

FLUXANA®

Certified Reference Materials Used Auto Catalyst

FLX-CRM 132, FLX-CRM 133



Certificate of Analysis

| | FLX-CRM 132 | | FLX-CRM 133 | |
|-----------|---------------------|---------------------------|---------------------|---------------------------|
| | Value ¹⁾ | Uncertainty ²⁾ | Value ¹⁾ | Uncertainty ²⁾ |
| Pd | 1673 | 43 | 1075 | 33 |
| Pt | 1770 | 18 | 465 | 32 |
| Rh | 295 | 6 | 242 | 4 |

Notes: All values are in mg/kg and are based on dried (105°C) sample material.

Definitions

- 1 The above values are the present best estimates of the true content for each component. Each value is a panel consensus, based on the averaged results of an inter laboratory testing program, detailed in values obtained by individual laboratories or methods.**
- 2 uncertainty calculated for a confidence interval of 95% (k=2).**

Bedburg-Hau, 16.12.2016

Responsible Reference Materials

Dr. Barbara Schäfer



Statistics and Report

Dr. Rainer Schramm



Non-certified Concentration values

| | FLX-CRM 132 | FLX-CRM 133 |
|------------------------------------|--------------------|--------------------|
| MgO | 7,5 | 7,7 |
| Al₂O₃ | 39,1 | 42,1 |
| SiO₂ | 33,6 | 29,8 |
| P₂O₅ | 0,83 | 0,97 |
| SO₃ | 1,6 | 0,7 |
| CaO | 0,48 | 0,50 |
| TiO₂ | 0,50 | 1,04 |
| Fe₂O₃ | 1,8 | 2,3 |
| SrO | 0,24 | 0,62 |
| ZrO₂ | 5,3 | 5,8 |
| BaO | 0,77 | 0,93 |
| La₂O₃ | 0,72 | 0,47 |
| CeO₂ | 5,8 | 5,5 |

Notes: All values are in mass% and are based on dried (105°C) sample material. These values are given to provide additional information on the overall matrix composition.

Reference Material Information

Type: 2 different used auto catalytic converters
Form and Size: Powder, as-produced, 30 g each bottle
Manufactured by: The material is a customary industrial product taken directly from processing
Packaged and tested by: FLUXANA GmbH & Co.KG, Germany
Certified by: FLUXANA GmbH & Co.KG, Germany

Description

About 9 kg of each material were delivered to and homogeneously distributed into 30 g bottles by FLUXANA. The bottles were then vacuum packed for storage.

Description of the CRM

This reference material is an industrial product and was taken directly from the production stream. The complete batch was sealed into 30 g bottles. This material is normally used in recycling of precious metals.

Intended use

Control sample for handheld, transportable and laboratory x-ray fluorescence (xrf) instruments.

Instructions for the correct use of the CRM

This material has to be dried at 105 °C until constant mass prior use. The minimum sample quantity for analysis should be 0.5 g. The material is moisture sensitive and should be stored in a desiccator after breaking the seal.

For XRF use, dried samples should be prepared as loose powder in a sample cup (e.g. SC 3332) equipped with a thin film (e.g. TF-240) or as pressed pellet well mixed with a binder (e.g. 4 parts sample and 1 part CEREOX® BM-0002-1).

Hazardous situation

For this material an actual MSDS is available.

Level of homogeneity and stability

The material was used as delivered. Based on ISO Guide 35:2006 and DIN ISO 13528:2009-01, a homogeneity and stability study of the materials was performed.

Metrological traceability

The analytical methods used by the participants must be in accordance with international measurement standards (XRF fusion, ICP or any other wet chemical methods), which are considered as traceable. Other methods, like XRF pressed pellet or XRF standardless methods, are not recognized as being traceable. Values from these methods will not be taken into account for calculation of the assigned values and uncertainty.

Measurement uncertainty

Measurement uncertainty includes components arising from systematic effects, such as components associated with corrections and the assigned quantity values of measurement standards, as well as the definitional uncertainty. The participants did not provide any uncertainty with the concentration values.

Evaluation

Launching the process of accreditation according DIN EN ISO/IEC 17043:2010-05 FLUXANA has adapted the evaluation process to robust statistical methods.

The assigned values were determined as consensus values from the participants who used traceable methods. Additionally all statistical data were calculated using robust statistical methods according DIN ISO 13528:2009-01, ISO/TS 20612:2007 and DIN 38402-45:2014-06.

Advantages of using robust statistics

Statistical methods are robust in the sense that any outliers have only a limited effect on the overall result. Steps were taken to ensure that the results are still meaningful even if the proportion of outliers is 1/3. Robust statistics are also preferable for small populations.

Values obtained by individual laboratories or methods

Please see the detailed report from the proficiency test for this information.

Methods used

X-ray fluorescence analysis with fused bead as sample preparation

ICP-OES with digestion (peroxide or acid)

ICP-OES with NiS collection

Fire assay

Further information

This Reference Material has been produced and certified, wherever possible, in accordance with the requirements of ISO 17043, ISO Guide 34-2009, ISO Guide 31-2000 and ISO Guide 35-2006.

This certification is applicable to the whole of the sample.

As-supplied, this material will not remain stable indefinitely. The matrix will be affected by contact with the atmosphere, and in particular it will absorb moisture. Therefore it must be stored in a desiccator after breaking the seal. Then it continues to be fit for use for an indeterminate period, on the understanding that the sample will be dried prior to weighing, preparation and measurement.

All production records will be retained for a period of 10 years from the date of this certificate. This certification will therefore expire in 2026, although we reserve the right to make changes as issue revisions, in the intervening period.

Participating Laboratories

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|--|---------|
| Dorfner Anzaplan | Germany |
| FLUXANA GmbH & Co.KG | Germany |
| HuK Umweltlabor GmbH | Germany |
| Institut für Materialprüfung Glörfeld GmbH | Germany |
| Umicore AG & Co. KG | Germany |