MAIN EDITION

BUREAU OF ANALYSED SAMPLES LTD

BRITISH CHEMICAL STANDARD CERTIFIED REFERENCE MATERIAL

CERTIFICATE OF ANALYSIS

BCS-CRM No. 395

BAUXITE

Prepared under rigorous laboratory conditions and, AFTER CERTIFICATION ANALYSIS IN GREAT BRITAIN AND FRANCE, issued by the Bureau of Analysed Samples Ltd.

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ANALYSES

Mean of 4 values - mass content in %.

All results relate to the dried (110°C) sample.

Analyst No.	Fe_2O_3	SiO_2	Al_2O_3	TiO_2	CaO	MgO	LOI	Na_2O	K_2O	Li_2O	Cr_2O_3	MnO	P_2O_5	V_2O_5
1	16.4	1.28	52.4	1.90	0.05	0.02	27.5	0.03	0.02	0.01	...	...	0.16	0.07
2	16.1	1.18	52.2	1.90	0.05	0.02	27.8	0.02	0.02	0.01	0.07	<0.02	...	...
3	16.3	1.30	52.6	1.85	0.04	0.02	27.8	...	...	...	...	...	...	...
4	16.3	1.24	52.2	1.96	0.06	0.03	28.0	..	...	...	...	...	...	0.04
5	16.3	1.22	52.5	1.87	0.05	0.01	27.4	0.03	0.01	...	...	...	0.13	...
6	16.2	1.22	52.6	1.96	0.07	0.02	27.8	...	...	...	...	...	...	...
7	16.4	1.26	52.2	1.99	0.05	0.03	27.9	<0.01	0.03	...	...	<0.01	0.14	...
8	16.3	1.21	52.5	2.04	0.04	0.02	27.8	...	...	...	...	...	...	...
M_M	**16.3**	**1.24**	**52.4**	**1.93**	**0.05**	**0.02**	**27.8**	...	...	...	...	...	...	...
s_M	0.1	0.04	0.2	0.07	0.01	0.01	0.2	...	...	...	...	...	...	...

The above figures are those which each Analyst has decided upon after careful verification.

M_M: Mean of the intralaboratory means. s_M: standard deviation of the intralaboratory means.

CERTIFIED VALUES (Cv)

mass content in %

	Fe_2O_3	SiO_2	Al_2O_3	TiO_2	CaO	MgO	LOI
Cv	**16.3**	**1.24**	**52.4**	**1.93**	**0.05**	**0.02**	**27.8**
C(95%)	0.1	0.04	0.2	0.06	0.01	0.01	0.2

The half width confidence interval **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 35:2006 sections 6.1 and 10.5.2.

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NOTES ON METHODS USED

FERRIC OXIDE

Analyst No. 1 determined ferric oxide photometrically with 1,10-phenanthroline according to the Standard Method B.S. 1902: Part 2B: 1967. Nos. 2, 3, 4 and 7 determined ferric oxide by titration with dichromate after hydrogen sulphide or stannous chloride reduction. No. 5 used atomic absorption spectroscopy. Nos. 6 and 8 oxidized and then titrated with mercurous nitrate and potassium thiocyanate indicator.

Analysts Nos. 1 and 5 also used X-ray fluorescence and found 16.2% in each case. Nos. 4 and 5 also determined ferric oxide by titration with EDTA and found 16.3% and 16.2% respectively.

SILICA

All Analysts except No. 5 used gravimetric methods. Nos. 1 and 2 determined the bulk of the silica by the coagulation method and the residual silica photometrically as molybdenum blue according to the Standard Method B.S. 1902: Part 2D: 1969. Nos. 3, 4, 6, 7 and 8 decomposed the sample with nitric/sulphuric acid and after two dehydrations determined silica in the usual way. No. 5 used atomic absorption spectroscopy.

Analysts Nos. 1 and 5 also determined silica by X-ray fluorescence and found 1.30% and 1.23% respectively. No. 4 also used atomic absorption spectroscopy and found 1.24%.

ALUMINA

Analysts Nos. 1, 2 and 7 removed iron and titanium by extraction with cupferron/chloroform and completed by titration with CDTA/standard zinc solution (No. 1) or with EDTA/standard zinc solution (Nos. 2 and 7). No. 4 used a similar method; the EDTA complexed by the alumina was released by fluoride and titrated using zinc sulphate (fluoride release technique). No. 3 removed iron, titanium, etc., by pouring the sample solution into excess sodium hydroxide and determined alumina gravimetrically after precipitation with oxine. No. 5 used atomic absorption spectroscopy. Nos. 6 and 8 determined alumina gravimetrically by difference from the total R_2O_3.

Analyst No. 1 also used X-ray fluorescence and found 52.5%. No. 5 also determined alumina by both complexometry and X-ray fluorescence; the results were 52.7% in each case.

TITANIA

All Analysts, except No. 5, determined titania photometrically with hydrogen peroxide. Nos. 1 and 2 followed the procedure of the Standard Method B.S. 1902: Part 2B: 1967. No. 5 used atomic absorption spectroscopy.

Analyst No. 1 also used X-ray fluorescence and found 1.91%. No. 4 also used atomic absorption spectroscopy and found 1.80%. No. 5 also determined titania by both photometry and X-ray fluorescence; the results were 1.90% and 1.85% respectively.

LIME

Analyst No. 1 determined lime by titration with EDTA according to the Standard Method B.S. 1902: Part 2B: 1967. Nos. 2, 3, 4, 5 and 6 used atomic absorption spectroscopy. No. 7 used direct reading spectroscopy. No. 8 determined lime gravimetrically as oxalate ignited to the oxide, after correcting for Al_20_3.

Analysts Nos. 1 and 5 also used X-ray fluorescence and found 0.05% in each case.

MAGNESIA

Analyst No. 1 determined magnesia by titration with EDTA according to the Standard Method B.S. 1902: Part 2B: 1967. Nos. 2, 3, 4, 5 and 6 used atomic absorption spectroscopy. No. 7 used direct reading spectroscopy. No. 8 precipitated the magnesia with 8-hydroxyquinoline and completed gravimetrically.

Analyst No. 5 also used X-ray fluorescence and found 0.02%.

LOSS ON IGNITION

Analysts Nos. 1 and 2 ignited to constant weight at 1025°C. Nos. 3, 4 and 6 ignited at 1100°C. No. 5 ignited at 1000°C, No. 7 at 1050°C and No. 8 at 1020°C.

ALKALIS

Analysts Nos. 1 and 2 determined alkalis by flame photometry. No. 5 used atomic absorption spectroscopy. No. 7 used direct-reading spectroscopy.

Analyst No. 1 also used X-ray fluorescence and found Na_2O <0.01%, K_2O 0.02%. No. 5 also determined alkalis by flame photometry and found Na_2O 0.02%, K_2O 0.02%.

CHROMIC OXIDE

Photometric with diphenylcarbazide.

MANGANESE OXIDE

Analyst No. 2 determined manganese oxide photometrically after oxidation with periodate. No. 7 used direct-reading spectroscopy.

PHOSPHORUS PENTOXIDE

Analysts Nos. 1 and 5 used X-ray fluorescence spectroscopy. No. 7 precipitated phosphorus as ammonium phosphomolybdate and completed by titration.

VANADIUM PENTOXIDE

Analyst No. 1 used X-ray fluorescence. No. 4 determined vanadium pentoxide photometrically as phosphovanadotungstate.

In July 1989, eleven members of the Trace Analysis Group of Ceramic Research Ltd. further analysed BCS-CRM No. 395 using a mixture of Flame Atomic Absorption Spectrometry, Optical Emission Spectroscopy, Mass Spectroscopy and X-ray Fluorescence Spectroscopy. The following approximate results were obtained:

Mass content in %.

	Cr	Cu	Mn	Ni	Pb	Sr	Zn
$\mathbf{M_M}$	*0.0453*	*0.0021*	*0.0042*	*0.0034*	*0.0028*	*0.0023*	*0.0043*
s_M	*0.0029*	*0.0003*	*0.0005*	*0.0008*	*0.0005*	*0.0008*	*0.0007*
No. of laboratories	10	9	8	9	9	7	9
No. of techniques	3	2	2	2	2	3	2

DESCRIPTION OF SAMPLE

Bottles of 100g powder graded <150µm (100 mesh) for chemical analysis.

INTENDED USE & STABILITY

The sample is intended for the verification of analytical methods, such as those used by the participating laboratories, for the calibration of analytical instruments in cases where the calibration with primary substances (pure metals or stoichiometric compounds) is not possible and for establishing values for secondary reference materials.

It will remain stable provided that the bottle remains sealed and is stored in a cool, dry atmosphere. When the bottle has been opened the lid should be secured immediately after use. If the contents should become discoloured (e.g. oxidised) by atmospheric contamination they should be discarded.

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For BUREAU OF ANALYSED SAMPLES LTD,

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