

## BUREAU OF ANALYSED SAMPLES LTD

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**BRITISH CHEMICAL STANDARD CERTIFIED REFERENCE MATERIAL** 

# **CERTIFICATE OF ANALYSIS** BCS-CRM No. 222/1 (ECRM 154-1) **3% NICKEL 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	ANALYSTS representing MANUFACTURERS and USERS (cont.)				
1 COPPINS, W. C., MSc, ARIC, Ridsdale & Co. Ltd., Middlesbrough.	4 BALFOUR, B. E., AMet, AIM, Henry Wiggin & Co. Ltd., Hereford.				
GOVERNMENT DEPARTMENT	5 BOOTH, J., BSc, Park Gate Iron & Steel Co. Ltd., Rotherham.				
2 EDWARDS, F. H., BSc,	6 CHATWIN, H., Rolls Royce, Ltd., Derby.				
Bragg Laboratory, Naval Ordnance Inspection Establishment, Sheffield.	7 GARDNER, L. E., AMet, FIM, Edgar Allen & Co., Ltd., Sheffield.				
ANALYSTS representing MANUFACTURERS and USERS	8 KIDMAN, L., AMet, AIM, AMInstF,				
3 BAGSHAWE, B., AMet, FIM, MInstF,	English Steel Corporation Ltd., Sheffield.				
Brown-Firth Research Laboratories, Sheffield.	9 KYLE, J. H., AIM, W. Beardmore & Co. Ltd., Glasgow.				

Mean of 4 values - mass content in %.										
Analyst No.	Ni	С	Si	Mn	Р	S	Cr	Мо	Со	Cu
1	3.54	0.32	0.22	0.62	0.021	0.009	0.05	0.029	0.036	0.15
2	3.55	0.30	0.22	0.64	0.020	0.009	0.05	0.029		
3	3.55	0.31	0.23	0.61	0.019	0.009	0.05			
4	3.54								0.038	0.14
5	3.53									
6	3.51									
7	3.54	0.32		0.61						
8	3.55									
9	3.54									
M <sub>M</sub>	3.54									
$s_{M}$	0.02									

ANALYSES

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.

During the examination of this sample by laboratories in the EEC the following additional information was obtained:

Phosphorus - mean value of 0.020% (standard deviation of 0.002%) from 64 laboratories.

Cobalt - mean value of 0.038% (standard deviation of 0.002%) from 49 laboratories

<b>CERTIFIED VALUE (Cv)</b>					
mass content in %					
		Ni			
	Cv	3.54			

The half width confidence interval  $\mathbf{C}(95\%) = \frac{\mathbf{t} \times \mathbf{s}_{M}}{\sqrt{n}}$  where "t" is the appropriate two sided Student's t value at the 95% confidence level for "n" acceptable mean values.

0.01

C(95%)

For further information regarding the confidence interval for the certified value see ISO Guide 35:2006 sections 6.1 and 10.5.2.

#### DESCRIPTION OF SAMPLE

Bottles of 100g of chip material graded 1700-250µm (10 - 60 mesh) for chemical analysis.

### BCS-CRM No. 222/1 (ECRM 154-1) **3% NICKEL STEEL** NOTES ON METHODS USED

#### NICKEL

Analyst No. 1 precipitated the nickel with dimethylglyoxime, dissolved the precipitate in dilute sulphuric acid, boiled with excess of ferric sulphate and titrated the ferrous salt thus formed with dichromate solution (Analoid Method No. 62). Nos. 2, 3, 5, 7, 8 and 9 used the Standard titrimetric method B.S. 1121: Part 37: 1961. Nos. 4 and 6 determined nickel gravimetrically as the dimethylglyoxime complex.

Analyst No. 2 also used a titrimetric method in which EDTA was used as titrant with PAN as indicator and found 3.58%. No. 4 also used the Standard titrimetric method and found 3.54%. No. 7 also determined nickel photometrically with dimethylglyoxime and found 3.55%.

#### CARBON

Analysts Nos. 1, 2 and 7 determined carbon gravimetrically by combustion. No. 3 used a low pressure method.

#### SILICON

All Analysts determined silicon gravimetrically by the Standard method B.S. 1121: Part 10: 1948.

#### MANGANESE

Analyst No. 1 determined manganese titrimetrically by the Analoid method No. 52. Nos. 2, 3 and 7 determined manganese photometrically, Nos. 2 and 3 following the procedure of the Standard method B.S. 1121: Part 23: 1951.

#### **PHOSPHORUS**

Analyst No. 1 determined phosphorus titrimetrically by the Analoid method No. 21. No. 2 used the Standard gravimetric method B.S. 1121: Part 9: 1948. No. 3 determined phosphorus photometrically as phosphovanadomolybdic acid. SULPHUR

Analyst No. 1 determined sulphur by combustion. Nos. 2 and 3 used the Standard gravimetric method B.S. 1121: Part 1A: 1957. CHROMIUM

Analyst No. 1 determined chromium titrimetrically by the Analoid method No. 37. No. 2 determined chromium photometrically using the Standard method B.S. 1121: Part 24: 1952. No. 3 used the Standard titrimetric method B.S. 1121: Part 13: 1954.

#### MOLYBDENUM

Both Analysts determined molybdenum photometrically as oxythiocyanate after extraction with butyl acetate.

COBALT

Analyst No. 1 determined cobalt photometrically with nitroso-R-salt according to the Standard method B.S. 1121: Part 42: 1961. No. 4 determined cobalt photometrically after extraction of the 2-nitroso-1-naphthol complex with benzene. COPPER

Both Analysts determined copper photometrically with 2-2' diquinolyl, No. 1 following the procedure of the Standard method B.S. 1121: Part 36: 1956.

#### **INTENDED USE & STABILITY**

The chip sample, BCS-CRM 222/1 (ECRM 154-1), 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.

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