MAIN EDITION

BCIRA
and
BUREAU OF ANALYSED SAMPLES LTD

SPECTROSCOPIC CERTIFIED REFERENCE MATERIAL

CERTIFICATE OF ANALYSIS
SCRM No. 662/4
HIGH PHOSPHORUS ENGINEERING IRON

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

CO-OPERATING ANALYSTS

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ANALYSES

Mean of 4 values - mass content in %.

Analyst No.	C Total	Si	Mn	P	S
1	2.96	2.33	0.78	0.29	0.089
2	2.96	2.33	0.77	0.29	0.087
3	2.95	2.35	0.73	0.30	0.086
4	2.94	2.32	0.75	0.35	0.082
5	2.96	2.33	0.76	0.29	0.089
M_M	**2.95**	**2.33**	**0.76**	**0.30**	**0.087**
s_M	0.01	0.02	0.02	0.03	0.003

The above figures are those which each Analyst has decided upon after careful verification.
Figures in bold type certified, figures in small italic type only approximate.

M_M: Mean of the laboratory mean values. s_M: standard deviation of the laboratory mean values.

This iron contains approximately 1% of chromium

CERTIFIED VALUES (Cv)

mass content in %

	C Total	Si	Mn	P	S
Cv	**2.95**	**2.33**	**0.76**	**0.30**	**0.087**
C(95%)	0.02	0.02	0.03	0.04	0.004

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. This is an expression of the uncertainty of the certified value.

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

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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(The current edition is available at www.basrid.co.uk)

SCRM 662/4 HIGH PHOSPHORUS ENGINEERING IRON

NOTES ON METHODS USED

CARBON (TOTAL)

Analysts Nos 1, 3 and 5 determined carbon using high frequency combustion with infrared measurement according to the Standard Method BS 6200*:3.8.3:1990. Nos. 2 and 4 used non-aqueous titration according to the Standard Method BS 6200*:3.8.2:1991.

SILICON

All Analysts determined silicon gravimetrically after dehydration with perchloric acid according to the Standard Method BS 6200:3.26.5:1985.

MANGANESE

Analysts Nos. 1 and 2 determined manganese photometrically after oxidation with periodate according to the Standard Method BS 6200:3.18.2:1985. No. 3 determined manganese titrimetrically after oxidation with persulphate. Nos. 4 and 5 used atomic absorption spectrometry.

PHOSPHORUS

Analyst No. 1 determined phosphorus titrimetrically after precipitation as phosphomolybdate. Nos. 2 and 5 determined phosphorus photometrically as phosphovanadomolybdate according to the Standard Method BS EN†10184:1992. No. 3 determined phosphorus gravimetrically as ammonium phosphomolybdate. No. 4 used inductively coupled plasma - atomic emission spectrometry.

Analyst No. 4 also determined phosphorus photometrically as phosphovanadomolybdate and obtained a mean value of 0.36%.

SULPHUR

Analysts Nos. 1, 3, 4 and 5 determined sulphur after high frequency combustion. Nos. 1, 3 and 5 used infrared measurement according to the Standard Method BS 6200*:3.28.2:1990. No. 4 absorbed the evolved gases in hydrogen peroxide and titrated with sodium borate. Analyst No. 2 determined sulphur gravimetrically as barium sulphate.

* BS6200: Sampling and analysis of Iron, Steel and other Ferrous Metals: Part 3: Methods of Analysis. Published by the British Standards Institution, 2 Park Street, London. WIA 2BS.

† BS EN Standards are European Standards published by the European Committee for Standardization (CEN), which have the status of a British Standard.

DESCRIPTION OF SAMPLE

SCRM 662/4, is sold as 48mm x 42mm x 12 mm thick rectangular blocks for spectroscopic analysis.

The material for this SCRM was prepared at the laboratories of the BCIRA, Alvechurch, Birmingham, U.K. using a special method of casting known to provide material of uniform composition in a form suitable for use as a Certified Reference Material (CRM) for optical emission spectrometric analysis. Blocks from this cast have been shown, by statistically designed procedures, to provide reproducible results using optical emission spectrometry.

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

INTENDED USE

SCRM 662/4 is primarily intended for the construction of calibration curves or for Quality Control purposes. It is one of a series of four such SCRMs (SCRM 661/4, 662/4, 664/4 and 665/4) which may be used together.

STABILITY

This SCRM will remain stable provided that the block is stored in a dry atmosphere.

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. The analytical sample was prepared by taking turnings from several blocks which were then mixed and subdivided. Each analyst received a representative sample of the bulk material and the Certified Values accurately represent the chemical composition of the SCRM.

Most of the analytical methods used in the characterisation of this CRM were either international or national standard methods or standard 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 SCRM 662/4 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 and found to be acceptable. It 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.

COMMUTABILITY

It has been established that, when using optical emission spectrometers, materials of similar composition from different sources may respond differently. The user should be aware that the metallurgical history of this SCRM may not accurately reflect the metallurgical history of the user's own materials.

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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For BUREAU OF ANALYSED SAMPLES LTD

R.P. MEERES,
Managing Director

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