

Certified Reference Material

FLX-140

Zirconium Refractory

Certified Values

Parameter	Mass fraction in % ¹⁾	Uncertainty in % ²⁾	Traceable to
Al ₂ O ₃	1.48	0.05	SI unit kg/kg
CaO	0.056	0.026	SI unit kg/kg
Cr ₂ O ₃	0.124	0.006	SI unit kg/kg
HfO ₂	1.92	0.08	BCS-CRM No. 358
K ₂ O	0.098	0.004	SI unit kg/kg
La ₂ O ₃	0.289	0.019	SI unit kg/kg
MgO	0.204	0.048	SI unit kg/kg
Na ₂ O	0.234	0.056	SI unit kg/kg
SiO ₂	0.481	0.089	BCS-CRM No. 358
SrO	0.164	0.018	SI unit kg/kg
TiO ₂	0.169	0.028	BCS-CRM No. 358
ZrO ₂	89.66	0.45	SI unit kg/kg

Table1) Certified Values

- 1) Certified value traceable to SI unit kg/kg based on ignited sample material for 1h at 1025°C.
- 2) Expanded uncertainty U_{CRM} calculated for a confidence interval of 95% (k=2) based on uncertainty of characterization.

The sum of all oxides is 99.828. This excludes LOI.

This certificate is valid, within the uncertainty specified, **until 12.10.2030**, provided the CRM is handled in accordance with instructions given in this certificate. The certification is nullified if the CRM is damaged, contaminated, or otherwise modified.

Bedburg-Hau, **12.10.2020**

Responsible Reference Materials
Susan Aschenbrenner

General Manager
Dr. Rainer Schramm

Description of the CRM

This reference material is an industrial product. The complete batch was sealed into 74g bottles.

Intended use

Calibration and control sample for x-ray fluorescence (XRF) analysis.

Informational Values

	Mass Fraction in % ³⁾	Uncertainty ⁴⁾
Y ₂ O ₃	4.66	0.16
Fe ₂ O ₃	0.292	0.079
LOI	2.67	-

Table2) Informational Values

3) Only Informational Value.

4) Expanded uncertainty U_{CRM} calculated for a confidence interval of 95% (k=2) based on uncertainty of characterization, if present.

Instructions for the correct use of the CRM

This material is moisture sensitive. This material has to be ignited for minimum 1 hour at 1025°C prior use. The ignition process must result in a constant weight. The ignited material must be stored in a desiccator not longer than 24h, then reignition might be necessary. The minimum sample quantity for analysis should be 0.5g.

For XRF use, ignited samples should be prepared as a fused bead, e.g. in accordance with DIN EN ISO 12677:2013-02.

Storage Information

The material has to be stored in a dry and clean environment.

Hazardous situation

For this material an actual MSDS is available.

Level of homogeneity

In accordance with ISO Guide 35:2017 a homogeneity study was performed. A one-way ANOVA was used to calculate the batch inhomogeneity.

Stability

In accordance with ISO Guide 35:2017 a stability study was performed. As a result, the stability of the material was considered as fit for purpose. The uncertainty of long-term stability was calculated.

Total expanded uncertainty

The total expanded uncertainty U_{CRM} for a confidence interval of 95% ($k=2$) was calculated by taking into account the uncertainty of characterization u_{char} , of inhomogeneity u_{bb} and of long-term stability u_{lts} .

$$U_{CRM} = k \times \sqrt{u_{char}^2 + u_{bb}^2 + u_{lts}^2}$$

Traceability

All of the results derived as part of this testing program have traceability to the SI unit kg/kg or BCS-CRM No. 358.

Methods used

The analytical work performed to assess this material was carried out by the FLUXANA laboratory, which works under DIN EN ISO/IEC 17025:2018 accreditation.

In accordance with DIN EN ISO 17034:2017 and ISO Guide 35:2017, we use the approach stated in DIN EN ISO 17034:2017 Chapter 7.12.3. d) value transfer from an RM to a closely matched candidate RM performed using a single measurement procedure performed by one laboratory.

An example for this approach is found in DIN ISO 13528:2015 E.5. Using this approach, samples of the test material that is to be the new reference material are tested along with matching and/or synthetic RMs using a suitable method. The assigned values X_{CRM} and their uncertainties U_{CRM} are then derived from a calibration against the certified reference values of the compared RMs. Synthetic RMs are made from pure chemicals by weighing.

Measurement method used: XRF with fusion as sample preparation technique.

This certificate is in conformance with ISO Guide 31:2015.