



BUREAU OF ANALYSED SAMPLES LTD

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BRITISH CHEMICAL STANDARD CERTIFIED REFERENCE MATERIAL

CERTIFICATE OF ANALYSIS BCS-CRM No. 232/2 (ECRM 051-1) 0.1% SULPHUR STEEL

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

CO-OPERATING ANALYSTS

INDEPENDENT ANALYST

1 COPPINS, W. C., *MSc, FRIC*, Ridsdale & Co. Ltd., Middlesbrough.

ANALYSTS representing MANUFACTURERS and USERS

2 ALBUTT, K. J., *BSc, PhD, ACT(Birm), AIM*,

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3 ALLEN, W. M.,

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7 WATSON, D., B.S.C., Irlam Works, Manchester.

8 WHITLEY, E., *BSc Tech, AMCT, FRIC, AIM*,

John Summers and Sons Ltd., Shotton.

ANALYSES

Mean of 4 values - mass content in %.

Analyst No.	C	Mn	S	Si	P	Cr	Ni	Cu
1	0.181	1.19	0.123	<i>0.11</i>	<i>0.025</i>	<i>0.05</i>	<i>0.14</i>	<i>0.15</i>
2	0.180	1.16	0.126	...	...	...	...	...
3	0.181	1.17	0.131	...	...	...	...	...
4	0.180	1.18	0.128	...	...	...	...	...
5	0.182	1.19	0.123	...	...	...	...	...
6	0.181	1.19	0.126	...	...	...	...	...
7	0.180	1.17	0.125	...	...	...	...	...
8	0.182	1.16	0.123	...	...	...	...	...
M_M	0.181	1.18	0.126	...	...	...	...	...
s_M	0.001	0.02	0.003	...	...	...	...	...

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

Figures in bold type standardized, figures in small italic type only approximate.

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

CERTIFIED VALUES (C_v)

mass content in %

	C	Mn	S
C_v	0.181	1.18	0.126
C(95%)	0.001	0.02	0.003

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.

BCS-CRM No. 232/2 (ECRM 051-1)

0.1% SULPHUR STEEL

NOTES ON METHODS USED

CARBON

All analysts determined carbon by combustion. Nos. 1, 6 and 8 used a non-aqueous titration method (Jones et al, Analyst 1965, **90**, 623; 1966, **91**, 399). No. 2 used the Ströhlein method. Nos. 3, 5 and 7 used gravimetric methods similar to the Standard method B.S. 1121: Part 11: 1967. No. 3 used two chromic-sulphuric acid bulbs to ensure complete removal of sulphur gases. No. 4 determined carbon by infrared absorption.

Analysts Nos. 1 and 8 also determined carbon by the Standard gravimetric method and found 0.18% in each case. No. 5 also determined carbon by non-aqueous titration and found 0.179%. No. 7 also used an infrared absorption method and found 0.183%.

MANGANESE

Analysts Nos. 1, 2, 4, 5 and 7 determined manganese titrimetrically. Nos. 1 and 2 used direct methods in which the manganese was oxidized with persulphate/silver nitrate and titrated with arsenite/nitrite solution. Nos. 4, 5 and 7 used the Standard method B.S. 1121: Part 16: 1966 which includes a zinc oxide separation. Nos. 3, 6 and 8 determined manganese photometrically after oxidation with periodate according to the Standard method B.S. 1121: Part 23: 1951.

Analysts Nos. 3, 5 and 7 also used direct titrimetric methods and found 1.18%, 1.19% and 1.17% respectively.

SULPHUR

All analysts determined sulphur gravimetrically. No. 1 used a method involving a preliminary chromatographic separation of the sulphur, as sulphuric acid, on an alumina column (Nydahl, Anal. Chem., 1954, **26**, 580) whereas Nos. 2, 4, 5, 6, 7 and 8 used the Standard method B.S. 1121: Part 1: 1966.

Analyst No. 1 also used the Standard gravimetric method and found 0.125%. Nos. 2, 4, 5, 7 and 8 also used combustion methods, completing either titrimetrically (Nos. 2, 4, 5 and 8) or by infrared absorption (No. 7) and found 0.131%, 0.130%, 0.126%, 0.126% and 0.129% respectively.

SILICON

Photometric molybdenum-blue method (Analoid Method No. 43).

PHOSPHORUS

Titrimetric determination via phosphomolybdate (Analoid Method No. 21).

CHROMIUM

Titrimetric method, oxidizing with persulphate/silver nitrate and titrating with ammonium ferrous sulphate (Analoid method No. 37).

NICKEL

Photometric determination with dimethylglyoxime (Analoid Method No. 44).

COPPER

Photometric determination with bis-cyclohexanone oxalyldihydrazone (Analoid method No. 65).

DESCRIPTION OF SAMPLE

British Chemical Standard - bottles of 100g chips graded 1700 - 250µm (10 - 60 mesh) for chemical analysis.

INTENDED USE & STABILITY

The chip sample, BCS-CRM 232/2 (ECRM 051-1), 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.

This Certified Reference Material has been prepared in accordance with the recommendations specified in ISO Guides 30 to 35, available from the International Standards Organisation in Geneva.

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For BUREAU OF ANALYSED SAMPLES LTD

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