

Preliminary Product Information Sheet

Microanalytical Reference Material

CRMS-NP-B03

Nano-particulate pressed powder pellet

Reference Values

Analyte	Value	Uncertainty (95% CL)	Unit
Ca	33.2	0.7	g/100g
Li	7.29	0.64	μg/g
B*	33.2	5.7	μg/g
Na	4271	163	μg/g
Mg	23941	692	μg/g
Al	1207	38	μg/g
Si	9461	371	μg/g
P	521	26	μg/g
K	427	21	μg/g
V	2.91	0.44	μg/g
Cr	12.9	2.6	μg/g
Mn	254	17	μg/g
Fe	2479	88	μg/g
Co	2.33	0.12	μg/g
Ni	9.85	1.20	μg/g
Cu	86.8	5.7	μg/g
Zn	42.9	3.2	μg/g
Ga	0.42	0.04	μg/g
Rb	2.21	0.15	μg/g

Information Values

Analyte	Value	Uncertainty (95% CL)	Unit
Be	13.5		μg/g
S	3519	328	μg/g
Sc	0.3		μg/g
Ti	45		μg/g
Ge	0.12		μg/g
As	2.64	0.62	μg/g
Se	0.32		μg/g
Zr	170	30	μg/g
Nb	0.220		μg/g
Mo	1.46		μg/g
Ag	3.3		μg/g
Cd	0.3		μg/g

Reference Values

Analyte	Value	Uncertainty (95% CL)	Unit
Sr	2663	59	μg/g
Y	1.15	0.14	μg/g
Cs	0.27	0.02	μg/g
Ba	38.5	2.3	μg/g
La	6.62	1.40	μg/g
Pr	0.281	0.041	μg/g
Nd	1.09	0.15	μg/g
Sm	0.18	0.02	μg/g
Eu	0.04	0.01	μg/g
Gd	0.16	0.02	μg/g
Tb	0.03	0.01	μg/g
Dy	0.16	0.02	μg/g
Ho	0.03	0.01	μg/g
Er	0.10	0.02	μg/g
Yb	0.10	0.02	μg/g
Lu	0.016	0.005	μg/g
Th	0.17	0.03	μg/g
U	0.416	0.037	μg/g

Information Values

Analyte	Value	Uncertainty (95% CL)	Unit
Sn	9.57	1.78	μg/g
Sb	1.15	0.29	μg/g
Te	0.007		μg/g
Ce	19.1	5.0	μg/g
Tm	0.011	0.002	μg/g
Hf	2.25	0.41	μg/g
Ta	0.03		μg/g
W	0.118		μg/g
Re	0.001		μg/g
Tl	0.022		μg/g
Pb	391		μg/g
Bi	0.36		μg/g

The assigned values represent the mean of laboratory means. The reference values were obtained through measurements performed on the nano-powder using two or more methods (ICP-MS, ICP-AES, XRF) in two or three competent laboratories. Further, each laboratory's performance was statistically evaluated following recommendations from ISO Guide 35^[1].

Verifying homogeneity and stability tests were performed on Nano-Pellets of the batch CRMS-NP-B01 using LA-ICP-MS and in accordance with ASTM E826-14^[2], ISO 13528^[3], and ISO Guide 35. These two components were then combined with uncertainty component related to characterisation and expanded to a confidence level of 95 %. While the absolute reference values are the same, the uncertainties are not exactly transferable to the batch CRMS-NP-B03.

The expanded uncertainty is composed of the uncertainty components from characterisation, as well as from the homogeneity, and stability. Unless stated otherwise a coverage factor $k = 2$ was applied to reach a confidence level of 95 %, as defined in the Guide to the Expression of Uncertainty in Measurement (GUM)^[4].

Information values did not fulfil all necessary statistical criteria of a reference value and should neither be considered for calibration nor validation. The information values, which have an uncertainty were demoted due to the calculated combined expanded uncertainty not being usable and or due to insufficient characterisation.

*Boron was characterized using Solution-SF-ICP-MS as a single reference measurement procedure (as defined in ISO/IEC Guide 99^[5]) in a single laboratory and has a coverage factor of $k = 2.8$.

Strontium Isotope Measurement Information Values (ID-TIMS)

Analyte	Value	Uncertainty (2SD)	Uncertainty (95% CL)
⁸⁷ Sr/ ⁸⁶ Sr	0.709190	0.000011	0.000040

The ⁸⁷Sr/⁸⁶Sr isotope ratio was determined using an accredited method in which three aliquots were measured by TIMS after acid digestion and strontium separation.

This product information sheet is valid for:

Pellet serial number: {SERIENNUMMER}

Date of dispatch: {LIEFERDATUM}

Intended Use

This microanalytical reference material (MRM) is designed for use by laboratories undertaking the determination of major and trace element mass fractions in calcium carbonate and equivalent matrices with LA-ICP-MS (Laser Ablation Inductively Coupled Plasma Mass Spectrometry). It is suitable for calibration and as a secondary reference material for the assessment of a measurement procedure and quality control. Note that the material may only be used for a single purpose in the same measurement process. For example, it must not be used for calibration and method validation at the same time.

Description of the MRM

This MRM is a nanoparticulate pressed powder pellet of the coral powder "CRMS". CRMS is the abbreviation for Corallium Rubrum Mediterranean Sardinia. The original coral fragments were milled to a particle size of $< 40 \mu\text{m}$. The resulting powder was subjected to our own material-specific milling protocol, freeze-dried, homogenised, and split into batches. Pellets with a diameter of 10 mm are pressed without any binders using a programmable hydraulic press. The fortification of contrasting colour surrounding the reference material is, according to the manufacturer, an "organic compound". The exact composition is not specified any closer. The certificate of analysis is available on demand.

Handling advice and Storage

Avoid touching the pellet's surface directly in order to prevent contamination. Also, do not clean the surface with any liquids as it may compromise the pellet's integrity.

Please note the label marks the bottom of the pellet.

Store the MRM in a desiccator and or in a dark and dry environment.

The myStandards GmbH cannot be held responsible for changes that happen during storage of the material at the customer's premises, especially with respect to opened samples.

Period of Validity

Provided the storage and handling conditions are met, no chemical alteration is known to exist, and the assigned values will remain stable. Therefore, the product information and assigned values for this MRM are valid for one year, pending stability monitoring, from the date of dispatch. This validity may be extended as further evidence of stability becomes available. The manufacturer will inform the customer if any alterations occur.

Safety instructions

Nano-particulate powders can cause harm if ingested, inhaled or in contact with skin. In their pressed form however, they do not exhibit any dusting. If a pellet should accidentally break, we advise wearing a dust mask during clean up.

Minimal sample size

The minimal sample size corresponds to a spot size of $80 \mu\text{m}$.

Further ablation conditions and signal acquisition parameters during homogeneity- and stability-testing were:

<i>Laser fluence</i>	<i>7 J/cm²</i>
<i>Repetition rate</i>	<i>10 Hz</i>
<i>Background</i>	<i>10 s</i>
<i>Signal acquisition</i>	<i>40 s</i>

Metrological Traceability

This MRM has been produced in accordance with the recommendations specified in ISO 17034^[6] and ISO Guide 35 and are traceable to the base units of SI via calibrated measurements in competent and accredited laboratories (ISO 17025^[7]). The value for strontium isotope measurements is also traceable to the units of SI via calibrated measurements using a single reference measurement procedure in an accredited laboratory (ISO 17025).

Further Information

A detailed report on the certification of the corresponding reference material CRMS-NP-B01 is available on request or can be downloaded from www.my-standards.com.

Sample handling prior to pelletising is performed manually. Therefore, small amounts of the sample material may be seen on the fortification, this does not reduce the integrity of the MRM. Please refrain from using this part of the pellet.

The pellets are sold exclusively via the myStandards GmbH and authorised subcontractors.

Document History

Version	Date	Changes applied
1.0	28.03.2023	First publication

References

[1] **ISO Guide 35:2017 (E)**, *Reference materials – Guidance for characterization and assessment of homogeneity and stability*

[2] **ASTM E826-14**, *Standard Practice for Testing Homogeneity of a Metal Lot or Batch in Solid Form by Spark Atomic Emission Spectroscopy*. ASTM International, West Conshohocken, PA, 2014. www.astm.org

[3] **ISO 13528:2015 (E)**, *Statistical methods for use in proficiency testing by interlaboratory comparison*

[4] **ISO/IEC Guide 98-3:2008**, *Uncertainty of measurement - Part 3: Guide to the expression of uncertainty in measurement (GUM:1995)*

[5] **ISO/IEC Guide 99:2007**, *International vocabulary of metrology – Basic and general concepts and associated terms (VIM)*

[6] **EN ISO 17034:2016 (D/E)**, *General requirements for the competence of reference material producers*

[7] **EN ISO/IEC 17025:2017 (D/E)**, *General requirements for the competence of testing and calibration laboratories*

Legal notice

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