

## The Technical Association of Refractories, Japan

## Certified Reference Material Series for X-ray Fluorescence Analysis of Refractories

J R R M 8 0 1 (Alumina-Magnesia Refractory)  
Results of Analyses

Unit : mass%

Constituent	SiO <sub>2</sub>	Al <sub>2</sub> O <sub>3</sub>	Fe <sub>2</sub> O <sub>3</sub>	TiO <sub>2</sub>	CaO	MgO	Na <sub>2</sub> O	K <sub>2</sub> O	P <sub>2</sub> O <sub>5</sub>	Uncertified value			
										MnO	Cr <sub>2</sub> O <sub>3</sub>	ZrO <sub>2</sub>	
Certified value	0.35 <sub>5</sub>	93.4 <sub>9</sub>	2.00 <sub>9</sub>	0.21 <sub>7</sub>	0.14 <sub>1</sub>	3.26 <sub>1</sub>	0.19 <sub>9</sub>	0.01 <sub>4</sub>	0.00 <sub>2</sub>	0.00 <sub>2</sub>	0.00 <sub>3</sub>	0.00 <sub>8</sub>	
Laboratories	L <sub>1</sub>	0.34 <sub>8 i</sub>	93.5 <sub>3 e</sub>	1.99 <sub>6 i</sub>	0.21 <sub>4 i</sub>	0.14 <sub>1 i</sub>	3.26 <sub>9 i</sub>	0.19 <sub>8 a</sub>	0.01 <sub>6 a</sub>	0.00 <sub>2 c</sub>	0.00 <sub>0 i</sub>	0.00 <sub>0 i</sub>	0.00 <sub>0 i</sub>
	L <sub>2</sub>	0.34 <sub>9 c</sub>	93.5 <sub>2 e</sub>	2.02 <sub>0 c</sub>	0.21 <sub>9 i</sub>	0.12 <sub>8 i</sub>	3.24 <sub>2 d</sub>	0.19 <sub>2 f</sub>	0.01 <sub>2 f</sub>	0.00 <sub>0 c</sub>	0.00 <sub>3 i</sub>	—	—
	L <sub>3</sub>	0.38 <sub>2 c</sub>	93.5 <sub>0 e</sub>	1.99 <sub>6 c</sub>	0.21 <sub>8 c</sub>	0.15 <sub>9 a</sub>	3.27 <sub>9 d</sub>	0.21 <sub>2 f</sub>	0.01 <sub>7 f</sub>	0.00 <sub>2 c</sub>	—	—	—
	L <sub>4</sub>	0.37 <sub>9 i</sub>	93.6 <sub>4 e</sub>	2.02 <sub>6 i</sub>	0.21 <sub>6 i</sub>	0.13 <sub>0 i</sub>	3.28 <sub>3 i</sub>	0.21 <sub>2 a</sub>	0.01 <sub>4 a</sub>	0.00 <sub>2 c</sub>	0.00 <sub>3 i</sub>	0.00 <sub>6 i</sub>	0.01 <sub>8 i</sub>
	L <sub>5</sub>	0.33 <sub>6 c</sub>	93.4 <sub>1 e</sub>	2.00 <sub>2 c</sub>	0.21 <sub>4 c</sub>	0.14 <sub>0 a</sub>	3.28 <sub>0 d</sub>	0.21 <sub>0 a</sub>	0.00 <sub>9 a</sub>	0.00 <sub>2 c</sub>	0.00 <sub>2 a</sub>	0.00 <sub>3 a</sub>	—
	L <sub>6</sub>	0.34 <sub>8 c</sub>	93.4 <sub>2 e</sub>	2.00 <sub>4 c</sub>	0.21 <sub>9 c</sub>	0.14 <sub>8 p</sub>	3.27 <sub>4 i</sub>	0.18 <sub>8 a</sub>	0.01 <sub>2 a</sub>	0.00 <sub>2 c</sub>	0.00 <sub>0 i</sub>	0.00 <sub>0 i</sub>	0.00 <sub>0 i</sub>
	L <sub>7</sub>	0.35 <sub>0 c</sub>	93.5 <sub>9 e</sub>	2.03 <sub>0 c</sub>	0.22 <sub>2 c</sub>	0.14 <sub>8 a</sub>	3.20 <sub>2 d</sub>	0.18 <sub>6 a</sub>	0.01 <sub>6 a</sub>	0.00 <sub>2 c</sub>	—	—	—
	L <sub>8</sub>	0.34 <sub>8 c</sub>	93.3 <sub>2 e</sub>	1.99 <sub>8 c</sub>	0.21 <sub>5 c</sub>	0.13 <sub>6 a</sub>	3.26 <sub>2 a</sub>	0.19 <sub>7 a</sub>	0.01 <sub>4 a</sub>	0.00 <sub>1 c</sub>	0.00 <sub>3 a</sub>	0.00 <sub>6 a</sub>	0.01 <sub>2 c</sub>
Average ( $\bar{X}$ )	0.35 <sub>5</sub>	93.49 <sub>1</sub>	2.009 <sub>0</sub>	0.217 <sub>1</sub>	0.141 <sub>3</sub>	3.261 <sub>4</sub>	0.199 <sub>4</sub>	0.013 <sub>8</sub>	0.001 <sub>6</sub>	0.001 <sub>8</sub>	0.003 <sub>0</sub>	0.007 <sub>5</sub>	
Standard deviation	(Reproducibility) $s_{\bar{x}}$	0.016 <sub>4</sub>	0.10 <sub>2</sub>	0.013 <sub>9</sub>	0.002 <sub>8</sub>	0.010 <sub>4</sub>	0.027 <sub>3</sub>	0.010 <sub>8</sub>	0.002 <sub>5</sub>	0.000 <sub>6</sub>	0.001 <sub>2</sub>	0.002 <sub>8</sub>	0.011 <sub>6</sub>
	(Reproducibility without laboratories) $s_{I(T)}$ * 1	0.009 <sub>7</sub>	0.08 <sub>0</sub>	0.010 <sub>3</sub>	0.001 <sub>4</sub>	0.005 <sub>8</sub>	0.010 <sub>0</sub>	0.004 <sub>0</sub>	0.001 <sub>7</sub>	0.000 <sub>9</sub>	0.001 <sub>3</sub>	0.002 <sub>5</sub>	0.006 <sub>8</sub>
Uncertainty C (95%) * 2	0.01 <sub>4</sub>	0.0 <sub>9</sub>	0.01 <sub>2</sub>	0.00 <sub>2</sub>	0.00 <sub>9</sub>	0.02 <sub>3</sub>	0.00 <sub>9</sub>	0.00 <sub>2</sub>	0.00 <sub>1</sub>	0.00 <sub>1</sub>	0.00 <sub>3</sub>	0.01 <sub>9</sub>	

(Note) \* 1  $s_{I(T)}$  is intermediate precision without a time condition. \* 2 The half-width confidence interval C (95%) =  $t_{\ell-1,0.05} \times s_{\bar{x}} / \sqrt{\ell}$  ( $\ell$  = number of laboratories)

- List of laboratories : Krosaki Corporation, Kawasaki Refractories Co.,Ltd., Yotai Refractories Co.,Ltd., Asahi Glass Co.,Ltd., Harima Ceramic Co.,Ltd., Shinagawa Refractories Co.,Ltd., TYK Corporation, Toshiba Monofrax Co.,Ltd.
- Analytical techniques : JIS R 2014(Method for chemical analysis of refractory containing alumina and magnesia) a:AAS, c:colorimetry, d:Combined use of EDTA titration and ICP-AES, e:chelometry, f:flame spectrophotometry, i:ICP-AES, p:Combined use of Cation exchange separation-chelatometric titration and ICP-AES .
- Analytical values : Each value is the average of two values obtained by two measurements on different days. These analysis values are shown converted into LOI (Loss on ignition) component free values from the February 22, 2008 v20080222 version on.
- Outlier tests were carried out by Grubbs test. The samples rejected by Grubbs tests were discussed in view of analytical techniques and it was determined whether the outliers should be adopted or not.
- Date of preparation : June, 1997

Prepared, and Values given and certified by

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## The Technical Association of Refractories, Japan

## Certified Reference Material Series for X-ray Fluorescence Analysis of Refractories

J R R M 8 0 2 (Alumina-Magnesia Refractory)  
Results of Analyses

Unit : mass%

Constituent	SiO <sub>2</sub>	Al <sub>2</sub> O <sub>3</sub>	Fe <sub>2</sub> O <sub>3</sub>	TiO <sub>2</sub>	CaO	MgO	Na <sub>2</sub> O	K <sub>2</sub> O	P <sub>2</sub> O <sub>5</sub>	Uncertified value		
										MnO	Cr <sub>2</sub> O <sub>3</sub>	ZrO <sub>2</sub>
Certified value	3.32 <sub>9</sub>	84.2 <sub>5</sub>	1.03 <sub>5</sub>	1.48 <sub>4</sub>	2.00 <sub>3</sub>	6.13 <sub>2</sub>	0.15 <sub>9</sub>	0.46 <sub>2</sub>	0.95 <sub>7</sub>	0.00 <sub>3</sub>	0.00 <sub>2</sub>	0.00 <sub>2</sub>
Laboratories												
L <sub>1</sub>	3.36 <sub>7 i</sub>	84.2 <sub>2 e</sub>	1.04 <sub>0 i</sub>	1.49 <sub>4 i</sub>	2.02 <sub>6 i</sub>	6.12 <sub>2 i</sub>	0.16 <sub>0 a</sub>	0.44 <sub>6 a</sub>	0.97 <sub>0 c</sub>	0.00 <sub>3 i</sub>	0.00 <sub>1 i</sub>	0.00 <sub>0 i</sub>
L <sub>2</sub>	3.34 <sub>0 c</sub>	84.2 <sub>0 e</sub>	1.04 <sub>4 c</sub>	1.45 <sub>6 i</sub>	2.00 <sub>6 i</sub>	6.11 <sub>2 d</sub>	0.16 <sub>2 f</sub>	0.47 <sub>0 f</sub>	0.96 <sub>0 c</sub>	0.00 <sub>2 i</sub>	—	—
L <sub>3</sub>	3.29 <sub>1 x</sub>	84.3 <sub>8 e</sub>	1.03 <sub>2 c</sub>	1.46 <sub>0 c</sub>	1.98 <sub>8 a</sub>	6.07 <sub>6 d</sub>	0.16 <sub>2 f</sub>	0.47 <sub>6 f</sub>	0.95 <sub>8 c</sub>	—	—	—
L <sub>4</sub>	3.38 <sub>1 i</sub>	84.2 <sub>9 e</sub>	1.02 <sub>2 i</sub>	1.49 <sub>8 i</sub>	2.02 <sub>7 i</sub>	6.13 <sub>2 d</sub>	0.15 <sub>8 a</sub>	0.46 <sub>6 a</sub>	0.95 <sub>1 c</sub>	0.00 <sub>2 i</sub>	0.00 <sub>4 i</sub>	0.00 <sub>0 i</sub>
L <sub>5</sub>	3.38 <sub>3 c</sub>	84.2 <sub>4 e</sub>	1.03 <sub>8 c</sub>	1.48 <sub>1 c</sub>	2.00 <sub>7 a</sub>	6.14 <sub>6 d</sub>	0.15 <sub>9 a</sub>	0.46 <sub>8 a</sub>	0.95 <sub>8 c</sub>	0.00 <sub>2 a</sub>	0.00 <sub>2 a</sub>	0.00 <sub>7 c</sub>
L <sub>6</sub>	3.26 <sub>4 i</sub>	84.2 <sub>2 e</sub>	1.03 <sub>8 c</sub>	1.49 <sub>0 c</sub>	1.99 <sub>5 i</sub>	6.17 <sub>4 i</sub>	0.15 <sub>4 a</sub>	0.46 <sub>4 a</sub>	0.94 <sub>1 c</sub>	0.00 <sub>4 i</sub>	0.00 <sub>0 i</sub>	0.00 <sub>0 i</sub>
L <sub>7</sub>	3.36 <sub>1 c</sub>	84.3 <sub>1 e</sub>	1.03 <sub>7 c</sub>	1.49 <sub>1 c</sub>	1.97 <sub>3 a</sub>	6.14 <sub>2 d</sub>	0.16 <sub>0 a</sub>	0.44 <sub>5 a</sub>	0.95 <sub>2 c</sub>	—	—	—
L <sub>8</sub>	3.24 <sub>6 x</sub>	84.1 <sub>7 e</sub>	1.03 <sub>0 c</sub>	1.50 <sub>2 c</sub>	2.00 <sub>1 a</sub>	6.15 <sub>2 a</sub>	0.15 <sub>4 a</sub>	0.46 <sub>4 a</sub>	0.96 <sub>4 c</sub>	0.00 <sub>3 a</sub>	0.00 <sub>1 a</sub>	0.00 <sub>1 c</sub>
Average ( $\bar{X}$ )	3.329 <sub>1</sub>	84.25 <sub>4</sub>	1.035 <sub>1</sub>	1.484 <sub>0</sub>	2.002 <sub>9</sub>	6.132 <sub>0</sub>	0.158 <sub>6</sub>	0.462 <sub>4</sub>	0.956 <sub>8</sub>	0.002 <sub>7</sub>	0.001 <sub>6</sub>	0.001 <sub>6</sub>
Standard deviation (Reproducibility) $s_{\bar{x}}$	0.054 <sub>6</sub>	0.06 <sub>6</sub>	0.006 <sub>8</sub>	0.017 <sub>2</sub>	0.018 <sub>1</sub>	0.029 <sub>5</sub>	0.003 <sub>2</sub>	0.011 <sub>3</sub>	0.008 <sub>7</sub>	0.000 <sub>7</sub>	0.001 <sub>2</sub>	0.001 <sub>2</sub>
Standard deviation (Reproducibility without laboratories) $s_{I(T)}^{*1}$	0.014 <sub>2</sub>	0.06 <sub>5</sub>	0.008 <sub>5</sub>	0.005 <sub>6</sub>	0.009 <sub>9</sub>	0.025 <sub>7</sub>	0.003 <sub>3</sub>	0.003 <sub>7</sub>	0.006 <sub>1</sub>	0.000 <sub>4</sub>	0.000 <sub>4</sub>	0.001 <sub>3</sub>
Uncertainty C (95%) <sup>**2</sup>	0.04 <sub>6</sub>	0.0 <sub>6</sub>	0.00 <sub>6</sub>	0.01 <sub>4</sub>	0.01 <sub>5</sub>	0.02 <sub>5</sub>	0.00 <sub>3</sub>	0.00 <sub>9</sub>	0.00 <sub>7</sub>	0.00 <sub>1</sub>	0.00 <sub>2</sub>	0.00 <sub>2</sub>

(Note) \* 1  $s_{I(T)}$  is intermediate precision without a time condition. \* 2 The half-width confidence interval C (95%) =  $t_{\ell-1,0.05} \times s_{\bar{x}} / \sqrt{\ell}$  ( $\ell$  = number of laboratories)

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- (2) Analytical techniques : JIS R 2014(Method for chemical analysis of refractory containing alumina and magnesia) a:AAS, c:colorimetry, d:Combined use of EDTA titration and ICP-AES, e:chelometry, f:flame spectrophotometry, i:ICP-AES, p:Combined use of Cation exchange separation-chelatometric titration and ICP-AES .
- (3) Analytical values : Each value is the average of two values obtained by two measurements on different days. These analysis values are shown converted into LOI (Loss on ignition) component free values from the February 22, 2008 v20080222 version on.
- (4) Outlier tests were carried out by Grubbs test. The samples rejected by Grubbs tests were discussed in view of analytical techniques and it was determined whether the outliers should be adopted or not.
- (5) Date of preparation : June, 1997

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## Certified Reference Material Series for X-ray Fluorescence Analysis of Refractories

J R R M 8 0 3 (Alumina-Magnesia Refractory)  
Results of Analyses

Unit : mass%

Constituent	SiO <sub>2</sub>	Al <sub>2</sub> O <sub>3</sub>	Fe <sub>2</sub> O <sub>3</sub>	TiO <sub>2</sub>	CaO	MgO	Na <sub>2</sub> O	K <sub>2</sub> O	P <sub>2</sub> O <sub>5</sub>	Uncertified value			
										MnO	Cr <sub>2</sub> O <sub>3</sub>	ZrO <sub>2</sub>	
Certified value	0.58 <sub>3</sub>	74.2 <sub>3</sub>	4.90 <sub>4</sub>	2.51 <sub>6</sub>	0.57 <sub>6</sub>	16.2 <sub>0</sub>	0.86 <sub>9</sub>	0.00 <sub>7</sub>	0.01 <sub>7</sub>	0.00 <sub>5</sub>	0.00 <sub>2</sub>	0.00 <sub>4</sub>	
Laboratories	L <sub>1</sub>	0.58 <sub>0 i</sub>	74.1 <sub>9 e</sub>	4.86 <sub>2 i</sub>	2.50 <sub>9 i</sub>	0.58 <sub>0 i</sub>	16.2 <sub>5 d</sub>	0.87 <sub>0 a</sub>	0.00 <sub>8 a</sub>	0.02 <sub>1 c</sub>	0.00 <sub>5 i</sub>	0.00 <sub>1 i</sub>	0.00 <sub>5 i</sub>
	L <sub>2</sub>	0.59 <sub>2 c</sub>	74.2 <sub>2 e</sub>	4.89 <sub>8 c</sub>	2.49 <sub>5 i</sub>	0.55 <sub>0 i</sub>	16.2 <sub>2 d</sub>	0.87 <sub>4 f</sub>	0.00 <sub>8 f</sub>	0.01 <sub>5 c</sub>	0.00 <sub>6 i</sub>	—	—
	L <sub>3</sub>	0.59 <sub>4 c</sub>	74.1 <sub>4 e</sub>	4.88 <sub>6 c</sub>	2.53 <sub>1 c</sub>	0.58 <sub>8 a</sub>	16.2 <sub>1 d</sub>	0.86 <sub>8 f</sub>	0.01 <sub>0 f</sub>	0.02 <sub>0 c</sub>	—	—	—
	L <sub>4</sub>	0.57 <sub>8 i</sub>	74.4 <sub>4 e</sub>	4.94 <sub>2 i</sub>	2.50 <sub>4 i</sub>	0.56 <sub>6 i</sub>	16.2 <sub>4 d</sub>	0.91 <sub>9 a</sub>	0.01 <sub>1 a</sub>	0.01 <sub>8 c</sub>	0.00 <sub>5 i</sub>	0.00 <sub>4 i</sub>	0.00 <sub>2 i</sub>
	L <sub>5</sub>	0.56 <sub>4 c</sub>	74.1 <sub>7 e</sub>	4.92 <sub>0 c</sub>	2.51 <sub>0 c</sub>	0.57 <sub>4 a</sub>	16.2 <sub>2 d</sub>	0.88 <sub>7 a</sub>	0.00 <sub>0 a</sub>	0.01 <sub>6 c</sub>	0.00 <sub>4 a</sub>	0.00 <sub>0 a</sub>	—
	L <sub>6</sub>	0.58 <sub>2 c</sub>	74.3 <sub>2 e</sub>	4.91 <sub>9 c</sub>	2.53 <sub>3 c</sub>	0.57 <sub>9 i</sub>	16.0 <sub>7 g</sub>	0.84 <sub>0 a</sub>	0.00 <sub>4 a</sub>	0.01 <sub>6 c</sub>	0.00 <sub>5 i</sub>	0.00 <sub>0 i</sub>	0.00 <sub>6 i</sub>
	L <sub>7</sub>	0.59 <sub>5 c</sub>	74.2 <sub>7 e</sub>	4.91 <sub>5 c</sub>	2.53 <sub>6 c</sub>	0.58 <sub>3 a</sub>	16.1 <sub>7 d</sub>	0.82 <sub>8 a</sub>	0.00 <sub>8 a</sub>	0.01 <sub>6 c</sub>	—	—	—
	L <sub>8</sub>	0.57 <sub>8 c</sub>	74.1 <sub>1 e</sub>	4.88 <sub>9 c</sub>	2.50 <sub>6 c</sub>	0.59 <sub>0 a</sub>	16.2 <sub>6 d</sub>	0.86 <sub>8 a</sub>	0.00 <sub>5 a</sub>	0.01 <sub>7 c</sub>	0.00 <sub>4 a</sub>	0.00 <sub>6 a</sub>	0.00 <sub>2 c</sub>
Average ( $\bar{X}$ )	0.582 <sub>9</sub>	74.23 <sub>3</sub>	4.903 <sub>9</sub>	2.515 <sub>5</sub>	0.576 <sub>3</sub>	16.20 <sub>5</sub>	0.869 <sub>3</sub>	0.006 <sub>8</sub>	0.017 <sub>4</sub>	0.004 <sub>8</sub>	0.002 <sub>2</sub>	0.003 <sub>8</sub>	
Standard deviation	(Reproducibility) $s_x$	0.010 <sub>5</sub>	0.10 <sub>6</sub>	0.024 <sub>9</sub>	0.015 <sub>5</sub>	0.013 <sub>0</sub>	0.06 <sub>1</sub>	0.027 <sub>5</sub>	0.003 <sub>5</sub>	0.002 <sub>2</sub>	0.000 <sub>8</sub>	0.003 <sub>1</sub>	0.002 <sub>1</sub>
	(Reproducibility without laboratories) $s_{I(T)}$ *	0.004 <sub>6</sub>	0.10 <sub>1</sub>	0.009 <sub>2</sub>	0.005 <sub>8</sub>	0.005 <sub>1</sub>	0.06 <sub>5</sub>	0.004 <sub>5</sub>	0.001 <sub>2</sub>	0.001 <sub>4</sub>	0.000 <sub>4</sub>	0.002 <sub>0</sub>	0.001 <sub>9</sub>
Uncertainty C (95%) **2	0.00 <sub>9</sub>	0.0 <sub>9</sub>	0.02 <sub>1</sub>	0.01 <sub>3</sub>	0.01 <sub>1</sub>	0.0 <sub>5</sub>	0.02 <sub>3</sub>	0.00 <sub>3</sub>	0.00 <sub>2</sub>	0.00 <sub>1</sub>	0.00 <sub>4</sub>	0.00 <sub>3</sub>	

(Note) \* 1  $s_{I(T)}$  is intermediate precision without a time condition. \* 2 The half-width confidence interval C (95%) =  $t_{\ell-1,0.05} \times s_x / \sqrt{\ell}$  ( $\ell$  = number of laboratories)

- List of laboratories : Krosaki Corporation, Kawasaki Refractories Co.,Ltd., Yotai Refractories Co.,Ltd., Asahi Glass Co.,Ltd., Harima Ceramic Co.,Ltd., Shinagawa Refractories Co.,Ltd., TYK Corporation, Toshiba Monofrax Co.,Ltd.
- Analytical techniques : JIS R 2014(Method for chemical analysis of refractory containing alumina and magnesia) a:AAS, c:colorimetry, d:Combined use of EDTA titration and ICP-AES, e:chelometry, f:flame spectrophotometry, i:ICP-AES, p:Combined use of Cation exchange separation-chelatometric titration and ICP-AES .
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J R R M 8 0 4 (Alumina-Magnesia Refractory)  
Results of Analyses

Unit : mass%

Constituent	SiO <sub>2</sub>	Al <sub>2</sub> O <sub>3</sub>	Fe <sub>2</sub> O <sub>3</sub>	TiO <sub>2</sub>	CaO	MgO	Na <sub>2</sub> O	K <sub>2</sub> O	P <sub>2</sub> O <sub>5</sub>	Uncertified value		
										MnO	Cr <sub>2</sub> O <sub>3</sub>	ZrO <sub>2</sub>
Certified value	5.17 <sub>8</sub>	64.6 <sub>6</sub>	4.02 <sub>0</sub>	0.13 <sub>2</sub>	4.76 <sub>7</sub>	20.8 <sub>4</sub>	0.08 <sub>9</sub>	0.04 <sub>4</sub>	0.11 <sub>1</sub>	0.02 <sub>0</sub>	0.01 <sub>0</sub>	0.00 <sub>2</sub>
Laboratories L <sub>1</sub> L <sub>2</sub> L <sub>3</sub> L <sub>4</sub> L <sub>5</sub> L <sub>6</sub> L <sub>7</sub> L <sub>8</sub>	5.22 <sub>9 i</sub>	64.8 <sub>2 e</sub>	4.02 <sub>4 i</sub>	0.13 <sub>3 i</sub>	4.80 <sub>1 i</sub>	20.8 <sub>0 d</sub>	0.09 <sub>1 a</sub>	0.04 <sub>6 a</sub>	0.11 <sub>0 c</sub>	0.02 <sub>2 i</sub>	0.01 <sub>0 i</sub>	0.00 <sub>1 i</sub>
	5.14 <sub>4 i</sub>	64.8 <sub>4 e</sub>	4.03 <sub>3 c</sub>	0.12 <sub>8 i</sub>	4.76 <sub>7 i</sub>	20.9 <sub>1 d</sub>	0.09 <sub>5 f</sub>	0.04 <sub>2 f</sub>	0.11 <sub>1 c</sub>	0.01 <sub>9 i</sub>	—	—
	5.17 <sub>6 c</sub>	64.7 <sub>0 e</sub>	4.00 <sub>5 c</sub>	0.13 <sub>0 c</sub>	4.77 <sub>8 a</sub>	20.8 <sub>8 d</sub>	0.08 <sub>6 f</sub>	0.04 <sub>5 f</sub>	0.11 <sub>1 c</sub>	—	—	—
	5.21 <sub>2 i</sub>	64.4 <sub>2 e</sub>	4.00 <sub>8 i</sub>	0.13 <sub>2 i</sub>	4.78 <sub>0 i</sub>	20.9 <sub>8 d</sub>	0.09 <sub>2 a</sub>	0.04 <sub>6 a</sub>	0.11 <sub>2 c</sub>	0.01 <sub>9 i</sub>	0.01 <sub>3 i</sub>	0.00 <sub>0 i</sub>
	5.17 <sub>1 c</sub>	64.5 <sub>0 e</sub>	4.03 <sub>5 c</sub>	0.13 <sub>1 c</sub>	4.75 <sub>3 a</sub>	20.8 <sub>9 d</sub>	0.08 <sub>7 a</sub>	0.04 <sub>2 a</sub>	0.11 <sub>2 c</sub>	0.01 <sub>8 a</sub>	0.00 <sub>8 a</sub>	—
	5.16 <sub>5 c</sub>	64.6 <sub>4 e</sub>	4.03 <sub>1 c</sub>	0.13 <sub>5 c</sub>	4.76 <sub>8 i</sub>	20.7 <sub>4 d</sub>	0.08 <sub>4 a</sub>	0.04 <sub>3 a</sub>	0.11 <sub>0 c</sub>	0.02 <sub>5 i</sub>	0.00 <sub>7 i</sub>	0.00 <sub>3 i</sub>
	5.15 <sub>1 c</sub>	64.6 <sub>0 e</sub>	4.01 <sub>2 c</sub>	0.13 <sub>6 c</sub>	4.73 <sub>5 a</sub>	20.7 <sub>6 d</sub>	0.09 <sub>0 a</sub>	0.04 <sub>2 a</sub>	0.11 <sub>2 c</sub>	—	—	—
	5.17 <sub>4 c</sub>	64.7 <sub>4 e</sub>	4.01 <sub>6 c</sub>	0.13 <sub>4 c</sub>	4.75 <sub>6 a</sub>	20.7 <sub>8 d</sub>	0.08 <sub>4 a</sub>	0.04 <sub>4 a</sub>	0.11 <sub>1 c</sub>	0.02 <sub>0 a</sub>	0.01 <sub>1 a</sub>	0.00 <sub>4 c</sub>
Average ( $\bar{X}$ )	5.177 <sub>8</sub>	64.65 <sub>8</sub>	4.020 <sub>5</sub>	0.132 <sub>4</sub>	4.767 <sub>3</sub>	20.84 <sub>3</sub>	0.088 <sub>6</sub>	0.043 <sub>8</sub>	0.111 <sub>1</sub>	0.020 <sub>5</sub>	0.009 <sub>8</sub>	0.002 <sub>0</sub>
Standard deviation (Reproducibility) $s_{\bar{x}}$ (Reproducibility without laboratories) $s_{I(T)}$ * 1	0.029 <sub>2</sub>	0.14 <sub>5</sub>	0.011 <sub>9</sub>	0.002 <sub>8</sub>	0.020 <sub>0</sub>	0.08 <sub>5</sub>	0.004 <sub>2</sub>	0.001 <sub>9</sub>	0.000 <sub>7</sub>	0.002 <sub>5</sub>	0.002 <sub>4</sub>	0.001 <sub>5</sub>
	0.018 <sub>7</sub>	0.05 <sub>1</sub>	0.021 <sub>5</sub>	0.001 <sub>2</sub>	0.023 <sub>1</sub>	0.06 <sub>0</sub>	0.002 <sub>1</sub>	0.003 <sub>3</sub>	0.001 <sub>6</sub>	0.001 <sub>2</sub>	0.000 <sub>9</sub>	0.001 <sub>3</sub>
Uncertainty C (95%) * 2	0.02 <sub>4</sub>	0.1 <sub>2</sub>	0.01 <sub>0</sub>	0.00 <sub>2</sub>	0.01 <sub>7</sub>	0.0 <sub>7</sub>	0.00 <sub>4</sub>	0.00 <sub>2</sub>	0.00 <sub>1</sub>	0.00 <sub>3</sub>	0.00 <sub>3</sub>	0.00 <sub>2</sub>

(Note) \* 1  $s_{I(T)}$  is intermediate precision without a time condition. \* 2 The half-width confidence interval C (95%) =  $t_{\alpha/2, \nu} \times s_{\bar{x}} / \sqrt{\ell}$  ( $\ell$  = number of laboratories)

- List of laboratories : Krosaki Corporation, Kawasaki Refractories Co.,Ltd., Yotai Refractories Co.,Ltd., Asahi Glass Co.,Ltd., Harima Ceramic Co.,Ltd., Shinagawa Refractories Co.,Ltd., TYK Corporation, Toshiba Monofrax Co.,Ltd.
- Analytical techniques : JIS R 2014(Method for chemical analysis of refractory containing alumina and magnesia) a:AAS, c:colorimetry, d:Combined use of EDTA titration and ICP-AES, e:chelometry, f:flame spectrophotometry, i:ICP-AES, p:Combined use of Cation exchange separation-chelatometric titration and ICP-AES .
- Analytical values : Each value is the average of two values obtained by two measurements on different days. These analysis values are shown converted into LOI (Loss on ignition) component free values from the February 22, 2008 v20080222 version on.
- Outlier tests were carried out by Grubbs test. The samples rejected by Grubbs tests were discussed in view of analytical techniques and it was determined whether the outliers should be adopted or not.
- Date of preparation : June, 1997

Prepared, and Values given and certified by

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## The Technical Association of Refractories, Japan

## Certified Reference Material Series for X-ray Fluorescence Analysis of Refractories

J R R M 8 0 5 (Alumina-Magnesia Refractory)  
Results of Analyses

Unit : mass%

Constituent	SiO <sub>2</sub>	Al <sub>2</sub> O <sub>3</sub>	Fe <sub>2</sub> O <sub>3</sub>	TiO <sub>2</sub>	CaO	MgO	Na <sub>2</sub> O	K <sub>2</sub> O	P <sub>2</sub> O <sub>5</sub>	Uncertified value			
										MnO	Cr <sub>2</sub> O <sub>3</sub>	ZrO <sub>2</sub>	
Certified value	2.49 <sub>8</sub>	58.0 <sub>3</sub>	0.73 <sub>2</sub>	1.05 <sub>9</sub>	0.28 <sub>2</sub>	36.0 <sub>4</sub>	0.54 <sub>6</sub>	0.01 <sub>5</sub>	0.68 <sub>2</sub>	0.00 <sub>6</sub>	0.00 <sub>1</sub>	0.00 <sub>6</sub>	
Laboratories	L <sub>1</sub>	2.52 <sub>3 i</sub>	58.0 <sub>4 e</sub>	0.73 <sub>2 i</sub>	1.07 <sub>7 i</sub>	0.29 <sub>6 i</sub>	35.9 <sub>3 d</sub>	0.52 <sub>5 a</sub>	0.01 <sub>4 a</sub>	0.69 <sub>0 c</sub>	0.00 <sub>5 i</sub>	0.00 <sub>0 i</sub>	0.00 <sub>0 i</sub>
	L <sub>2</sub>	2.52 <sub>4 c</sub>	58.1 <sub>0 e</sub>	0.73 <sub>8 c</sub>	1.03 <sub>2 i</sub>	0.26 <sub>7 i</sub>	35.9 <sub>2 d</sub>	0.55 <sub>7 f</sub>	0.01 <sub>4 f</sub>	0.68 <sub>0 c</sub>	0.00 <sub>8 i</sub>	—	—
	L <sub>3</sub>	2.47 <sub>0 x</sub>	58.1 <sub>2 e</sub>	0.73 <sub>8 c</sub>	1.05 <sub>2 c</sub>	0.31 <sub>8 a</sub>	35.9 <sub>8 d</sub>	0.51 <sub>8 f</sub>	0.01 <sub>8 f</sub>	0.68 <sub>2 c</sub>	—	—	—
	L <sub>4</sub>	2.52 <sub>0 i</sub>	58.0 <sub>8 e</sub>	0.72 <sub>0 i</sub>	1.05 <sub>1 i</sub>	0.26 <sub>8 i</sub>	36.1 <sub>8 d</sub>	0.56 <sub>0 a</sub>	0.01 <sub>6 a</sub>	0.68 <sub>8 c</sub>	0.00 <sub>8 i</sub>	0.00 <sub>5 i</sub>	0.00 <sub>0 i</sub>
	L <sub>5</sub>	2.51 <sub>0 c</sub>	58.1 <sub>1 e</sub>	0.73 <sub>2 c</sub>	1.05 <sub>0 c</sub>	0.27 <sub>1 a</sub>	36.0 <sub>2 d</sub>	0.55 <sub>3 a</sub>	0.00 <sub>9 a</sub>	0.68 <sub>2 c</sub>	0.00 <sub>7 a</sub>	0.00 <sub>0 a</sub>	—
	L <sub>6</sub>	2.47 <sub>8 i</sub>	57.9 <sub>4 t</sub>	0.73 <sub>6 c</sub>	1.07 <sub>9 c</sub>	0.26 <sub>5 p</sub>	36.1 <sub>4 g</sub>	0.53 <sub>4 a</sub>	0.01 <sub>4 a</sub>	0.67 <sub>8 c</sub>	0.00 <sub>4 i</sub>	0.00 <sub>0 i</sub>	0.00 <sub>0 i</sub>
	L <sub>7</sub>	2.51 <sub>8 c</sub>	57.8 <sub>8 e</sub>	0.73 <sub>6 c</sub>	1.05 <sub>8 c</sub>	0.28 <sub>5 a</sub>	36.0 <sub>8 d</sub>	0.52 <sub>0 a</sub>	0.02 <sub>2 a</sub>	0.67 <sub>8 c</sub>	—	—	—
	L <sub>8</sub>	2.44 <sub>1 x</sub>	57.9 <sub>9 e</sub>	0.72 <sub>8 c</sub>	1.07 <sub>5 c</sub>	0.28 <sub>4 a</sub>	36.0 <sub>8 d</sub>	0.55 <sub>3 a</sub>	0.01 <sub>1 a</sub>	0.67 <sub>8 c</sub>	0.00 <sub>5 a</sub>	0.00 <sub>0 a</sub>	0.00 <sub>0 c</sub>
Average ( $\bar{X}$ )	2.498 <sub>4</sub>	58.03 <sub>3</sub>	0.732 <sub>5</sub>	1.059 <sub>3</sub>	0.281 <sub>8</sub>	36.04 <sub>1</sub>	0.540 <sub>6</sub>	0.014 <sub>8</sub>	0.682 <sub>0</sub>	0.006 <sub>2</sub>	0.001 <sub>0</sub>	0.000 <sub>6</sub>	
Standard deviation	(Reproducibility) $s_x$	0.030 <sub>4</sub>	0.09 <sub>1</sub>	0.005 <sub>9</sub>	0.016 <sub>5</sub>	0.018 <sub>1</sub>	0.09 <sub>4</sub>	0.017 <sub>4</sub>	0.003 <sub>8</sub>	0.004 <sub>7</sub>	0.001 <sub>7</sub>	0.004 <sub>0</sub>	0.000 <sub>6</sub>
	(Reproducibility without laboratories) $s_{I(T)}$ * 1	0.005 <sub>7</sub>	0.07 <sub>8</sub>	0.003 <sub>4</sub>	0.003 <sub>8</sub>	0.003 <sub>3</sub>	0.09 <sub>8</sub>	0.009 <sub>6</sub>	0.001 <sub>5</sub>	0.003 <sub>8</sub>	0.000 <sub>8</sub>	0.001 <sub>4</sub>	0.000 <sub>3</sub>
Uncertainty C (95%) **2	0.02 <sub>5</sub>	0.0 <sub>8</sub>	0.00 <sub>5</sub>	0.01 <sub>4</sub>	0.01 <sub>5</sub>	0.0 <sub>8</sub>	0.01 <sub>5</sub>	0.00 <sub>3</sub>	0.00 <sub>4</sub>	0.00 <sub>2</sub>	0.00 <sub>5</sub>	0.00 <sub>6</sub>	

(Note) \* 1  $s_{I(T)}$  is intermediate precision without a time condition. \* 2 The half-width confidence interval C (95%) =  $t_{\ell-1,0.05} \times s_x / \sqrt{\ell}$  ( $\ell$  = number of laboratories)

- (1) List of laboratories : Krosaki Corporation, Kawasaki Refractories Co.,Ltd., Yotai Refractories Co.,Ltd., Asahi Glass Co.,Ltd., Harima Ceramic Co.,Ltd., Shinagawa Refractories Co.,Ltd., TYK Corporation, Toshiba Monofrax Co.,Ltd.
- (2) Analytical techniques : JIS R 2014(Method for chemical analysis of refractory containing alumina and magnesia) a:AAS, c:colorimetry, d:Combined use of EDTA titration and ICP-AES, e:chelometry, f:flame spectrophotometry, i:ICP-AES, p:Combined use of Cation exchange separation-chelatometric titration and ICP-AES .
- (3) Analytical values : Each value is the average of two values obtained by two measurements on different days. These analysis values are shown converted into LOI (Loss on ignition) component free values from the February 22, 2008 v20080222 version on.
- (4) Outlier tests were carried out by Grubbs test. The samples rejected by Grubbs tests were discussed in view of analytical techniques and it was determined whether the outliers should be adopted or not.
- (5) Date of preparation : June, 1997

Prepared, and Values given and certified by

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## The Technical Association of Refractories, Japan

## Certified Reference Material Series for X-ray Fluorescence Analysis of Refractories

J R R M 8 0 6 (Alumina-Magnesia Refractory)  
Results of Analyses

Unit : mass%

Constituent	SiO <sub>2</sub>	Al <sub>2</sub> O <sub>3</sub>	Fe <sub>2</sub> O <sub>3</sub>	TiO <sub>2</sub>	CaO	MgO	Na <sub>2</sub> O	K <sub>2</sub> O	P <sub>2</sub> O <sub>5</sub>	Uncertified value			
										MnO	Cr <sub>2</sub> O <sub>3</sub>	ZrO <sub>2</sub>	
Certified value	0.51 <sub>4</sub>	48.8 <sub>5</sub>	0.16 <sub>5</sub>	0.00 <sub>4</sub>	0.97 <sub>9</sub>	49.4 <sub>1</sub>	0.04 <sub>9</sub>	0.00 <sub>1</sub>	0.04 <sub>8</sub>	0.02 <sub>6</sub>	0.00 <sub>6</sub>	0.00 <sub>1</sub>	
Laboratories	L <sub>1</sub>	0.54 <sub>3 i</sub>	48.9 <sub>9 e</sub>	0.16 <sub>6 i</sub>	0.00 <sub>3 i</sub>	0.98 <sub>0 i</sub>	49.5 <sub>0 d</sub>	0.04 <sub>9 a</sub>	0.00 <sub>4 a</sub>	0.04 <sub>9 c</sub>	0.02 <sub>7 i</sub>	0.00 <sub>5 i</sub>	0.00 <sub>1 i</sub>
	L <sub>2</sub>	0.49 <sub>8 c</sub>	48.7 <sub>5 e</sub>	0.16 <sub>7 c</sub>	0.00 <sub>0 i</sub>	0.97 <sub>6 i</sub>	49.4 <sub>4 d</sub>	0.05 <sub>4 f</sub>	0.00 <sub>0 f</sub>	0.04 <sub>8 c</sub>	0.02 <sub>5 i</sub>	—	—
	L <sub>3</sub>	0.50 <sub>0 c</sub>	48.9 <sub>7 e</sub>	0.16 <sub>4 c</sub>	0.00 <sub>6 c</sub>	0.98 <sub>0 a</sub>	49.5 <sub>2 d</sub>	0.05 <sub>4 f</sub>	0.00 <sub>4 f</sub>	0.04 <sub>6 c</sub>	—	—	—
	L <sub>4</sub>	0.54 <sub>6 i</sub>	48.8 <sub>2 e</sub>	0.16 <sub>6 i</sub>	0.00 <sub>5 i</sub>	0.98 <sub>0 i</sub>	49.3 <sub>8 d</sub>	0.05 <sub>2 a</sub>	0.00 <sub>2 a</sub>	0.04 <sub>8 c</sub>	0.02 <sub>6 i</sub>	0.01 <sub>0 i</sub>	0.00 <sub>0 i</sub>
	L <sub>5</sub>	0.50 <sub>2 c</sub>	48.8 <sub>6 e</sub>	0.16 <sub>7 c</sub>	0.00 <sub>5 c</sub>	0.99 <sub>2 a</sub>	49.4 <sub>8 d</sub>	0.04 <sub>9 a</sub>	0.00 <sub>0 a</sub>	0.04 <sub>8 c</sub>	0.02 <sub>3 a</sub>	0.00 <sub>4 a</sub>	0.00 <sub>0 c</sub>
	L <sub>6</sub>	0.50 <sub>0 c</sub>	48.8 <sub>9 e</sub>	0.16 <sub>2 c</sub>	0.00 <sub>4 c</sub>	0.97 <sub>8 i</sub>	49.4 <sub>0 d</sub>	0.04 <sub>2 a</sub>	0.00 <sub>0 a</sub>	0.04 <sub>8 c</sub>	0.02 <sub>8 i</sub>	0.00 <sub>2 i</sub>	0.00 <sub>0 i</sub>
	L <sub>7</sub>	0.52 <sub>4 c</sub>	48.7 <sub>7 e</sub>	0.16 <sub>8 c</sub>	0.00 <sub>3 c</sub>	0.97 <sub>1 a</sub>	49.3 <sub>8 d</sub>	0.04 <sub>6 a</sub>	0.00 <sub>1 a</sub>	0.04 <sub>8 c</sub>	—	—	—
	L <sub>8</sub>	0.50 <sub>2 c</sub>	48.7 <sub>3 e</sub>	0.16 <sub>2 c</sub>	0.00 <sub>6 c</sub>	0.97 <sub>3 a</sub>	49.3 <sub>2 d</sub>	0.04 <sub>7 a</sub>	0.00 <sub>0 a</sub>	0.04 <sub>6 c</sub>	0.02 <sub>8 a</sub>	0.00 <sub>7 a</sub>	0.00 <sub>2 c</sub>
Average ( $\bar{X}$ )	0.514 <sub>4</sub>	48.84 <sub>8</sub>	0.165 <sub>3</sub>	0.004 <sub>4</sub>	0.978 <sub>8</sub>	49.42 <sub>8</sub>	0.049 <sub>1</sub>	0.001 <sub>4</sub>	0.047 <sub>6</sub>	0.026 <sub>2</sub>	0.005 <sub>6</sub>	0.000 <sub>6</sub>	
Standard deviation (Reproducibility) $s_{\bar{x}}$ (Reproducibility without laboratories) $s_{I(T)}$ * 1	$s_{\bar{x}}$	0.020 <sub>3</sub>	0.09 <sub>8</sub>	0.002 <sub>2</sub>	0.002 <sub>0</sub>	0.006 <sub>5</sub>	0.07 <sub>0</sub>	0.004 <sub>4</sub>	0.002 <sub>2</sub>	0.000 <sub>8</sub>	0.001 <sub>9</sub>	0.002 <sub>9</sub>	0.000 <sub>7</sub>
	$s_{I(T)}$ * 1	0.005 <sub>3</sub>	0.05 <sub>6</sub>	0.003 <sub>5</sub>	0.002 <sub>4</sub>	0.006 <sub>7</sub>	0.04 <sub>0</sub>	0.003 <sub>1</sub>	0.001 <sub>1</sub>	0.001 <sub>4</sub>	0.000 <sub>9</sub>	0.001 <sub>3</sub>	0.000 <sub>6</sub>
Uncertainty C (95%) * 2	0.01 <sub>7</sub>	0.0 <sub>8</sub>	0.00 <sub>2</sub>	0.00 <sub>2</sub>	0.00 <sub>5</sub>	0.0 <sub>6</sub>	0.00 <sub>4</sub>	0.00 <sub>2</sub>	0.00 <sub>1</sub>	0.00 <sub>2</sub>	0.00 <sub>4</sub>	0.00 <sub>1</sub>	

(Note) \* 1  $s_{I(T)}$  is intermediate precision without a time condition. \* 2 The half-width confidence interval C (95%) =  $t_{\ell-1,0.05} \times s_{\bar{x}} / \sqrt{\ell}$  ( $\ell$  = number of laboratories)

- List of laboratories : Krosaki Corporation, Kawasaki Refractories Co.,Ltd., Yotai Refractories Co.,Ltd., Asahi Glass Co.,Ltd., Harima Ceramic Co.,Ltd., Shinagawa Refractories Co.,Ltd., TYK Corporation, Toshiba Monofrax Co.,Ltd.
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## Certified Reference Material Series for X-ray Fluorescence Analysis of Refractories

J R R M 8 0 7 (Alumina-Magnesia Refractory)  
Results of Analyses

Unit : mass%

Constituent	SiO <sub>2</sub>	Al <sub>2</sub> O <sub>3</sub>	Fe <sub>2</sub> O <sub>3</sub>	TiO <sub>2</sub>	CaO	MgO	Na <sub>2</sub> O	K <sub>2</sub> O	P <sub>2</sub> O <sub>5</sub>	Uncertified value			
										MnO	Cr <sub>2</sub> O <sub>3</sub>	ZrO <sub>2</sub>	
Certified value	0.58 <sub>6</sub>	39.9 <sub>6</sub>	0.32 <sub>3</sub>	0.19 <sub>8</sub>	2.75 <sub>9</sub>	55.0 <sub>7</sub>	0.32 <sub>9</sub>	0.15 <sub>3</sub>	0.53 <sub>0</sub>	0.00 <sub>5</sub>	0.00 <sub>2</sub>	0.00 <sub>1</sub>	
Laboratories	L <sub>1</sub>	0.58 <sub>6 i</sub>	40.0 <sub>0 e</sub>	0.31 <sub>6 i</sub>	0.19 <sub>4 i</sub>	2.74 <sub>1 i</sub>	55.0 <sub>5 d</sub>	0.31 <sub>1 a</sub>	0.14 <sub>5 a</sub>	0.53 <sub>1 c</sub>	0.00 <sub>6 i</sub>	0.00 <sub>0 i</sub>	0.00 <sub>1 i</sub>
	L <sub>2</sub>	0.58 <sub>2 c</sub>	39.9 <sub>2 e</sub>	0.32 <sub>8 c</sub>	0.19 <sub>4 i</sub>	2.75 <sub>8 i</sub>	55.1 <sub>2 d</sub>	0.34 <sub>5 f</sub>	0.13 <sub>5 f</sub>	0.53 <sub>0 c</sub>	0.00 <sub>6 i</sub>	—	—
	L <sub>3</sub>	0.58 <sub>4 x</sub>	39.8 <sub>0 e</sub>	0.32 <sub>4 c</sub>	0.20 <sub>3 c</sub>	2.77 <sub>4 a</sub>	55.0 <sub>6 d</sub>	0.33 <sub>8 f</sub>	0.14 <sub>8 f</sub>	0.53 <sub>5 c</sub>	—	—	—
	L <sub>4</sub>	0.59 <sub>2 i</sub>	40.0 <sub>6 e</sub>	0.32 <sub>1 i</sub>	0.20 <sub>0 i</sub>	2.77 <sub>0 i</sub>	55.1 <sub>6 d</sub>	0.34 <sub>6 a</sub>	0.17 <sub>0 a</sub>	0.52 <sub>6 c</sub>	0.00 <sub>7 i</sub>	0.00 <sub>6 i</sub>	0.00 <sub>2 i</sub>
	L <sub>5</sub>	0.58 <sub>4 c</sub>	40.0 <sub>1 e</sub>	0.33 <sub>0 c</sub>	0.19 <sub>6 c</sub>	2.76 <sub>5 a</sub>	55.1 <sub>4 d</sub>	0.33 <sub>2 a</sub>	0.15 <sub>9 a</sub>	0.53 <sub>0 c</sub>	0.00 <sub>6 a</sub>	0.00 <sub>0 a</sub>	—
	L <sub>6</sub>	0.58 <sub>0 i</sub>	40.0 <sub>1 t</sub>	0.32 <sub>1 c</sub>	0.20 <sub>0 c</sub>	2.77 <sub>6 i</sub>	55.0 <sub>7 g</sub>	0.30 <sub>6 a</sub>	0.15 <sub>2 a</sub>	0.53 <sub>6 c</sub>	0.00 <sub>2 i</sub>	0.00 <sub>0 i</sub>	0.00 <sub>2 i</sub>
	L <sub>7</sub>	0.60 <sub>6 c</sub>	39.9 <sub>4 e</sub>	0.32 <sub>5 c</sub>	0.19 <sub>8 c</sub>	2.72 <sub>0 a</sub>	54.9 <sub>8 d</sub>	0.31 <sub>2 a</sub>	0.15 <sub>5 a</sub>	0.53 <sub>0 c</sub>	—	—	—
	L <sub>8</sub>	0.57 <sub>6 x</sub>	39.9 <sub>0 e</sub>	0.32 <sub>2 c</sub>	0.20 <sub>2 c</sub>	2.76 <sub>7 a</sub>	54.9 <sub>8 d</sub>	0.34 <sub>0 a</sub>	0.16 <sub>2 a</sub>	0.52 <sub>6 c</sub>	0.00 <sub>4 a</sub>	0.00 <sub>2 a</sub>	0.00 <sub>0 c</sub>
Average ( $\bar{X}$ )	0.586 <sub>3</sub>	39.95 <sub>3</sub>	0.323 <sub>4</sub>	0.198 <sub>4</sub>	2.758 <sub>9</sub>	55.07 <sub>0</sub>	0.328 <sub>8</sub>	0.153 <sub>3</sub>	0.530 <sub>5</sub>	0.005 <sub>2</sub>	0.001 <sub>6</sub>	0.001 <sub>3</sub>	
Standard deviation	(Reproducibility) $s_x$	0.009 <sub>2</sub>	0.08 <sub>1</sub>	0.004 <sub>3</sub>	0.003 <sub>6</sub>	0.019 <sub>2</sub>	0.06 <sub>9</sub>	0.016 <sub>4</sub>	0.010 <sub>9</sub>	0.003 <sub>8</sub>	0.002 <sub>0</sub>	0.003 <sub>9</sub>	0.000 <sub>9</sub>
	(Reproducibility without laboratories) $s_{I(T)}$ *	0.009 <sub>3</sub>	0.06 <sub>8</sub>	0.003 <sub>9</sub>	0.002 <sub>4</sub>	0.022 <sub>6</sub>	0.04 <sub>8</sub>	0.007 <sub>6</sub>	0.003 <sub>1</sub>	0.006 <sub>0</sub>	0.000 <sub>4</sub>	0.001 <sub>5</sub>	0.001 <sub>3</sub>
Uncertainty C (95%) **2	0.00 <sub>8</sub>	0.0 <sub>7</sub>	0.00 <sub>4</sub>	0.00 <sub>3</sub>	0.01 <sub>6</sub>	0.0 <sub>6</sub>	0.01 <sub>4</sub>	0.00 <sub>9</sub>	0.00 <sub>3</sub>	0.00 <sub>2</sub>	0.00 <sub>5</sub>	0.00 <sub>2</sub>	

(Note) \* 1  $s_{I(T)}$  is intermediate precision without a time condition. \* 2 The half-width confidence interval C (95%) =  $t_{\ell-1,0.05} \times s_x / \sqrt{\ell}$  ( $\ell$  = number of laboratories)

- List of laboratories : Krosaki Corporation, Kawasaki Refractories Co.,Ltd., Yotai Refractories Co.,Ltd., Asahi Glass Co.,Ltd., Harima Ceramic Co.,Ltd., Shinagawa Refractories Co.,Ltd., TYK Corporation, Toshiba Monofrax Co.,Ltd.
- Analytical techniques : JIS R 2014(Method for chemical analysis of refractory containing alumina and magnesia) a:AAS, c:colorimetry, d:Combined use of EDTA titration and ICP-AES, e:chelometry, f:flame spectrophotometry, i:ICP-AES, p:Combined use of Cation exchange separation-chelatometric titration and ICP-AES .
- Analytical values : Each value is the average of two values obtained by two measurements on different days. These analysis values are shown converted into LOI (Loss on ignition) component free values from the February 22, 2008 v20080222 version on.
- Outlier tests were carried out by Grubbs test. The samples rejected by Grubbs tests were discussed in view of analytical techniques and it was determined whether the outliers should be adopted or not.
- Date of preparation : June, 1997

Prepared, and Values given and certified by

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## The Technical Association of Refractories, Japan

## Certified Reference Material Series for X-ray Fluorescence Analysis of Refractories

J R R M 8 0 8 (Alumina-Magnesia Refractory)  
Results of Analyses

Unit : mass%

Constituent	SiO <sub>2</sub>	Al <sub>2</sub> O <sub>3</sub>	Fe <sub>2</sub> O <sub>3</sub>	TiO <sub>2</sub>	CaO	MgO	Na <sub>2</sub> O	K <sub>2</sub> O	P <sub>2</sub> O <sub>5</sub>	Uncertified value		
										MnO	Cr <sub>2</sub> O <sub>3</sub>	ZrO <sub>2</sub>
Certified value	0.79 <sub>s</sub>	28.6 <sub>s</sub>	0.56 <sub>s</sub>	0.71 <sub>4</sub>	0.99 <sub>4</sub>	67.0 <sub>1</sub>	0.40 <sub>s</sub>	0.69 <sub>2</sub>	0.22 <sub>9</sub>	0.01 <sub>7</sub>	0.00 <sub>1</sub>	0.00 <sub>1</sub>
Laboratories												
L <sub>1</sub>	0.81 <sub>5 i</sub>	28.7 <sub>9 e</sub>	0.56 <sub>3 i</sub>	0.71 <sub>9 i</sub>	1.00 <sub>2 i</sub>	66.9 <sub>4 d</sub>	0.41 <sub>8 a</sub>	0.70 <sub>0 a</sub>	0.23 <sub>2 c</sub>	0.01 <sub>8 i</sub>	0.00 <sub>1 i</sub>	0.00 <sub>0 i</sub>
L <sub>2</sub>	0.77 <sub>8 c</sub>	28.6 <sub>2 e</sub>	0.57 <sub>6 c</sub>	0.70 <sub>7 i</sub>	0.97 <sub>7 i</sub>	66.9 <sub>1 d</sub>	0.40 <sub>5 f</sub>	0.67 <sub>0 f</sub>	0.23 <sub>0 c</sub>	0.01 <sub>6 i</sub>	—	—
L <sub>3</sub>	0.80 <sub>8 c</sub>	28.8 <sub>1 e</sub>	0.56 <sub>8 c</sub>	0.70 <sub>8 c</sub>	1.00 <sub>2 a</sub>	67.0 <sub>9 d</sub>	0.40 <sub>8 f</sub>	0.69 <sub>6 f</sub>	0.22 <sub>6 c</sub>	—	—	—
L <sub>4</sub>	0.80 <sub>4 i</sub>	28.6 <sub>0 e</sub>	0.56 <sub>2 i</sub>	0.71 <sub>0 i</sub>	0.98 <sub>6 i</sub>	67.2 <sub>9 d</sub>	0.41 <sub>8 a</sub>	0.69 <sub>5 a</sub>	0.22 <sub>8 c</sub>	0.01 <sub>6 i</sub>	0.00 <sub>2 i</sub>	0.00 <sub>0 i</sub>
L <sub>5</sub>	0.80 <sub>2 c</sub>	28.7 <sub>9 e</sub>	0.55 <sub>6 c</sub>	0.71 <sub>1 c</sub>	1.00 <sub>8 a</sub>	67.1 <sub>5 d</sub>	0.40 <sub>8 a</sub>	0.70 <sub>2 a</sub>	0.23 <sub>1 c</sub>	0.01 <sub>4 a</sub>	0.00 <sub>1 a</sub>	0.00 <sub>4 c</sub>
L <sub>6</sub>	0.79 <sub>2 c</sub>	28.7 <sub>0 e</sub>	0.57 <sub>0 c</sub>	0.72 <sub>2 c</sub>	0.99 <sub>4 i</sub>	66.9 <sub>0 d</sub>	0.40 <sub>0 a</sub>	0.69 <sub>6 a</sub>	0.22 <sub>8 c</sub>	0.01 <sub>8 i</sub>	0.00 <sub>0 i</sub>	0.00 <sub>0 i</sub>
L <sub>7</sub>	0.79 <sub>7 c</sub>	28.5 <sub>4 e</sub>	0.56 <sub>2 c</sub>	0.72 <sub>5 c</sub>	0.99 <sub>2 a</sub>	66.9 <sub>0 d</sub>	0.41 <sub>4 a</sub>	0.69 <sub>9 a</sub>	0.23 <sub>0 c</sub>	—	—	—
L <sub>8</sub>	0.79 <sub>7 c</sub>	28.6 <sub>3 e</sub>	0.56 <sub>0 c</sub>	0.71 <sub>0 c</sub>	0.99 <sub>0 a</sub>	66.9 <sub>2 d</sub>	0.40 <sub>2 a</sub>	0.68 <sub>1 a</sub>	0.22 <sub>9 c</sub>	0.01 <sub>9 a</sub>	0.00 <sub>2 a</sub>	0.00 <sub>3 c</sub>
Average ( $\bar{X}$ )	0.799 <sub>1</sub>	28.68 <sub>s</sub>	0.564 <sub>6</sub>	0.714 <sub>0</sub>	0.993 <sub>9</sub>	67.01 <sub>3</sub>	0.409 <sub>1</sub>	0.691 <sub>8</sub>	0.229 <sub>3</sub>	0.016 <sub>8</sub>	0.001 <sub>2</sub>	0.001 <sub>4</sub>
Standard deviation (Reproducibility) $s_{\bar{x}}$	0.011 <sub>0</sub>	0.10 <sub>3</sub>	0.006 <sub>4</sub>	0.006 <sub>9</sub>	0.009 <sub>7</sub>	0.14 <sub>7</sub>	0.007 <sub>0</sub>	0.010 <sub>9</sub>	0.001 <sub>8</sub>	0.001 <sub>9</sub>	0.000 <sub>7</sub>	0.000 <sub>0</sub>
Standard deviation (Reproducibility without laboratories) $s_{I(T)}$ * 1	0.005 <sub>7</sub>	0.07 <sub>1</sub>	0.004 <sub>4</sub>	0.002 <sub>6</sub>	0.005 <sub>3</sub>	0.09 <sub>1</sub>	0.006 <sub>4</sub>	0.005 <sub>6</sub>	0.002 <sub>2</sub>	0.000 <sub>3</sub>	0.001 <sub>1</sub>	0.001 <sub>3</sub>
Uncertainty C (95%) * 2	0.00 <sub>s</sub>	0.0 <sub>s</sub>	0.00 <sub>s</sub>	0.00 <sub>s</sub>	0.00 <sub>s</sub>	0.1 <sub>2</sub>	0.00 <sub>6</sub>	0.00 <sub>s</sub>	0.00 <sub>2</sub>	0.00 <sub>2</sub>	0.00 <sub>1</sub>	0.00 <sub>0</sub>

(Note) \* 1  $s_{I(T)}$  is intermediate precision without a time condition. \* 2 The half-width confidence interval C (95%) =  $t_{\ell-1,0.05} \times s_{\bar{x}} / \sqrt{\ell}$  ( $\ell$  = number of laboratories)

- List of laboratories : Krosaki Corporation, Kawasaki Refractories Co.,Ltd., Yotai Refractories Co.,Ltd., Asahi Glass Co.,Ltd., Harima Ceramic Co.,Ltd., Shinagawa Refractories Co.,Ltd., TYK Corporation, Toshiba Monofrax Co.,Ltd.
- Analytical techniques : JIS R 2014(Method for chemical analysis of refractory containing alumina and magnesia) a:AAS, c:colorimetry, d:Combined use of EDTA titration and ICP-AES, e:chelometry, f:flame spectrophotometry, i:ICP-AES, p:Combined use of Cation exchange separation-chelatometric titration and ICP-AES .
- Analytical values : Each value is the average of two values obtained by two measurements on different days. These analysis values are shown converted into LOI (Loss on ignition) component free values from the February 22, 2008 v20080222 version on.
- Outlier tests were carried out by Grubbs test. The samples rejected by Grubbs tests were discussed in view of analytical techniques and it was determined whether the outliers should be adopted or not.
- Date of preparation : June, 1997

Prepared, and Values given and certified by

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## The Technical Association of Refractories, Japan

## Certified Reference Material Series for X-ray Fluorescence Analysis of Refractories

J R R M 8 0 9 (Alumina-Magnesia Refractory)  
Results of Analyses

Unit : mass%

Constituent	SiO <sub>2</sub>	Al <sub>2</sub> O <sub>3</sub>	Fe <sub>2</sub> O <sub>3</sub>	TiO <sub>2</sub>	CaO	MgO	Na <sub>2</sub> O	K <sub>2</sub> O	P <sub>2</sub> O <sub>5</sub>	Uncertified value		
										MnO	Cr <sub>2</sub> O <sub>3</sub>	ZrO <sub>2</sub>
Certified value	0.36 <sub>3</sub>	19.8 <sub>6</sub>	0.11 <sub>5</sub>	2.88 <sub>8</sub>	4.47 <sub>9</sub>	70.1 <sub>1</sub>	0.04 <sub>9</sub>	0.98 <sub>9</sub>	1.06 <sub>8</sub>	0.00 <sub>6</sub>	0.00 <sub>1</sub>	0.00 <sub>1</sub>
Laboratories												
L <sub>1</sub>	0.37 <sub>8 i</sub>	19.8 <sub>2 e</sub>	0.11 <sub>6 i</sub>	2.88 <sub>9 i</sub>	4.49 <sub>5 i</sub>	70.0 <sub>4 d</sub>	0.05 <sub>2 a</sub>	0.99 <sub>4 a</sub>	1.07 <sub>8 c</sub>	0.00 <sub>6 i</sub>	0.00 <sub>0 i</sub>	0.00 <sub>2 i</sub>
L <sub>2</sub>	0.34 <sub>2 i</sub>	19.8 <sub>8 e</sub>	0.11 <sub>5 c</sub>	2.87 <sub>8 i</sub>	4.43 <sub>5 i</sub>	70.1 <sub>2 d</sub>	0.04 <sub>1 f</sub>	0.96 <sub>4 f</sub>	1.04 <sub>5 c</sub>	0.00 <sub>8 i</sub>	—	—
L <sub>3</sub>	0.34 <sub>6 x</sub>	19.8 <sub>4 e</sub>	0.11 <sub>8 c</sub>	2.89 <sub>7 c</sub>	4.49 <sub>3 a</sub>	70.1 <sub>3 d</sub>	0.05 <sub>4 f</sub>	0.98 <sub>9 f</sub>	1.08 <sub>1 c</sub>	—	—	—
L <sub>4</sub>	0.37 <sub>8 i</sub>	19.9 <sub>4 e</sub>	0.11 <sub>2 i</sub>	2.88 <sub>8 i</sub>	4.44 <sub>9 i</sub>	70.2 <sub>2 d</sub>	0.05 <sub>5 a</sub>	1.00 <sub>6 a</sub>	1.08 <sub>6 c</sub>	0.00 <sub>8 i</sub>	0.00 <sub>4 i</sub>	0.00 <sub>0 i</sub>
L <sub>5</sub>	0.36 <sub>8 c</sub>	19.9 <sub>6 e</sub>	0.11 <sub>6 c</sub>	2.89 <sub>9 c</sub>	4.51 <sub>5 a</sub>	70.1 <sub>2 d</sub>	0.04 <sub>8 a</sub>	1.00 <sub>2 a</sub>	1.07 <sub>2 c</sub>	0.00 <sub>7 a</sub>	0.00 <sub>0 a</sub>	—
L <sub>6</sub>	0.35 <sub>7 i</sub>	19.8 <sub>4 t</sub>	0.11 <sub>2 c</sub>	2.88 <sub>2 c</sub>	4.47 <sub>6 i</sub>	70.1 <sub>6 g</sub>	0.04 <sub>2 a</sub>	1.00 <sub>1 a</sub>	1.06 <sub>6 c</sub>	0.00 <sub>5 i</sub>	0.00 <sub>0 i</sub>	0.00 <sub>3 i</sub>
L <sub>7</sub>	0.39 <sub>0 c</sub>	19.8 <sub>4 e</sub>	0.11 <sub>8 c</sub>	2.89 <sub>6 c</sub>	4.50 <sub>8 a</sub>	70.0 <sub>2 d</sub>	0.04 <sub>9 a</sub>	0.96 <sub>1 a</sub>	1.05 <sub>6 c</sub>	—	—	—
L <sub>8</sub>	0.34 <sub>8 x</sub>	19.76 <sub>6e</sub>	0.11 <sub>5 c</sub>	2.87 <sub>5 c</sub>	4.46 <sub>2 a</sub>	70.0 <sub>4 d</sub>	0.05 <sub>4 a</sub>	0.99 <sub>8 a</sub>	1.05 <sub>9 c</sub>	0.00 <sub>5 a</sub>	0.00 <sub>3 a</sub>	0.00 <sub>0 c</sub>
Average ( $\bar{x}$ )	0.363 <sub>4</sub>	19.86 <sub>0</sub>	0.115 <sub>3</sub>	2.888 <sub>0</sub>	4.479 <sub>1</sub>	70.10 <sub>6</sub>	0.049 <sub>4</sub>	0.989 <sub>4</sub>	1.067 <sub>9</sub>	0.006 <sub>5</sub>	0.001 <sub>4</sub>	0.001 <sub>3</sub>
Standard deviation (Reproducibility)	$s_x$											
Standard deviation (without laboratories)	$s_{I(T)}^{*1}$											
Uncertainty C (95%) <sup>*2</sup>												

(Note) \* 1  $s_{I(T)}$  is intermediate precision without a time condition. \* 2 The half-width confidence interval C (95%) =  $t_{\ell-1,0.05} \times s_x / \sqrt{\ell}$  ( $\ell$  = number of laboratories)

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- Outlier tests were carried out by Grubbs test. The samples rejected by Grubbs tests were discussed in view of analytical techniques and it was determined whether the outliers should be adopted or not.
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## The Technical Association of Refractories, Japan

## Certified Reference Material Series for X-ray Fluorescence Analysis of Refractories

J R R M 8 1 0 (Alumina-Magnesia Refractory)  
Results of Analyses

Unit : mass%

Constituent	SiO <sub>2</sub>	Al <sub>2</sub> O <sub>3</sub>	Fe <sub>2</sub> O <sub>3</sub>	TiO <sub>2</sub>	CaO	MgO	Na <sub>2</sub> O	K <sub>2</sub> O	P <sub>2</sub> O <sub>5</sub>	Uncertified value		
										MnO	Cr <sub>2</sub> O <sub>3</sub>	ZrO <sub>2</sub>
Certified value	4.21 <sub>1</sub>	10.0 <sub>8</sub>	3.11 <sub>8</sub>	1.91 <sub>6</sub>	0.18 <sub>0</sub>	78.9 <sub>6</sub>	0.75 <sub>9</sub>	0.16 <sub>7</sub>	0.51 <sub>3</sub>	0.01 <sub>6</sub>	0.00 <sub>4</sub>	0.00 <sub>4</sub>
Laboratories												
L <sub>1</sub>	4.24 <sub>7 i</sub>	10.0 <sub>0 e</sub>	3.12 <sub>0 i</sub>	1.92 <sub>6 i</sub>	0.17 <sub>9 i</sub>	79.0 <sub>8 d</sub>	0.76 <sub>3 a</sub>	0.16 <sub>8 a</sub>	0.51 <sub>2 c</sub>	0.01 <sub>8 i</sub>	0.00 <sub>2 i</sub>	0.00 <sub>1 i</sub>
L <sub>2</sub>	4.17 <sub>1 c</sub>	10.0 <sub>2 e</sub>	3.12 <sub>2 c</sub>	1.86 <sub>8 i</sub>	0.17 <sub>2 i</sub>	79.0 <sub>0 d</sub>	0.76 <sub>0 f</sub>	0.15 <sub>8 f</sub>	0.51 <sub>6 c</sub>	0.01 <sub>6 i</sub>	—	—
L <sub>3</sub>	4.19 <sub>2 x</sub>	10.1 <sub>4 e</sub>	3.11 <sub>4 c</sub>	1.93 <sub>2 c</sub>	0.18 <sub>6 a</sub>	79.0 <sub>6 d</sub>	0.73 <sub>8 f</sub>	0.16 <sub>8 a</sub>	0.51 <sub>2 c</sub>	—	—	—
L <sub>4</sub>	4.22 <sub>4 i</sub>	10.2 <sub>0 e</sub>	3.11 <sub>9 i</sub>	1.88 <sub>4 i</sub>	0.17 <sub>8 i</sub>	78.9 <sub>2 d</sub>	0.78 <sub>2 a</sub>	0.17 <sub>2 a</sub>	0.51 <sub>6 c</sub>	0.01 <sub>5 i</sub>	0.00 <sub>8 i</sub>	0.00 <sub>0 i</sub>
L <sub>5</sub>	4.28 <sub>6 e</sub>	10.1 <sub>0 e</sub>	3.11 <sub>2 c</sub>	1.89 <sub>0 c</sub>	0.18 <sub>0 a</sub>	79.0 <sub>6 d</sub>	0.78 <sub>4 a</sub>	0.16 <sub>6 a</sub>	0.51 <sub>5 c</sub>	0.01 <sub>4 a</sub>	0.00 <sub>1 a</sub>	0.01 <sub>8 c</sub>
L <sub>6</sub>	4.17 <sub>7 i</sub>	10.0 <sub>7 t</sub>	3.11 <sub>4 c</sub>	1.93 <sub>2 c</sub>	0.18 <sub>3 p</sub>	78.9 <sub>4 g</sub>	0.74 <sub>4 a</sub>	0.16 <sub>5 a</sub>	0.51 <sub>1 c</sub>	0.01 <sub>4 i</sub>	0.00 <sub>0 i</sub>	0.00 <sub>1 i</sub>
L <sub>7</sub>	4.24 <sub>0 c</sub>	10.0 <sub>4 e</sub>	3.12 <sub>8 c</sub>	1.97 <sub>0 c</sub>	0.18 <sub>4 a</sub>	78.9 <sub>6 d</sub>	0.74 <sub>5 a</sub>	0.17 <sub>2 a</sub>	0.51 <sub>9 c</sub>	—	—	—
L <sub>8</sub>	4.15 <sub>2 x</sub>	10.0 <sub>9 e</sub>	3.11 <sub>8 c</sub>	1.92 <sub>8 c</sub>	0.18 <sub>1 a</sub>	78.7 <sub>0 d</sub>	0.75 <sub>8 a</sub>	0.16 <sub>6 a</sub>	0.50 <sub>6 c</sub>	0.01 <sub>6 a</sub>	0.00 <sub>8 a</sub>	0.00 <sub>0 c</sub>
Average ( $\bar{X}$ )	4.211 <sub>1</sub>	10.08 <sub>3</sub>	3.118 <sub>4</sub>	1.916 <sub>3</sub>	0.180 <sub>4</sub>	78.96 <sub>5</sub>	0.759 <sub>3</sub>	0.166 <sub>9</sub>	0.513 <sub>4</sub>	0.015 <sub>5</sub>	0.003 <sub>8</sub>	0.004 <sub>0</sub>
Standard deviation (Reproducibility)	$s_{\bar{x}}$	0.045 <sub>6</sub>	0.06 <sub>5</sub>	0.005 <sub>4</sub>	0.033 <sub>4</sub>	0.004 <sub>1</sub>	0.12 <sub>5</sub>	0.017 <sub>0</sub>	0.004 <sub>6</sub>	0.004 <sub>0</sub>	0.001 <sub>6</sub>	0.004 <sub>1</sub>
deviation (Reproducibility without laboratories)	$s_{I(T)}$ *	0.029 <sub>6</sub>	0.05 <sub>7</sub>	0.009 <sub>1</sub>	0.011 <sub>2</sub>	0.005 <sub>7</sub>	0.09 <sub>0</sub>	0.005 <sub>5</sub>	0.003 <sub>3</sub>	0.006 <sub>0</sub>	0.000 <sub>4</sub>	0.002 <sub>3</sub>
Uncertainty C (95%) **2		0.03 <sub>8</sub>	0.0 <sub>5</sub>	0.00 <sub>5</sub>	0.02 <sub>8</sub>	0.00 <sub>3</sub>	0.1 <sub>0</sub>	0.01 <sub>4</sub>	0.00 <sub>4</sub>	0.00 <sub>3</sub>	0.00 <sub>2</sub>	0.00 <sub>5</sub>

(Note) \* 1  $s_{I(T)}$  is intermediate precision without a time condition. \* 2 The half-width confidence interval C (95%) =  $t_{\ell-1,0.05} \times s_{\bar{x}} / \sqrt{\ell}$  ( $\ell$  = number of laboratories)

- List of laboratories : Krosaki Corporation, Kawasaki Refractories Co.,Ltd., Yotai Refractories Co.,Ltd., Asahi Glass Co.,Ltd., Harima Ceramic Co.,Ltd., Shinagawa Refractories Co.,Ltd., TYK Corporation, Toshiba Monofrax Co.,Ltd.
- Analytical techniques : JIS R 2014(Method for chemical analysis of refractory containing alumina and magnesia) a:AAS, c:colorimetry, d:Combined use of EDTA titration and ICP-AES, e:chelometry, f:flame spectrophotometry, i:ICP-AES, p:Combined use of Cation exchange separation-chelatometric titration and ICP-AES .
- Analytical values : Each value is the average of two values obtained by two measurements on different days. These analysis values are shown converted into LOI (Loss on ignition) component free values from the February 22, 2008 v20080222 version on.
- Outlier tests were carried out by Grubbs test. The samples rejected by Grubbs tests were discussed in view of analytical techniques and it was determined whether the outliers should be adopted or not.
- Date of preparation : June, 1997

Prepared, and Values given and certified by

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