM FOR CALIBRATION PURPOSES

## Inorganic analysis

### A01 to A08 - Content of the major component

Primary CRMs provide direct traceability of the chemical measurement to the SI. Their amount of substance content is certified by precision coulometric titration on the SMU standard equipment.

These CRMs are used for determination of amount content (or mass fraction) of working RMs („standard substances“). They can be used directly for either determination of concentration of volumetric solutions or their preparation, if low uncertainty is essential.

Certified value is the amount content, values recalculated to purity are given here for easy comparison.

Code	CRM	Approx. purity (%)	U (k=2) (%)	Mass (g)
A01	Amidosulphuric acid	99.98	0.012	20
A02	Potassium hydrogen phthalate	99.91	0.008	25
A03	Arsenic(III) oxide	99.98	0.008	20
A04	Potassium dichromate	99.99	0.007	25
A05	Potassium chloride	99.99	0.013	20
A07	TRIS	99.91	0.027	20
A08	Potassium iodate	100.00	0.019	20



## B01 to B37 – Single element solutions

Single element CRMs are intended for calibration purposes in measurements using instrumental techniques - AES, AAS, AFS or other analytical method. Their mass concentration is determined by refined high-accuracy titration methods and the values are traceable to SMU primary reference materials or directly to SMU standard for amount of substance. Nominal mass concentration of single element solutions is  $1 \text{ g}\cdot\text{L}^{-1}$ .

Code	Element	Nominal U (k=2) ( $\text{g}\cdot\text{L}^{-1}$ )	Matrix
B01	Ag	0.002	2 % $\text{HNO}_3$
B02	Al	0.002	2 % HCl
B03	As	0.003	4 % $\text{HNO}_3$
B04	B	0.002	$\text{H}_2\text{O}$
B05	Ba	0.002	2 % $\text{HNO}_3$
B06	Bi	0.002	10 % $\text{HNO}_3$
B07	Ca	0.002	0.5 % $\text{HNO}_3$
B08	Cd	0.002	2 % $\text{HNO}_3$
B09	Co	0.002	2 % $\text{HNO}_3$
B10	Cr	0.002	2 % HCl
B12	Cu	0.002	2 % $\text{HNO}_3$
B13	Fe	0.002	5 % $\text{HNO}_3$
B15	Hg	0.003	5 % $\text{HNO}_3$
B18	K	0.002	$\text{H}_2\text{O}$
B20	Mg	0.002	0.5 % $\text{HNO}_3$
B21	Mn	0.002	2 % $\text{HNO}_3$
B23	Na	0.002	$\text{H}_2\text{O}$
B24	Ni	0.002	2 % $\text{HNO}_3$
B25	P	0.003	$\text{H}_2\text{O}$
B26	Pb	0.002	2 % $\text{HNO}_3$
B31	Sn	0.003	20 % HCl
B32	Sr	0.002	2 % $\text{HNO}_3$
B35	Tl	0.003	2 % $\text{HNO}_3$
B36	V	0.003	5 % $\text{HNO}_3$
B37	Zn	0.002	2 % $\text{HNO}_3$

Volume: 100 mL



## B50 to B54 – Anion solutions

Anion CRMs are intended for calibration purposes in measurements using instrumental techniques - IC, electrophoresis, ion-selective electrode measurement or other analytical methods. Their mass concentration is determined by refined high-accuracy titration methods and the values are traceable to SMU primary reference materials or directly to SMU standard for amount of substance.

CRM code	Anion	Nominal mass concentration (g·L <sup>-1</sup> )	U (k=2) (g·L <sup>-1</sup> )
B50	Cl <sup>-</sup>	1.000	0.002
B51	PO <sub>4</sub> <sup>3-</sup>	1.000	0.003
B52	SO <sub>4</sub> <sup>2-</sup>	1.000	0.002
B53	NO <sub>3</sub> <sup>-</sup>	1.000	0.002
B54*	NO <sub>2</sub> <sup>-</sup>	1.000	0.0023

Volume: 250 mL  
\* 100 mL



## Mole fraction in gaseous phase

### D01 to D23 – PRMs of selected gas mixtures

Certified reference materials of gas mixtures are prepared on the Slovak primary standard equipment for gas mixtures, keeping the newest ISO standards: ISO 6143 (2001) Gas analysis – Determination of the composition of calibration gas mixtures – Comparison methods and ISO 6142-1 (2015) Gas analysis – Preparation of calibration gas mixtures Part 1: Gravimetric method for Class I mixtures implemented at SMU working procedures. Each PRM undergoes validation process in analytical comparison against maintained appropriate set of Primary Standard Mixtures at SMU.

Code	PRM of gas mixture	Component	Mole fraction range (mol/mol)	$U_{rel}(k=2)$ (%)
D01, D11	CO, CO <sub>2</sub> , propane in N <sub>2</sub>	CO <sub>2</sub>	0.06 - 0.14	0.2 – 0.2
		CO	0.005 - 0.035	0.30 - 0.25
		propane	0.0001 - 0.002	0.4 – 0.4
D02, D12	CO <sub>2</sub> in N <sub>2</sub>		0.0001 - 0.20	0.5 – 0.2
D03, D13	CO in N <sub>2</sub>		0.000003- 0.20	1.0 - 0.25
D04, D14	propane in N <sub>2</sub>		0.0001 - 0.01	0.4 – 0.4
D05, D15	ethanol in N <sub>2</sub>		0.00005 - 0.0008	1.0 - 0.70
D06, D16	natural gas	Methane	0.5 - 0.98	0.16
		Ethane	0.002 - 0.20	0.32
		Propane	0.0005 0.1	0.54
		n-butane	0.0005 0.015	0.58
		iso-butane	0.0005 - 0.015	0.56
		n-pentane	0.0001 - 0.0025	0.82
		iso-pentane	0.0001 - 0.0025	0.98
		neopentane	0.0001 – 0.0025	1.06
		n-hexane	0.0001 - 0.0025	0.88
		CO <sub>2</sub>	0.005 - 0.2	0.42
		N <sub>2</sub>	0.005 - 0.25	0.31
H <sub>2</sub>	0.005 – 0.1	1.11		
D21	SO <sub>2</sub> v N <sub>2</sub>		0.00001 – 0.0001	1.5-1.0
D22	NO v N <sub>2</sub>		0.00001 – 0.0001	1.5-1.0
D23	NO <sub>2</sub> in Air		0.00001 – 0.0001	16.6
D20	stack gases	CO <sub>2</sub>	0.05-0.20	0.2-0.2
		CO	0.00001-0.00100	0.7-0.4
		Propane	.0.000006-0.00010	1.0-1.0
		NO	0.00001-0.00100	1.5-1.0
		SO <sub>2</sub>	0.00001-0.00100	1.5-1.0

<b>D90, D113</b>	<b>biogas</b>	<b>Methane</b>	0.35-0.95	0.15-0.15
		<b>Ethane</b>	0.00002-0.00500	0.84-0.84
		<b>Propane</b>	0.00002-0.00500	0.80-0.80
		<b>CO<sub>2</sub></b>	0.04-0.45	0.33-0.33
		<b>N<sub>2</sub></b>	0.04-0.25	0.16-0.16
		<b>H<sub>2</sub></b>	0.002-0.030	1.64-1.64
		<b>O<sub>2</sub></b>	0.002-0.015	0.86-0.86

**Packing:** Filling to the own aluminium cylinders with inner volume 5 dm<sup>3</sup> at 10 MPa. Natural gas is delivered at only 5 MPa. SMU provides for all these PRMs 2 years warranty.

On request, other mole fractions or mixtures with other components can be prepared.



Aluminium cylinders with inner volume 5 dm<sup>3</sup>

## CRMs of PHYSICOCHEMICAL PROPERTIES

### pH

The buffers are intended for the calibration of pH instruments and for calibration of working buffers.

#### E10 to E14 – Primary buffers

The value of the primary buffers is determined by primary measurement in Harned cells using hydrogen and Ag/AgCl electrodes on the National standard of pH.

Code	Type	Nominal pH at 25°C	U (k=2)
E10	Tetraoxalate	1.68	0.005
E11	Oxalate	4.00	0.005
E12	Phosphate	7.00	0.005
E13	Borate	9.18	0.005
E14	Carbonate	10.00	0.005

Volume: 5 × 20 mL



## E20 to E25 – Secondary buffers

The value of secondary buffers is traceable to primary buffers.

Code	Type	Nominal pH at 25°C	U (k=2)
E20	Tetraoxalate	1.68	0.02
E21	Oxalate	4.00	0.02
E22	Phosphate	7.00	0.02
E23*	Borate	9.18	0.02
E24*	Carbonate	10.00	0.02
E25*	Succinate	5.00	0.02

Volume: 150 mL

\*125 mL

## E30 to E35 – Secondary buffers

Code	Type	Nominal pH at 25°C	U (k=2)
E30	Tetraoxalate	1.68	0.02
E31	Oxalate	4.00	0.02
E32	Phosphate	7.00	0.02
E33	Borate	9.18	0.02
E34	Carbonate	10.00	0.02
E35	Succinate	5.00	0.02

Volume: 500 mL



## Electrolytic conductivity

CRM are designed for the traceability of working RMs of the conductivity or the calibration of working conductivity meters. The CRMs consist of KCl or HCl aqueous solutions.

### F03 to F10 and F21 to F33 – CRMs of the electrolytic conductivity

The value of the electrolytic conductivity of solutions is measured on the National standard of electrolytic conductivity.

Code	Nominal electrolytic conductivity		U (k=2) (S·m <sup>-1</sup> )	Base component	Temperature coefficient (K <sup>-1</sup> )
	(S·m <sup>-1</sup> )	(μS·cm <sup>-1</sup> )			
F03	2	20000	0.0020	HCl	0.0145
F04	1	10000	0.0010	HCl	0.0145
F05	0.5	5000	0.00050	HCl	0.0145
F06	0.2	2000	0.00020	HCl	0.0145
F07	0.1	1000	0.00010	HCl	0.0145
F08	0.05	500	0.00010	HCl	0.0145
F09	0.02	200	0.000040	HCl	0.0146
F10	0.01	100	0.000020	HCl	0.0147
F21	10	100000	0.020	KCl	0.0178
F22	5	50000	0.010	KCl	0.0186
F23	2	20000	0.0040	KCl	0.0190
F24	1	10000	0.0020	KCl	0.0192
F25	0.5	5000	0.0010	KCl	0.0193
F26	0.2	2000	0.00040	KCl	0.0193
F27	0.1	1000	0.00020	HCl	0.0145
F28	0.05	500	0.00015	HCl	0.0145
F29	0.02	200	0.000060	HCl	0.0146
F30	0.01	100	0.000030	HCl	0.0147
F31	0.005	50	0.000025	HCl	0.0149
F32	0.0084	84	0.000025	HCl	0.0147
F33	0.1411	1411	0.00028	HCl	0.0145

Volume: 250 mL





## Density

### T02 and T05 – Secondary CRMs of density

CRMs are used for calibration of working standards and field measuring instruments. The certified values are traceable to the primary SMU standard of density. Actual values of density at temperatures 15, 20, 25, and 30°C are given in the CRM certificate.

Code	Type	Nominal density ( $\text{kg}\cdot\text{dm}^{-3}$ )	U (k=2) ( $\text{kg}\cdot\text{dm}^{-3}$ )
		20°C	
T02	Ethanol	0.808	0.0004
T05	Mineral oil	0.836	0.0004

Volume: 100 mL



## Refractive index

### H01 to H07 – CRMs of refractive index

CRMs are intended for calibration and measurement validation of refractometers.

Code	Material	$n_{D}^{20}$	U (k=2)
H01	1-butanol	1.3992	0.00004
H02	p-xylene	1.4958	0.00004
H03	monobromobenzene	1.5598	0.00004
H04	1 - bromonaphthalene	1.6579	0.00004
H05	oil B01	1.4929	0.00004
H06	oil JYO	1.4464	0.00004
H07	medicinal oil	1.4669	0.00004

Volume: 1 mL



## Absorbance /spectral transmittance and associated quantities

### J01 – Wavelength scale for UV-VIS spectrometry – Water solution of holmium oxide

CRM is intended for the calibration of the wavelength scale of spectrometers in the UV-VIS spectral range.

Wavelength of minimum spectral transmittance of specific bands of Ho(III) solution with a 1 cm light path cell at 20°C to 30°C:

Band width (nm)	Band number and corresponding wavelength in nm													
	1	2	3	4	5	6	7	8	9	10	11	12	13	14
0.1 - 2	241	250	278	288	333	345	360	386	416	451	468	485	537	641

**Volume:** 10 mL

Complete list of values of the wavelengths for different spectral band widths (0.1 nm, 0.2 nm, 0.5 nm, 1.0 nm, 2.0 nm) and their corresponding uncertainties (from 0.06 nm to 0.3 nm) is given in the certificate provided with the CRM.

### J01a – Wavelength scale for UV-VIS spectrometry – Water solution of neodymium oxide

CRM is intended for the calibration of the wavelength scale of spectrometers in the VIS spectral range as a supplement to J01 for wavelength higher than 575 nm.

Wavelength of minimum spectral transmittance of specific bands of Nd(III) solution at different spectral band widths with a 1 cm light path cell at 20°C to 30°C:

Band width (nm)	Band number and corresponding wavelength in nm						
	1	2	3	4	5	6	7
0.1 - 5	575	679	731	740	794	801	865

**Volume:** 10 mL

Complete list of values of the wavelengths for different spectral band widths (0.1 nm, 0.2 nm, 0.5 nm, 1.0 nm, 2.0 nm, 3.0 nm, 4.0 nm, 5.0 nm) and their corresponding uncertainties (from 0.049 nm to 0.075 nm) is given in the certificate provided with the CRM.

## J02 – Absorbance scale for UV-VIS spectrometry – Water solution of potassium dichromate

CRM is intended for the calibration of the absorbance scale of spectrometers in the UV-VIS spectral range.

Absorbance of solutions with a 1 cm light path cell at 25°C for spectral bandwidth 1 nm and for different wavelengths:

Solution No.	Nominal absorbance at given wavelength				
	235 nm	257 nm	313 nm	345 nm	350 nm
1	0.24	0.28	0.09	0.21	0.21
2	0.49	0.57	0.19	0.42	0.42
3	0.74	0.86	0.28	0.63	0.64
4	0.99	1.15	0.38	0.84	0.85
5	1.24	1.44	0.48	1.06	1.07

**Volume:** 6 × 10 mL

Complete list of values of absorbances and their corresponding uncertainties (from 0.0023 to 0.0036) is given in the certificate provided with the CRM.

## J02a – Absorbance scale for UV-VIS spectrometry – Water solution of potassium dichromate

CRM is intended for the calibration of the absorbance scale of spectrometers in the UV-VIS spectral range.

Absorbance of solutions with a 1 cm light path cell at 25°C for wavelength 430 nm and for spectral bandwidth 1 nm and 2 nm:

Wavelength (nm)	Spectral bandwidth (nm)	Solution Nr.	Nominal absorbance	Expanded uncertainty (k=2)
430	1	1	0.30	0.0012
		2	0.62	0.0023
		3	0.95	0.0036
		4	1.28	0.0036
430	2	1	0.30	0.0012
		2	0.62	0.0024
		3	0.95	0.0036
		4	1.28	0.0037

**Volume:** 5 × 20 mL

Complete list of values of absorbances and their corresponding uncertainties is given in the certificate provided with the CRM.

### J03 – Absorbance scale for UV-VIS spectrometry – Water solutions of cobalt and nickel ions

CRM is intended for the calibration of the absorbance scale of spectrometers in the UV-VIS spectral range.

Absorbance of solution with a 1 cm light path cell at 25°C for different wavelengths and spectral band widths:

Spectral bandwidth	Solution No.	Nominal absorbance at given wavelength			
		302 nm	395 nm	512 nm	678 nm
1 nm	1	0.29	0.28	0.28	0.11
	2	0.61	0.59	0.58	0.22
	3	0.94	0.90	0.89	0.34

Volume:  $4 \times 10$  mL

Complete list of values of absorbances and their corresponding uncertainties (from 0.0021 to 0.0092) is given in the certificate provided with the CRM.

### J04 – Heterochromatic stray light for UV-VIS spectrometry – Potassium iodide

CRM is intended for the calibration of heterochromatic stray light in the UV region for wavelength of 260 nm and spectral bandwidth 0.2 nm.

The specific absorption coefficient of water solutions with 1 cm light path cell at 23.5°C for spectral band width 0.2 nm:

Wavelength (nm)	Nominal specific absorption coefficient ( $\text{dm}^3 \cdot \text{g}^{-1} \cdot \text{cm}^{-1}$ )	U (k = 2) ( $\text{dm}^3 \cdot \text{g}^{-1} \cdot \text{cm}^{-1}$ )
255	1.05	0.07
258	0.46	0.024
260	0.26	0.016
265	0.05	0.0040

Mass: 10 g

Complete list of values of specific absorption coefficients and their corresponding uncertainties is given in the certificate provided with the CRM.



## CRM FOR QUALITY CONTROL

### Metallurgy

#### M01 to M03 – Carbon steel

CRMs are intended for validation of methods for determination of carbon and sulphur in carbon steels and for calibration of instruments for determination of carbon and sulphur.

Certified values of elements:

Code	Element	Mass fraction (%)	U (k=2) (%)
M01	C	0.090	0.004
	S	0.057	0.004
M02	C	1.34	0.02
	S	0.007	0.002
M03	C	5.63	0.04
	S	0.008	0.002

Mass: 150 g



## M11 to M21 – Blast-furnace slags

These CRMs are used in metallurgical and chemical industry, civil engineering and geology for quality control of chemical methods of individual components analysis. Raw materials of these CRMs present original blast furnace slags except four CRMs (M17, M19, M20, M21) which were specially prepared.

Comp onent	SiO <sub>2</sub>		CaO		MgO		Al <sub>2</sub> O <sub>3</sub>		Fe total		S total		MnO		TiO <sub>2</sub>	
	Mass fraction (%)	U (%)	Mass fraction (%)	U (%)	Mass fraction (%)	U (%)	Mass fraction (%)	U (%)	Mass fraction (%)	U (%)	Mass fraction (%)	U (%)	Mass fraction (%)	U (%)	Mass fraction (%)	U (%)
<b>M11</b>	35.3	0.3	38.8	0.3	12.0	0.3	10.0	0.2	0.21	0.04	-	-	0.47	0.05	0.32	0.03
<b>M12</b>	38.5	0.2	-	-	16.8	0.4	7.05	0.08	0.59	0.05	-	-	1.24	0.03	0.34	0.03
<b>M13</b>	39.0	0.2	31.2	0.5	18.9	0.3	6.2	0.1	0.55	0.06	-	-	0.78	0.03	0.39	0.03
<b>M14</b>	39.1	0.2	42.1	0.4	6.1	0.2	8.4	0.1	0.30	0.05	-	-	0.73	0.03	0.30	0.03
<b>M15</b>	32.8	0.3	49.6	0.2	1.1	0.1	9.2	0.2	-	-	1.17	0.08	0.60	0.04	0.38	0.04
<b>M16</b>	44.0	0.3	31.2	0.3	0.73	0.04	7.94	0.06	5.5	0.1	0.14	0.03	3.40	0.06	0.91	0.03
<b>M17</b>	21.9	0.3	29.4	0.5	17.5	0.5	24.0	0.2	-	-	-	-	-	-	-	-
<b>M18</b>	51.4	0.5	-	-	-	-	45.2	0.2	-	-	-	-	0.06	0.01	-	-
<b>M19</b>	20.3	0.2	28.7	0.2	8.0	0.1	38.6	0.2	1.12	0.03	-	-	0.26	0.03	0.78	0.04
<b>M20</b>	33.57	0.06	30.1	0.3	9.3	0.2	24.0	0.2	-	-	-	-	-	-	-	-
<b>M21</b>	-	-	28.0	0.2	9.2	0.2	14.5	0.1	1.68	0.09	-	-	0.58	0.02	-	-

Mass: 75 g

