MAIN EDITION

BUREAU OF ANALYSED SAMPLES LTD

BRITISH CHEMICAL STANDARD CERTIFIED REFERENCE MATERIAL

CERTIFICATE OF ANALYSIS

BCS-CRM No. 371

COMMERCIAL-GRADE NICKEL

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 and Co. Ltd., Middlesbrough.

GOVERNMENT DEPARTMENT

2 NICHOLLS, H. A., *FRIC*,
Bragg Laboratory,
Chemical Inspectorate, Ministry of Defence, Sheffield.

ANALYSTS representing MANUFACTURERS and USERS

3 ANDREW, T. R., *BSc*, *PhD*, *FRIC*,
Mullard Mitcham, Central Materials Laboratory, Mitcham.

ANALYSTS representing MANUFACTURERS and USERS (cont.)

4 BALFOUR, B. E., *AMet*, *AIM*, Henry Wiggin and Co. Ltd., Hereford.

5 BILLS, K. M., International Nickel Ltd., Birmingham.

6 CLULEY, H. J., *MSc*, *PhD*, *FRIC*,
GEC Ltd., Hirst Research Centre, Wembley.

7 ELWELL, W. T., *PhD*, *FRIC*,
Imperial Metal Industries Ltd., Birmingham.

8 HARRISON, F. H., British Driver-Harris Co. Ltd., Stockport.

ANALYSES

Mean of 4 values - mass content in %.

Analyst No.	C	Si	S	Co	Mg
1	0.29	0.33	0.013	0.41	0.059
2	0.31	0.34	0.014	0.40	0.060
3	0.29	0.33	0.011	0.38	0.067
4	0.30	0.34	0.014	0.39	0.059
5	0.29	0.33	0.013	0.38	0.061
6	0.29	0.33	0.011	0.41	0.060
7	0.30	0.34	0.013	0.39	0.058
8	0.30	0.34	0.013	0.39	0.059
M_M	**0.30**	**0.34**	**0.013**	**0.39**	**0.060**
s_M	0.01	0.01	0.002	0.02	0.003

Figures in bold type certified, figures in small italic type only approximate

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 %.

	C	Si	S	Co	Mg
Cv	**0.30**	**0.34**	**0.013**	**0.39**	**0.060**
C(95%)	0.01	0.01	0.001	0.01	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.

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NOTES ON METHODS USED

CARBON

All Analysts determined carbon by combustion. Nos. 1 and 2 completed gravimetrically according to the Standard method for iron and steel BS 1121: Part 11: 1967. No. 3 used a titrimetric method. Nos. 4, 5 and 8 completed by measurement of infra-red absorption. No. 6 used the Standard conductimetric method BS 3727: Part 3: 1966. No. 7 used a low pressure method.

SILICON

Analysts Nos. 1, 2, 4, 5 and 6 determined silicon gravimetrically after double dehydration with perchloric acid. Nos. 3, 7 and 8 determined silicon photometrically as molybdenum-blue according to the Standard method BS 3727: Part 10: 1964.

Analysts Nos. 5 and 6 also used the British Standard method and found 0.33% and 0.32% respectively. No. 7 also determined silicon gravimetrically and found 0.34%.

SULPHUR

Analysts Nos. 1 and 7 determined sulphur gravimetrically. No. 1 carried out a preliminary chromatographic separation of the sulphur, as sulphuric acid, on an alumina column (Nydahl, Anal. Chem., 1954, **26**, 580). No. 7 used the ASTM method Designation E39-56. The other Analysts determined sulphur by combustion. No. 2 completed conductimetrically (Nall and Scholey, Metallurgia, 1961, **64**, 97), Nos. 3, 5, 6 and 8 titrimetrically and No. 4 by infra-red absorption. Nos.4 and 5 confirmed the standardization of their equipment by means of standard nickel samples which had been analysed by neutron activation (MacArthur and Morris, Metallurgia, 1969, **80**, 37).

Analyst No. 4 also determined sulphur titrimetrically after combustion and found 0.014%. No. 8 also determined sulphur by infra-red absorption after combustion and found 0.014%.

COBALT

Analyst No. 1 precipitated cobalt with 1-nitroso-2-naphthol and determined it photometrically with nitroso-R-salt. Nos. 2 and 5 determined cobalt by atomic-absorption spectroscopy. Nos. 3, 4, 6, 7 and 8 determined cobalt photometrically with 2-nitroso 1-naphthol according to the Standard method BS 3727: Part 5: 1964.

Analyst No. 3 also determined cobalt with tetra-phenyl arsonium chloride and found 0.38%. No 5 also used the British Standard Method and found 0.38%. No. 7 also found 0.38% by atomic-absorption spectroscopy.

MAGNESIUM

All Analysts determined magnesium by atomic-absorption spectroscopy; Nos. 1, 3 and 6 followed the procedure of the Standard method BS 3727: Part 21: 1966.

Analyst No. 1 also found 0.059% by separating nickel by electro-deposition from an ammoniacal solution and determining magnesium gravimetrically as the pyrophosphate.

DESCRIPTION OF SAMPLE

Bottles of 100g chips graded 1700 - 250 micron (10 - 60 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.

TRACEABILITY

The traceability of BCS-CRM 371 to the SI is ensured by the use of either stoichiometric analytical techniques or methods which are calibrated against pure metals or stoichiometric compounds.

NEWHAM HALL, NEWBY,
MIDDLESBROUGH, ENGLAND, TS8 9EA
Email: enquiries@basrid.co.uk
Website: www.basrid.co.uk

For BUREAU OF ANALYSED SAMPLES LTD

R.P. MEERES,
Managing Director

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