Brammer Standard Company, Inc.

Certificate of Analysis

B.S. CE 208

Rare Earth Cast Iron Reference Material

	Certified Value[1]	Estimate of Uncertainty[2]		Certified Value[1]	Estimate of Uncertainty[2,3]
		Analysis listed as percent by weight			
C	**2.41**	0.03	**Al**	**0.003**	0.001
Mn	**0.35**	0.01	**As**	**0.004**	0.001
P	**0.118**	0.006	**Co**	**0.031**	0.002
S	**0.041**	0.002	**Mg**	**0.0008**	0.0001
Si	**1.63**	0.03	Mo	(0.001)	
Cu	**0.212**	0.007	**La**	**0.007**	0.0015
Ni	**0.047**	0.007	**Te**	**<0.002**	
Cr	**0.007**	0.001	**Ti**	**0.048**	0.005
Ce	**0.018**	0.002	**V**	**0.024**	0.002
Total Rare Earths	**0.035**	0.0015			

[1] The certified value listed is the present best estimate of the true value based on the results of an interlaboratory testing program.

[2] The uncertainties listed are based on value judgments of the material inhomogeneity and possible bias in the determined analytical values. No attempt is made to derive exact statistical measurements of imprecision because several methods were used in the determination of most constituents.

[3] The value in parentheses is not certified and is provided for information only.

The requirements of ISO Guide 31 and ISO Guide 35 were generally followed for the preparation of this reference material and certificate of analysis. This is a reference material as defined by ISO Guide 30.

See reverse side for more information. Certificate Number CE208-050595

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BS CE 208 Certificate number CE208-050595

Analysis	C	Mn	P	S	Si	Cu	Ni	Cr	Mo	Ce
1	2.39	0.326	0.112	0.0378	1.60	0.20	0.042	0.006	0.0008	0.0165
2	2.40	0.340	0.114	0.0396	1.60	0.207	0.0427	0.007	0.0010	0.0167
3	2.407	0.340	0.116	0.0406	1.61	0.208	0.045	0.0071	0.0011	0.0171
4	2.41	0.34	0.117	0.0406	1.62	0.210	0.048	0.0079	0.0019	0.0172
5	2.42	0.348	0.117	0.0410	1.622	0.210	0.053	0.008		0.0175
6	2.43	0.350	0.118	0.0410	1.623	0.210	0.053	0.0082		0.0177
7	2.44	0.350	0.119	0.0410	1.63	0.210				0.0178
8		0.35	0.119	0.0410	1.63	0.212				0.0178
9		0.35	0.122	0.0415	1.64	0.213				0.0180
10		0.350	0.123	0.042	1.64	0.214				0.0182
11		0.350	0.126	0.042	1.64	0.215				0.019
12		0.355		0.0422	1.65	0.22				0.0191
13		0.357		0.0426	1.66	0.220				0.0201
14				0.0430	1.67	0.221				
15					1.68					
Average	2.414	0.347	0.1185	0.0411	1.634	0.2121	0.0473	0.0074	0.0012	0.0179
Std Dev	0.017	0.008	0.0040	0.0013	0.024	0.0057	0.0049	0.0008	0.0005	0.0010
Certified	2.41	0.35	0.118	0.041	1.63	0.212	0.047	0.007	(0.001)	0.018

Analysis	Al	As	Co	Mg	La	Te	Ti	V	Total Rare Earths
1	0.00205	0.003	0.030	0.0008	0.0057	<0.0001	0.0454	0.023	0.0340
2	0.0023	0.0032	0.0304	0.0008	0.006	<0.0005	0.046	0.0231	0.0345
3	0.003	0.0032	0.0307	0.00084	0.0070	0.00002	0.0492	0.0242	0.0346
4	0.0031	0.0038	0.031	0.0009	0.0079	0.0014	0.051	0.0244	0.0350
5	0.004	0.0051	0.032		0.008	0.0017	0.051	0.025	0.0350
6								0.026	0.0355
7									0.0358
8									0.0360
Average	0.0029	0.0037	0.0308	0.00084	0.0069		0.0485	0.0243	0.0351
Std Dev	0.0008	0.0009	0.0008	0.00005	0.0011		0.0027	0.0011	0.0007
Certified	0.003	0.004	0.031	0.0008	0.007	<0.002	0.048	0.024	0.035

Certified Values: The original certificate for this material was produced in 1981 for the China Metallurgical Import & Export Corporation. Additional interlaboratory testing was concluded by Brammer Standard Company, Inc., in 1994. The analysis listed above represents the original test data plus the data resulting from the recent interlaboratory testing program.

Analysis: Chemical analyses were made on chips sampled from the bulk material. The laboratories participating in the testing normally followed the requirements of ISO Guide 25. The individual values listed above are the average of each analyst's results. Methods of analysis used were ASTM Standard Methods E 350, E 351, and E 1019 plus additional ICP and AA spectrometric methods.

Co-operating Laboratories: Some of the co-operating laboratories were:

Anarem, Praha, Czech Republic
Analytical Associates Inc., Detroit, Michigan
Brammer Standard Company, Inc., Houston, Texas
China Metallurgical Import & Export Corporation, Beijing, China
Crucible Specialty Steel, Syracuse, New York
J. Dirats and Co., Inc., Westfield, Massachusetts
Shiva Technologies, Inc., Cicero, New York
VHG Laboratories, Inc., Manchester, New Hampshire

Homogeneity: This Reference Material was tested for homogeneity using ASTM Standard Practice E 826 and found acceptable.

Traceability: The following Certified Reference Materials were used to validate the analytical data listed above:
NIST SRM 5L, 32e, 121d, 122g, 125b, 338, 342a, 361, 362, 363, 365, 890, 891;
ECRM 085-1, 088-1, 096-1, 184-1, 481-1, 486-1, 487-1;
BCS 455/1, 456/1, 458/1; CMSI 1551; BAM 039-2, 044-1;
JSS 191-1, 192-1, 193-1, 194-1, 195-1.

Source: This material was produced by the China Metallurgical Import & Export Corporation, Beijing, China.

Available Form: This Reference Material is available only in the form of chips supplied in 150 g units.

Use: This Reference Material is intended for use in analytical chemistry.

Safety Notice: A Material Safety Data Sheet (MSDS) is not required for this material. This material will not release or otherwise result in exposure to a hazardous chemical, under normal conditions of use. Inquiries concerning this Reference Material should be directed to:

Brammer Standard Co., Inc. Phone: (281) 440-9396
14603 Benfer Road
Houston, Texas 77069-2895 USA Fax: (281) 440-4432

Certified by: _____ on May 5, 1995.
G. R. Brammer

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References:

ASTM documents available from ASTM, 1916 Race Street, Philadelphia, PA, 19103.

E 350-90 Standard Test Methods for Chemical Analysis of Carbon Steel, Low-Alloy Steel, Silicon Electrical Steel, Ingot Iron, and Wrought Iron

E 351 - 93 Standard Test Methods for Chemical Analysis of Cast Iron - All Types

E 826 - 85 (Reapproved 1990) Standard Practice for Testing Homogeneity of Materials for the Development of Reference Materials

E 1019-93 Standard Test Methods for Determination of Carbon, Sulfur, Nitrogen, and Oxygen in Steel and in Iron, Nickel, and Cobalt Alloys

ISO Guides available from American National Standards Institute, 11 West 42nd St., 13th Floor, New York, NY 10036.

ISO Guide 25 (Third edition, 1990), General requirements for the competence of calibration and testing laboratories.

ISO Guide 30 (Second edition, 1991), Terms and definitions used in connection with reference materials.

ISO Guide 31 (First edition, 1981), Contents of certificates of reference materials.

ISO Guide 33 (First edition, 1989), Uses of certified reference materials.

ISO Guide 35 (Second edition, 1989), Certification of reference materials - General and statistical principles.

Other useful documents available from NIST, U.S. Department of Commerce, Gaithersburg, MD 20899.

NBS Special Publication 260-100, Handbook for SRM Users

NIST Special Publication 829, Use of NIST Standard Reference Materials for Decisions on Performance of Analytical Chemical Methods and Laboratories

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