myStandards GmbH
Schauenburger Straße 116
24118 Kiel
Germany

Preliminary

Product Information Sheet

Microanalytical Reference Material

NOD-A1*-NP

Nano-particulate pressed powder pellet

Reference Values

Analyte	Value	SE	95% CL	Unit	k
Na2O	1.02	0.02	0.04	g/100g	2
MgO	4.57	0.11	0.22	g/100g	2
Al2O3	3.82	0.05	0.11	g/100g	2
SiO2	4.02	0.01	0.02	g/100g	2
P2O5	1.21	0.02	0.03	g/100g	2
CaO	15.3	0.2	0.5	g/100g	2
TiO2	0.48	0.01	0.02	g/100g	2
MnO	23.25	0.27	0.54	g/100g	2
Fe2O3(t)	15.29	0.20	0.39	g/100g	2
SO3	0.71	0.02	0.05	g/100g	2
Li	72	1	3	µg/g	2
Be	5.3	0.2	0.5	µg/g	2
V	590	10	20	µg/g	2
Co	3016	37	75	µg/g	2
Ni	5990	77	333	µg/g	4.303
Cu	1062	12	24	µg/g	2
Zn	565	13	26	µg/g	2
As	282	9	19	µg/g	2
Rb	10.2	0.2	0.4	µg/g	2
Sr	1565	80	161	µg/g	2
Y	121	4	8	µg/g	2
Zr	288	15	30	µg/g	2
Nb	47	1	6	µg/g	4.303
Mo	364	19	37	µg/g	2

Analyte	Value	SE	95% CL	Unit	k
Sb	35.7	0.9	1.8	µg/g	2
Te	36.1	1.3	2.7	µg/g	2
Cs	0.6	0.04	0.08	µg/g	2
Ba	1457	17	34	µg/g	2
La	116	5	10	µg/g	2
Ce	746	9	19	µg/g	2
Nd	102	1	2	µg/g	2
Sm	22.7	0.5	1.0	µg/g	2
Eu	5.3	0.1	0.2	µg/g	2
Gd	25.0	0.1	0.3	µg/g	2
Tb	3.7	0.1	0.2	µg/g	2
Dy	23.4	0.4	0.7	µg/g	2
Ho	4.9	0.1	0.2	µg/g	2
Er	14.5	0.4	0.7	µg/g	2
Tm	2.1	0.1	0.2	µg/g	2
Yb	13.9	0.1	0.3	µg/g	2
Lu	2.2	0.04	0.1	µg/g	2
Hf	5.9	0.4	0.7	µg/g	2
W	79	4	8	µg/g	2
Tl	108	4	8	µg/g	2
Pb	808	10	19	µg/g	2
Bi	9.3	0.3	0.6	µg/g	2
Th	23.0	0.3	0.6	µg/g	2
U	7.0	0.2	0.5	µg/g	2

Information Values

Analyte	Value	Unit
K2O	0.61	g/100g
LOI	23.58	g/100g
B	112	µg/g
Sc	10.8	µg/g
Se	5.3	µg/g

Analyte	Value	Unit
Cd	7.4	µg/g
In	0.10	µg/g
Sn	4	µg/g
Pr	23.2	µg/g
Ta	0.7	µg/g

myStandards GmbH
Schauenburger Straße 116
24118 Kiel
Germany

The reference values represent the mean of laboratory means. The values were obtained through measurements performed on the nanopowder using different methods (ICP-MS, ICP-OES, WD-XRF) in different laboratories. Further, reference values exhibited no outlying data (Grubb's-, Dixon-, Cochran's C, and Mandel's h&k-tests) and were normally distributed (Kolmogorov-Smirnov-Test). The standard error (SE) is calculated as the standard deviation (SD) of the laboratory means:

$$SE = \frac{SD\ of\ laboratory\ means}{\sqrt{N°\ of\ laboratories}}$$

In order to expand this uncertainty to an approximate 95 % confidence level (CL) each SE was expanded (multiplied) by the individually attributed appropriate factor "k", according to Student's t-distribution. In order to compare a measured value with a reference value, we refer to the European Commission on Reference Materials' Application Note 1:

https://ec.europa.eu/jrc/sites/jrcsh/files/erm_application_note_1_en.pdf

Information values did not fulfil all necessary statistical criteria of a reference value and should neither be considered for calibration nor validation.

*The original manufacturer (USGS) is not liable for any issues occurring from the use of this material since they took no part in the manufacturing of the pellets.

Intended Use

This microanalytical reference material (MRM) is designed for use by laboratories undertaking the determination of major and trace element mass fractions in manganese nodule and equivalent matrices with LA-ICP-MS (Laser Ablation Inductively Coupled Plasma Mass Spectrometry), μXRF/XRF (Micro X-ray Fluorescence Spectroscopy) and LIBS (Laser-Induced Breakdown Spectroscopy). 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 nanoparticular pressed powder pellet of the manganese nodule powder "NOD-A1". The original powder, purchased from the United States Geological Survey (USGS), was subjected to our own material-specific milling protocol and 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.
If using a pressed pellet not ordered specifically for μXRF and or XRF please consider the sample thickness.
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.

myStandards GmbH
Schauenburger Straße 116
24118 Kiel
Germany

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 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.

Date of dispatch:

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 accidently break, we advise wearing a dust mask during clean up.

Further Information

This MRM has been produced in accordance with the recommendations specified in ISO Guides 30 to 35. Due to processing a part of the sample material may be seen on the fortification, this does not reduce the performance of the MRM. Please refrain from using this part of the pellet.
The pellets are sold exclusively via the myStandards GmbH and authorised subcontractors.

Pellet serial number:
Manufactured for:
Size:

Document History

Version	*Date*	*Changes applied*
1.0	21.01.2019	First publication
1.1	24.04.2019	Changed Description of Assigned Values, Description of the MRM, Handling advice and Storage, Period of Validity and Further Information; Insert footnote to Legal notice; Added Document History
2.0	08.05.2020	New assigned values and updated description, Changed Intended Use (adding LIBS and calibration), Further Information (changing can to may) and References, addition of new terms and conditions
3.0	04.11.2020	Changed Description of the MRM, Handling advice and Storage, Further Information, Intended Use (adding LIBS, XRF and calibration) and Period of Validity (including changing date of manufacturing to date of dispatch); Addition of new terms and conditions; Updated document structure, Addition of individual Pellet characteristics
4.0	04.12.2020	Updated coverage factors
4.1	17.08.2021	Updated Al2O3 value
5.0	24.06.2022	New official letterhead

Legal notice