BUREAU OF ANALYSED SAMPLES LTD

BRITISH CHEMICAL STANDARD CERTIFIED REFERENCE MATERIAL

CERTIFICATE OF ANALYSIS

BCS-CRM No. 529

ANORTHIC FELDSPAR

Prepared under rigorous laboratory conditions and, AFTER CERTIFICATION ANALYSIS IN GREAT BRITAIN, BELGIUM, FRANCE, GERMANY, ITALY, JAPAN, AND TURKEY, issued by the Bureau of Analysed Samples Ltd and the Society of Glass Technology.

ANALYSES

Mean of 4 values - mass content in %.

Dried at 105°C

Analyst	SiO_2	Al_2O_3	Fe_2O_3	CaO	MgO	Na_2O	K_2O	LOI	*TiO_2*	*BaO*	*SrO*	*P_2O_5*
1	56.4083	27.0928	0.2760	…	0.0490	5.4875	0.4123	…	…	…	…	…
2	…	…	…	…	…	…	…	0.5900	…	…	…	…
3	56.2325	26.7725	0.2750	9.7125	0.0425	5.5400	0.4200	0.5523	…	…	..	…
4	…	…	0.2583	…	0.0398	…	0.4320	0.5400	…	…	…	…
5	56.2713	27.0770	0.2763	9.5313	0.0470	5.5610	0.4180	0.4878	*0.0905*	*0.0903*	*0.3570*	*0.0438*
6	56.3750	26.5775	0.2682	9.4933	0.0433	5.6795	0.4254	0.5258	*0.0839*	*0.0866*	*0.3395*	*0.0494*
7	56.1950	26.8950	0.2765	9.5040	…	5.6468	0.4200	0.6000	…	…	…	…
8	56.1449	27.0122	0.2667	9.4790	…	5.6437	0.4237	0.5175	…	…	…	…
9	55.7425	26.8652	0.2868	9.7313	0.0458	5.4600	0.4222	0.5800	…	…	…	…
10	56.5250	27.0000	0.2675	…	0.0500	5.5900	0.4150	…	…	…	…	…
11	56.3375	26.9198	0.2755	9.6288	0.0558	5.5965	0.4193	…	*0.0875*	*0.0965*	*0.3690*	…
12	56.4300	26.6675	0.2700	9.4800	…	…	0.4250	0.5575	*0.0900*	*0.0975*	*0.3125*	…
13	55.9350	…	0.2700	…	0.0343	5.6750	…	0.5475	…	…	…	…
14	…	26.3775	0.2798	9.6275	…	5.4825	0.4213	…	*0.0845*	…	…	…
M_M	**56.2361**	**26.8415**	**0.2728**	**9.5764**	**0.0453**	**5.5784**	**0.4212**	**0.5498**	*0.087*	*0.093*	*0.345*	*0.047*
s_M	0.2294	0.2242	0.0072	0.1006	0.0063	0.0789	0.0052	0.0345				
s_w	0.1378	0.0962	0.0064	0.0394	0.0013	0.0317	0.0037	0.0259				

M_M: Mean of the laboratory mean values. **s_M**: standard deviation of the laboratory mean values.. **s_W**: average within laboratory standard deviation.

Additional Information: Analyst No. 11 determined Cr_2O_3 by XRF and found 0.002%.
Analyst No. 6 determined SO_3 by ICP-OES and reported a value of 0.135%

CERTIFIED VALUES (Cv)

mass content in %

Dried at 105°C

	SiO_2	Al_2O_3	Fe_2O_3	CaO	MgO	Na_2O	K_2O	LOI
Cv	**56.24**	**26.84**	**0.273**	**9.58**	**0.045**	**5.58**	**0.421**	**0.550**
C(95%)	0.16	0.16	0.005	0.08	0.005	0.06	0.004	0.025
Minimum weight (g)	0.3	0.1	0.1	0.1	0.1	0.1	0.1	0.6

The half width confidence interval, C(95%), is an expression of the uncertainty of the certified value. C(95%) = $\frac{t \times s_M}{\sqrt{n}}$ where "t" is the appropriate two sided Student's t value at the 95% confidence level for "n" acceptable mean values. For further information regarding the confidence interval for the certified value see ISO Guide 35.

NB: Although widely accepted within the industry "mass content in %" is neither an SI nor an IUPAC supported quantity. Multiplication of the certified value (Cv) by 10^4 will yield the value in µg/g.

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ANORTHIC FELDSPAR
NOTES ON METHODS USED

SILICA

Analysts Nos. 1, 5, 7, 8, 11 and 12 determined silica using X-Ray Fluorescence Spectroscopy (XRF) Nos. 5, 7 and 11 according to EN ISO 12677 and No 12 ASTM C146-94 A. The remaining Analysts determined silica gravimetrically, Nos. 3 and 6 following JIS M8853 (No. 6 using Inductively Coupled Plasma-Optical Emission Spectrometry (ICP-OES) to determine the soluble portion), No. 9 following the method in Bennett & Reed p53[1], No. 13 following the method in Glass Technology Vol. 14 No. 1 1973 p.5.

ALUMINA

Analysts Nos. 1, 5, 7, 8, 10, 11, 12 and 14 determined alumina using XRF, Nos.5, 7 and 11 according to EN ISO 12677 and No. 12 EPA 6010C (2000). The other Analysts all used ICP-OES, Nos. 3 and 6 following JIS Method M8853.

FERRIC OXIDE

Analysts Nos. 1, 5, 7, 8, 10, 11, 12 and 14 determined ferric oxide using XRF, Nos. 5, 7 and 11 according to EN ISO 12677 and No. 12 EPA 6010C (2000). Analyst No. 9 used Flame Atomic Absorption Spectrometry (FAAS) and No. 13 followed Glass Technology Vol. 14 No. 1 1973 p.5. The remaining Analysts all used ICP-OES, Nos. 3 and 6 following JIS M8853.

CALCIUM OXIDE

Analysts Nos. 3, 6, 9 determined calcium oxide using ICP-OES, No. 3 following JIS M8853. The other Analysts all used XRF, Nos. 5, 7 and 11 according to EN ISO 12677 and No. 12 EPA 7000B (2007).

MAGNESIUM OXIDE

Analysts Nos. 1, 5, 10 and 11 determined magnesium oxide using XRF, Nos. 5, and 11 according to EN ISO 12677. Analysts Nos. 3, 4, 6, and 9 used ICP-OES, No. 3 following JIS M8853. Analyst No. 13 used FAAS according to Bennett and Reed p 53[1].

SODIUM OXIDE

Analysts Nos. 1, 5, 7, 8, 10, 11 and 14 determined sodium oxide using XRF, Nos. 5, 7 and 11 according to EN ISO 12677. No. 3 used FAAS, by following JIS M8853. No. 6 used ICP-OES. Analysts Nos. 9 and 13 used FAAS, No. 13 according to Bennett and Reed p53[1].

POTASSIUM OXIDE

Analysts Nos. 1, 5, 7, 8, , 10, 11, 12 and 14 determined potassium oxide using XRF, Nos. 5, 7 and 11 according to EN ISO 12677 and No. 12 EPA 7000B (2007). Nos. 3, and 9 used FAAS, No. 3 following JIS M8853. Analysts Nos. 4 and 6 used ICP-OES.

LOSS ON IGNITION

All of the Analysts determined Loss On Ignition at 1000±25°C.

TITANIUM DIOXIDE

Analysts Nos. 5, 11, 12 and 14 determined titanium dioxide using XRF, Nos. 5 and 11 following EN ISO 12677 and No. 12 EPA 6010C (2014). Analyst No. 6 used ICP-OES, following JIS M8853.

BARIUM OXIDE

Analysts Nos. 5, 11 and 12 determined barium oxide using XRF, Nos. 5 and 11 following EN ISO 12677and No. 12 EPA 6010C (2014). Analyst No. 6 used ICP-OES, following JIS M8853.

STRONTIUM OXIDE

Analysts Nos. 5, 11 and 12 determined strontium oxide using XRF, Nos. 5 and 11 following EN ISO 12677 and No. 12 EPA 6010C (2014). Analyst No. 6 used ICP-OES following JIS M8853.

PHOSPHORUS PENTOXIDE

Analyst No. 5 determined phosphorus pentoxide using XRF, following EN ISO 12677. No. 6 used ICP-OES.

[1]H.Bennett, R.A. Reed, Chemical Methods of Silicate Analysis-A Handbook, British Ceramic Research Association, Academic Press, 1971

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CO-OPERATING ANALYSTS

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4, 14	CARPENTIER, J-M.,	INISMa-CRIBC, Mons, Belgium.
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6	UCHIYAMA, K.,	Nippon Sheet Glass Co. Ltd., Itami, Japan.
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9	JONES, S.J., *BSc, CChem, MRSC,*	Ridsdale & Co. Ltd., Middlesbrough.
10	VERA, F.,	St Gobain Recherche, Aubervilliers, France.
11	HAMAEKERS, H.,	Sibelco, Dessel, Belgium.
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13	YORUR, A	Research Centre, Turkiye Sis eve Cam Fabrikalari AS, Is Kuleleri Kule, Turkey.

DESCRIPTION OF SAMPLE

British Chemical Standard BCS-CRM 529 is sold in the form of a powder passing a nominal 250 µm aperture sieve. It is supplied in bottles containing 100g.

The preparation of representative samples for chemical analysis and the certification by co-operative analysis was undertaken by Bureau of Analysed Samples Ltd.

Bureau of Analysed Samples Ltd is a United Kingdom Accreditation Service (UKAS) Accredited Reference Material Producer, No 4004, and, as the Producer of BCS-CRM 529 as defined in BS EN ISO 17034, is fully responsible for assigning the certified values and their uncertainties in accordance with BS EN ISO 17034 and ISO Guide 35.

INTENDED USE

BCS-CRM 529 is intended for the verification of analytical methods, such as those used by the participating laboratories, for the calibration of analytical instruments, for establishing values for secondary reference materials and for training purposes.

In order to ensure that a fully representative sample is taken users should take not less than the minimum weight stated on the certificate for that element, this being the lowest sample mass used by any of the Co-operating Analysts contributing to the certified value. Users of this material should be aware that the use of a smaller sub-sample size may invalidate the certified values and the associated 95% confidence limits.

The sample should be mixed thoroughly before each use.

STABILITY

BCS-CRM 529 will remain stable provided that the bottle remains sealed and is stored in a dry atmosphere. Once the bottle has been opened the lid should be secured immediately after use.

TRACEABILITY

The characterisation of this material has been achieved by chemical analysis involving inter-laboratory study, each laboratory using the method of their choice, details of which are given above.

Most of the analytical methods used in the characterisation of this CRM were either international or national standard methods or methods which are technically equivalent. All laboratories used either stoichiometric analytical techniques or methods which were calibrated predominantly against pure metals or stoichiometric compounds, ensuring traceability of the individual results to the SI.

MEASUREMENT UNCERTAINTY

The uncertainty of each of the certified values of BCS-CRM 529 has been established by multiplying the standard error arising from the chemical analysis by the appropriate two sided Student's t value at the 95% confidence level for the number of results. Homogeneity has been assessed on representative samples taken from the batch and found to be acceptable. Homogeneity has not, therefore, been included in the calculated measurement uncertainty. The stability of this CRM and its transportation also make negligible contributions to the overall uncertainty of the certified values.

COMMUTABILTY

BCS-CRM 529 is intended to be used in the same physical form as that used by the participating analysts and therefore commutability is not of relevance in respect of this CRM.

Further information and advice on this or other Certified Reference Materials or Reference Materials produced by Bureau of Analysed Samples Ltd may be obtained from the address below.

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