The Technical Association of Refractories, Japan

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

ＪＲＲＭ　１２１　(Fireclay Refractory)

Results of Analyses

Unit : mass%

Constituent		SiO_2	Al_2O_3	Fe_2O_3	TiO_2	MnO	CaO	MgO	Na_2O	K_2O	P_2O_5	Cr_2O_3	ZrO_2
Certified value		86.35	6.077	0.407	0.056	0.023	1.968	0.126	3.208	0.234	0.324	0.018	1.119
Laboratories	L_1	86.23	6.000	0.408	0.056	0.025	1.969	0.136	3.240	0.224	0.317	0.026	1.097
	L_2	86.17	6.023	0.410	0.051	0.021	2.008	0.136	3.199	0.250	0.325	0.014	1.143
	L_3	86.12	5.990	0.406	0.054	0.022	1.941	0.120	3.226	0.255	0.326	0.020	1.171
	L_4	86.28	6.170	0.400	0.064	0.023	1.943	0.130	3.228	0.236	0.350	0.012	1.117
	L_5	86.81	6.172	0.414	0.052	0.024	1.981	0.128	3.215	0.235	0.328	0.020	1.103
	L_6	86.37	6.141	0.424	0.060	0.025	1.984	0.125	3.262	0.208	0.322	0.018	1.144
	L_7	86.38	5.993	0.399	0.056	0.023	1.983	0.124	3.223	0.227	0.327	0.014	1.105
	L_8	86.40	6.104	0.409	0.053	0.021	1.948	0.121	3.164	0.242	0.328	0.020	1.150
	L_9	86.42	6.101	0.392	0.055	0.024	1.958	0.112	3.119	0.227	0.296	0.016	1.045
Average	$(\overline{\overline{X}})$	86.353	6.0771	0.4069	0.0557	0.0231	1.9683	0.1258	3.2084	0.2338	0.3243	0.0178	1.1194
Standard deviation (Reproducibility)	$s_{\bar{x}}$	0.194	0.0762	0.0092	0.0042	0.0016	0.0224	0.0078	0.0434	0.0144	0.0140	0.0045	0.0376
(Reproducibility without laboratories)	$s_{I(T)}$ * 1	0.093	0.0511	0.0117	0.0016	0.0020	0.0205	0.0039	0.0470	0.0060	0.0061	0.0022	0.0171
Uncertainty C (95%) * 2		0.15	0.059	0.007	0.003	0.001	0.017	0.006	0.033	0.011	0.011	0.003	0.029

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

(1) List of laboratories : Krosaki Corporation, Kawasaki Refractories Co.,Ltd., The Industrial Technology Center of Okayama Prefecture, Yotai Refractories Co.,Ltd., Asahi Glass Co.,Ltd., Harima Ceramic Co.,Ltd., Shinagawa Refractories Co.,Ltd., Toshiba Ceramics Co.,Ltd., Toshiba Monofrax Co., Ltd.

(2) Analytical techniques : JIS R 2212-1(Method for chemical analysis of refractory products — Part 1:Fireclay refractories)

(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 : December, 1993

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Telephone : 81-3-3572-0705　Fax : 81-3-3572-0175

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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　1 2 2　(Fireclay Refractory)

Results of Analyses

Unit : mass%

Constituent		SiO_2	Al_2O_3	Fe_2O_3	TiO_2	MnO	CaO	MgO	Na_2O	K_2O	P_2O_5	Cr_2O_3	ZrO_2
Certified value		78.34	10.27	0.248	1.039	0.204	0.435	0.658	1.042	2.059	4.905	0.819	0.203
Laboratories	L_1	78.13	10.11	0.266	1.021	0.224	0.443	0.664	1.057	2.061	4.893	0.879	0.202
	L_2	78.53	10.40	0.260	1.042	0.198	0.436	0.675	1.029	2.073	4.992	0.811	0.202
	L_3	78.43	10.19	0.233	1.037	0.208	0.427	0.629	1.059	2.102	4.897	0.817	0.204
	L_4	78.24	10.35	0.233	1.054	0.186	0.436	0.641	1.059	2.033	4.889	0.799	0.201
	L_5	78.45	10.25	0.260	1.059	0.202	0.444	0.649	1.043	2.066	4.941	0.797	0.203
	L_6	78.35	10.25	0.250	1.014	0.188	0.429	0.675	1.071	2.022	4.926	0.917	0.210
	L_7	78.36	10.19	0.236	1.075	0.210	0.434	0.672	1.033	2.064	4.892	0.779	0.218
	L_8	78.31	10.19	0.242	1.018	0.208	0.434	0.644	1.023	2.110	4.870	0.797	0.198
	L_9	78.26	10.52	0.252	1.029	0.209	0.435	0.669	1.004	2.003	4.843	0.775	0.192
Average	$(\bar{\bar{X}})$	78.340	10.272	0.2480	1.0388	0.2037	0.4353	0.6576	1.0420	2.0592	4.9048	0.8190	0.2033
Standard deviation (Reproducibility)	$s_{\bar{x}}$	0.122	0.125	0.0128	0.0210	0.0118	0.0055	0.0169	0.0217	0.0352	0.0429	0.0476	0.0074
(Reproducibility without laboratories)	$s_{I(T)}$ * 1	0.088	0.128	0.0089	0.0158	0.0078	0.0088	0.0104	0.0204	0.0348	0.0462	0.0123	0.0032
Uncertainty C (95%) * 2		0.09	0.10	0.010	0.016	0.009	0.004	0.013	0.017	0.027	0.033	0.037	0.006

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

(1) List of laboratories : Krosaki Corporation, Kawasaki Refractories Co.,Ltd., The Industrial Technology Center of Okayama Prefecture, Yotai Refractories Co.,Ltd., Asahi Glass Co.,Ltd., Harima Ceramic Co.,Ltd., Shinagawa Refractories Co.,Ltd., Toshiba Ceramics Co.,Ltd., Toshiba Monofrax Co., Ltd.

(2) Analytical techniques : JIS R 2212-1(Method for chemical analysis of refractory products — Part 1:Fireclay refractories)

(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.

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The Technical Association of Refractories, Japan

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

ＪＲＲＭ　１２３　(Fireclay Refractory)

Results of Analyses

Unit：mass%

Constituent		SiO_2	Al_2O_3	Fe_2O_3	TiO_2	MnO	CaO	MgO	Na_2O	K_2O	P_2O_5	Cr_2O_3	ZrO_2
Certified value		79.20	13.32	4.136	0.459	0.012	0.135	1.329	0.296	0.109	0.807	0.014	0.008
Laboratories	L_1	79.34	13.34	4.109	0.474	0.013	0.147	1.337	0.294	0.107	0.799	0.022	0.009
	L_2	79.29	13.27	4.155	0.454	0.010	0.140	1.383	0.290	0.116	0.810	0.020	0.000
	L_3	79.17	13.22	4.156	0.453	0.012	0.142	1.303	0.306	0.106	0.803	0.014	0.006
	L_4	79.02	13.38	4.162	0.448	0.012	0.145	1.298	0.302	0.113	0.817	0.011	0.008
	L_5	79.28	13.44	4.170	0.456	0.012	0.132	1.340	0.304	0.116	0.812	0.012	0.005
	L_6	79.14	13.26	4.161	0.452	0.014	0.116	1.314	0.296	0.103	0.793	0.015	0.019
	L_7	79.18	13.25	4.096	0.468	0.012	0.131	1.315	0.298	0.106	0.806	0.010	0.004
	L_8	79.20	13.28	4.112	0.458	0.012	0.128	1.283	0.298	0.107	0.808	0.012	0.006
	L_9	79.14	13.40	4.103	0.464	0.013	0.138	1.385	0.280	0.103	0.815	0.010	0.017
Average	$(\bar{\bar{X}})$	79.196	13.316	4.1360	0.4586	0.0122	0.1354	1.3287	0.2964	0.1086	0.8070	0.0140	0.0082
Standard deviation (Reproducibility)	$s_{\bar{x}}$	0.092	0.075	0.0300	0.0084	0.0011	0.0098	0.0356	0.0080	0.0051	0.0077	0.0044	0.0058
(Reproducibility without laboratories)	$s_{I(T)}$ * 1	0.092	0.079	0.0147	0.0052	0.0010	0.0040	0.0071	0.0052	0.0039	0.0059	0.0022	0.0038
Uncertainty C (95%) * 2		0.07	0.06	0.023	0.006	0.001	0.008	0.027	0.006	0.004	0.006	0.003	0.004

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

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(2) Analytical techniques ： JIS R 2212-1(Method for chemical analysis of refractory products — Part 1:Fireclay refractories)

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

J R R M　1 2 4　(Fireclay Refractory)

Results of Analyses

Unit : mass%

Constituent		SiO_2	Al_2O_3	Fe_2O_3	TiO_2	MnO	CaO	MgO	Na_2O	K_2O	P_2O_5	Cr_2O_3	ZrO_2
Certified value		73.99	16.58	2.605	2.748	0.246	1.101	0.109	0.313	1.793	0.191	0.117	0.112
Laboratories	L_1	74.05	16.49	2.566	2.722	0.248	1.097	0.121	0.304	1.802	0.204	0.128	0.114
	L_2	73.91	16.58	2.688	2.761	0.242	1.133	0.115	0.300	1.800	0.188	0.128	0.105
	L_3	73.97	16.52	2.630	2.764	0.248	1.071	0.100	0.337	1.817	0.187	0.122	0.116
	L_4	74.02	16.68	2.588	2.750	0.234	1.093	0.118	0.322	1.759	0.194	0.110	0.107
	L_5	73.89	16.58	2.582	2.755	0.246	1.125	0.111	0.324	1.808	0.190	0.115	0.110
	L_6	73.81	16.50	2.603	2.717	0.240	1.096	0.104	0.310	1.752	0.190	0.125	0.120
	L_7	74.00	16.60	2.563	2.789	0.248	1.063	0.107	0.314	1.798	0.186	0.118	0.110
	L_8	74.12	16.71	2.589	2.740	0.254	1.061	0.103	0.305	1.844	0.193	0.108	0.118
	L_9	74.15	16.57	2.640	2.738	0.252	1.166	0.101	0.302	1.760	0.186	0.102	0.104
Average	$(\bar{\bar{X}})$	73.991	16.577	2.6054	2.7484	0.2458	1.1006	0.1089	0.3131	1.7933	0.1909	0.1173	0.1116
Standard deviation (Reproducibility)	$s_{\bar{x}}$	0.112	0.080	0.039	0.021	0.006	0.035	0.007	0.012	0.030	0.005	0.009	0.005
(Reproducibility without laboratories)	$s_{I(T)}$ * 1	0.079	0.080	0.024	0.014	0.003	0.011	0.007	0.003	0.017	0.003	0.003	0.003
Uncertainty C (95%) * 2		0.09	0.06	0.031	0.017	0.005	0.027	0.006	0.009	0.024	0.004	0.007	0.004

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

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ＪＲＲＭ　１２５　(Fireclay Refractory)

Results of Analyses

Unit : mass%

Constituent		SiO_2	Al_2O_3	Fe_2O_3	TiO_2	MnO	CaO	MgO	Na_2O	K_2O	P_2O_5	Cr_2O_3	ZrO_2
Certified value		79.33	18.72	0.504	0.309	0.008	0.130	0.084	0.072	0.691	0.046	0.010	0.023
Laboratories	L_1	79.24	18.73	0.496	0.310	0.009	0.144	0.092	0.074	0.660	0.047	0.014	0.028
	L_2	79.12	18.66	0.524	0.308	0.007	0.124	0.084	0.072	0.739	0.046	0.014	0.014
	L_3	79.37	18.72	0.517	0.312	0.008	0.142	0.082	0.087	0.707	0.044	0.011	0.028
	L_4	79.28	18.70	0.496	0.310	0.008	0.126	0.088	0.076	0.703	0.049	0.008	0.017
	L_5	79.44	18.74	0.489	0.314	0.010	0.132	0.090	0.089	0.681	0.043	0.008	0.022
	L_6	79.24	18.77	0.518	0.310	0.009	0.134	0.080	0.061	0.644	0.046	0.010	0.030
	L_7	79.29	18.70	0.494	0.314	0.008	0.120	0.082	0.064	0.712	0.044	0.010	0.022
	L_8	79.48	18.80	0.512	0.308	0.006	0.116	0.074	0.062	0.698	0.046	0.008	0.022
	L_9	79.54	18.65	0.494	0.299	0.009	0.130	0.082	0.064	0.679	0.045	0.009	0.024
Average	$(\overline{\overline{X}})$	79.333	18.719	0.5044	0.3094	0.0082	0.1298	0.0838	0.0721	0.6914	0.0456	0.0102	0.0230
Standard deviation (Reproducibility)	$s_{\bar{x}}$	0.140	0.051	0.0132	0.0045	0.0014	0.0093	0.0054	0.0105	0.0285	0.0017	0.0023	0.0054
deviation (Reproducibility without laboratories)	$s_{I(T)}$ * 1	0.125	0.041	0.0136	0.0050	0.0011	0.0037	0.0046	0.0038	0.0110	0.0011	0.0014	0.0024
Uncertainty C (95%)	*2	0.11	0.04	0.010	0.003	0.001	0.007	0.004	0.008	0.022	0.001	0.002	0.004

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

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ＪＲＲＭ　１２６　(Fireclay Refractory)

Results of Analyses

Unit : mass%

Constituent		SiO_2	Al_2O_3	Fe_2O_3	TiO_2	MnO	CaO	MgO	Na_2O	K_2O	P_2O_5	Cr_2O_3	ZrO_2
Certified value		67.07	21.42	3.355	2.853	0.038	0.457	0.127	0.285	3.140	0.498	0.651	0.049
Laboratories	L_1	67.21	21.38	3.306	2.849	0.041	0.473	0.132	0.268	3.119	0.488	0.701	0.053
	L_2	67.04	21.34	3.302	2.865	0.036	0.453	0.131	0.320	3.167	0.503	0.669	0.041
	L_3	67.05	21.31	3.358	2.891	0.038	0.453	0.126	0.297	3.166	0.497	0.673	0.053
	L_4	67.04	21.61	3.355	2.863	0.034	0.435	0.124	0.296	3.133	0.505	0.625	0.043
	L_5	67.04	21.46	3.433	2.863	0.038	0.475	0.128	0.290	3.135	0.498	0.659	0.047
	L_6	66.84	21.31	3.377	2.826	0.036	0.457	0.131	0.271	3.131	0.500	0.673	0.056
	L_7	67.10	21.33	3.294	2.881	0.040	0.445	0.126	0.273	3.139	0.489	0.639	0.049
	L_8	67.08	21.49	3.395	2.847	0.037	0.439	0.118	0.268	3.154	0.508	0.628	0.046
	L_9	67.27	21.59	3.376	2.792	0.038	0.481	0.130	0.280	3.118	0.497	0.590	0.053
Average	$(\bar{\bar{X}})$	67.074	21.424	3.3551	2.8530	0.0376	0.4568	0.1273	0.2848	3.1402	0.4983	0.6508	0.0490
Standard deviation (Reproducibility)	$s_{\bar{x}}$	0.113	0.121	0.0471	0.0298	0.0022	0.0164	0.0046	0.0172	0.0178	0.0068	0.0333	0.0051
deviation (Reproducibility without laboratories)	$s_{I(T)}$ * 1	0.091	0.106	0.0228	0.0185	0.0011	0.0156	0.0037	0.0046	0.0318	0.0020	0.0164	0.0037
Uncertainty C (95%)	*2	0.09	0.09	0.036	0.023	0.002	0.013	0.004	0.001	0.014	0.005	0.026	0.004

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

(1) List of laboratories : Krosaki Corporation, Kawasaki Refractories Co.,Ltd., The Industrial Technology Center of Okayama Prefecture, Yotai Refractories Co.,Ltd., Asahi Glass Co.,Ltd., Harima Ceramic Co.,Ltd., Shinagawa Refractories Co.,Ltd., Toshiba Ceramics Co.,Ltd., Toshiba Monofrax Co., Ltd.

(2) Analytical techniques : JIS R 2212-1(Method for chemical analysis of refractory products — Part 1:Fireclay refractories)

(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 : December, 1993

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

ＪＲＲＭ　１２７　(Fireclay Refractory)

Results of Analyses

Unit : mass%

Constituent		SiO_2	Al_2O_3	Fe_2O_3	TiO_2	MnO	CaO	MgO	Na_2O	K_2O	P_2O_5	Cr_2O_3	ZrO_2
Certified value		68.64	23.10	0.926	2.196	0.174	0.182	0.153	1.757	0.542	1.786	0.273	0.046
Laboratories	L_1	68.54	22.87	0.924	2.181	0.175	0.194	0.164	1.765	0.533	1.741	0.291	0.052
	L_2	68.81	23.00	0.904	2.200	0.168	0.182	0.150	1.762	0.521	1.843	0.295	0.038
	L_3	68.71	23.06	0.929	2.225	0.180	0.178	0.145	1.760	0.553	1.797	0.276	0.050
	L_4	68.50	23.28	0.926	2.197	0.165	0.175	0.166	1.767	0.551	1.834	0.262	0.048
	L_5	68.51	23.05	0.931	2.216	0.172	0.190	0.152	1.762	0.571	1.798	0.270	0.042
	L_6	68.66	23.33	0.931	2.169	0.175	0.175	0.166	1.751	0.505	1.743	0.269	0.047
	L_7	68.56	23.11	0.910	2.237	0.181	0.186	0.148	1.763	0.554	1.774	0.273	0.050
	L_8	68.62	23.07	0.948	2.192	0.179	0.173	0.142	1.745	0.552	1.764	0.257	0.042
	L_9	68.87	23.12	0.935	2.143	0.175	0.187	0.146	1.742	0.542	1.783	0.268	0.041
Average	$(\bar{\bar{X}})$	68.642	23.099	0.9264	2.1956	0.1744	0.1822	0.1534	1.7574	0.5424	1.7863	0.2734	0.0456
Standard deviation (Reproducibility)	$s_{\bar{x}}$	0.124	0.140	0.0131	0.0289	0.0055	0.0076	0.0098	0.0090	0.0198	0.0356	0.0124	0.0050
(Reproducibility without laboratories)	$s_{I(T)}$ * 1	0.082	0.121	0.0091	0.0132	0.0026	0.0035	0.0044	0.0134	0.0078	0.0122	0.0099	0.0046
Uncertainty C (95%)	*2	0.10	0.11	0.010	0.022	0.004	0.006	0.008	0.007	0.015	0.027	0.010	0.004

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

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(2) Analytical techniques : JIS R 2212-1(Method for chemical analysis of refractory products — Part 1:Fireclay refractories)

(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.

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The Technical Association of Refractories, Japan

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

ＪＲＲＭ　１２８　(Fireclay Refractory)

Results of Analyses

Unit : mass%

Constituent		SiO_2	Al_2O_3	Fe_2O_3	TiO_2	MnO	CaO	MgO	Na_2O	K_2O	P_2O_5	Cr_2O_3	ZrO_2
Certified value		54.39	26.06	4.459	1.379	0.244	2.804	3.107	0.374	1.849	3.363	0.854	1.014
Laboratories	L_1	54.51	25.76	4.441	1.444	0.264	2.844	3.191	0.373	1.853	3.361	0.851	1.016
	L_2	54.42	26.12	4.466	1.360	0.234	2.787	3.101	0.350	1.854	3.437	0.876	0.970
	L_3	54.45	25.99	4.513	1.379	0.255	2.825	3.135	0.398	1.860	3.347	0.875	1.037
	L_4	54.26	26.28	4.419	1.416	0.232	2.858	3.016	0.398	1.850	3.355	0.822	1.004
	L_5	54.29	26.21	4.501	1.351	0.240	2.834	3.165	0.377	1.873	3.428	0.844	1.020
	L_6	54.34	25.87	4.432	1.342	0.235	2.819	3.184	0.366	1.841	3.315	0.948	1.009
	L_7	54.24	26.02	4.430	1.423	0.249	2.752	3.060	0.382	1.858	3.335	0.866	1.078
	L_8	54.35	26.29	4.471	1.352	0.244	2.734	3.056	0.362	1.823	3.320	0.826	1.031
	L_9	54.64	25.96	4.459	1.342	0.240	2.784	3.054	0.364	1.829	3.365	0.776	0.965
Average	$(\bar{\bar{X}})$	54.389	26.056	4.4591	1.3788	0.2437	2.8041	3.1069	0.3744	1.8490	3.3626	0.8538	1.0144
Standard deviation (Reproducibility)	$s_{\bar{x}}$	0.091	0.189	0.0314	0.0389	0.0104	0.0421	0.0638	0.0161	0.0154	0.0432	0.0470	0.0346
(Reproducibility without laboratories)	$s_{I(T)}$ * 1	0.090	0.054	0.0266	0.0141	0.0054	0.0293	0.0353	0.0133	0.0156	0.0243	0.0129	0.0146
Uncertainty C (95%) * 2		0.07	0.15	0.024	0.030	0.008	0.032	0.049	0.012	0.012	0.033	0.036	0.027

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

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The Technical Association of Refractories, Japan

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

ＪＲＲＭ　１２９　(Fireclay Refractory)

Results of Analyses

Unit : mass%

Constituent		SiO_2	Al_2O_3	Fe_2O_3	TiO_2	MnO	CaO	MgO	Na_2O	K_2O	P_2O_5	Cr_2O_3	ZrO_2
Certified value		62.33	30.14	1.462	0.967	0.018	0.157	2.234	0.234	1.930	0.201	0.107	0.112
Laboratories	L_1	62.33	29.83	1.472	0.953	0.018	0.171	2.241	0.228	1.923	0.198	0.117	0.107
	L_2	62.37	29.90	1.424	0.959	0.018	0.162	2.245	0.236	2.041	0.205	0.102	0.108
	L_3	62.37	29.86	1.482	0.967	0.018	0.160	2.260	0.252	1.933	0.200	0.100	0.126
	L_4	62.29	30.40	1.446	0.985	0.017	0.156	2.270	0.252	1.922	0.204	0.101	0.119
	L_5	62.41	30.24	1.438	0.967	0.018	0.155	2.216	0.244	1.957	0.200	0.100	0.110
	L_6	62.22	30.27	1.469	0.944	0.018	0.146	2.236	0.221	1.932	0.200	0.120	0.105
	L_7	62.37	29.99	1.445	0.985	0.018	0.150	2.256	0.220	1.896	0.197	0.112	0.115
	L_8	62.09	30.40	1.513	0.958	0.018	0.152	2.191	0.232	1.905	0.210	0.103	0.116
	L_9	62.54	30.37	1.468	0.988	0.021	0.162	2.193	0.224	1.858	0.198	0.104	0.104
Average	$(\bar{\bar{x}})$	62.332	30.140	1.4619	0.9673	0.0182	0.1571	2.2342	0.2343	1.9297	0.2013	0.1066	0.1122
Standard deviation (Reproducibility)	$s_{\bar{x}}$	0.092	0.243	0.0273	0.0158	0.0012	0.0075	0.0282	0.0126	0.0502	0.0041	0.0076	0.0072
(Reproducibility without laboratories)	$s_{I(T)}$ * 1	0.105	0.090	0.0202	0.0087	0.0014	0.0034	0.0215	0.0029	0.0159	0.0052	0.0027	0.0027
Uncertainty C (95%) * 2		0.07	0.19	0.021	0.012	0.001	0.006	0.022	0.010	0.039	0.003	0.006	0.006

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

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The Technical Association of Refractories, Japan

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

ＪＲＲＭ　１３０　(Fireclay Refractory)

Results of Analyses

Unit : mass%

Constituent		SiO_2	Al_2O_3	Fe_2O_3	TiO_2	MnO	CaO	MgO	Na_2O	K_2O	P_2O_5	Cr_2O_3	ZrO_2
Certified value		53.53	32.78	0.531	3.362	0.370	1.957	0.619	2.323	1.422	0.920	1.056	0.836
Laboratories	L_1	53.57	32.65	0.526	3.388	0.393	2.025	0.677	2.302	1.360	0.889	1.079	0.800
	L_2	53.51	32.58	0.535	3.330	0.354	1.948	0.617	2.379	1.478	0.917	1.035	0.835
	L_3	53.63	32.48	0.521	3.358	0.377	1.945	0.580	2.284	1.442	0.928	1.052	0.851
	L_4	53.56	32.94	0.529	3.378	0.359	1.942	0.649	2.365	1.422	0.931	1.029	0.838
	L_5	53.47	32.82	0.549	3.385	0.363	1.986	0.615	2.343	1.435	0.929	1.013	0.863
	L_6	53.56	32.93	0.541	3.353	0.366	1.919	0.607	2.310	1.409	0.919	1.147	0.823
	L_7	53.58	32.79	0.533	3.414	0.370	1.922	0.617	2.356	1.427	0.900	1.099	0.871
	L_8	53.53	32.92	0.532	3.323	0.381	1.938	0.599	2.309	1.461	0.939	1.047	0.831
	L_9	53.35	32.87	0.517	3.332	0.368	1.985	0.614	2.255	1.363	0.926	0.999	0.815
Average	$(\bar{\bar{X}})$	53.529	32.776	0.5314	3.3623	0.3701	1.9567	0.6194	2.3226	1.4219	0.9198	1.0556	0.8363
Standard deviation (Reproducibility)	$s_{\bar{x}}$	0.083	0.173	0.0101	0.0308	0.0117	0.0343	0.0279	0.0408	0.0402	0.0159	0.0460	0.0228
(Reproducibility without laboratories)	$s_{I(T)}$ * 1	0.115	0.080	0.0049	0.0213	0.0088	0.0227	0.0126	0.0256	0.0210	0.0066	0.0136	0.0142
Uncertainty C (95%)	*2	0.06	0.14	0.008	0.024	0.009	0.026	0.021	0.031	0.031	0.012	0.035	0.018

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

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

J R R M　1 3 1　(Fireclay Refractory)

Results of Analyses

Unit : mass%

Constituent		SiO_2	Al_2O_3	Fe_2O_3	TiO_2	MnO	CaO	MgO	Na_2O	K_2O	P_2O_5	Cr_2O_3	ZrO_2
Certified value		52.80	36.69	2.212	1.165	0.032	0.786	1.025	0.769	2.624	1.614	0.070	0.265
Laboratories	L_1	53.01	36.64	2.152	1.117	0.034	0.773	1.038	0.761	2.600	1.551	0.076	0.252
	L_2	52.64	36.55	2.214	1.146	0.030	0.784	1.046	0.749	2.673	1.599	0.069	0.265
	L_3	53.04	36.43	2.232	1.170	0.031	0.775	1.048	0.804	2.615	1.601	0.066	0.265
	L_4	52.60	36.86	2.205	1.181	0.032	0.797	1.010	0.761	2.597	1.618	0.057	0.249
	L_5	52.73	36.85	2.210	1.169	0.032	0.787	1.036	0.815	2.627	1.651	0.066	0.282
	L_6	52.75	36.77	2.245	1.156	0.029	0.787	1.024	0.724	2.612	1.641	0.096	0.276
	L_7	53.01	36.46	2.185	1.192	0.033	0.786	1.024	0.793	2.626	1.599	0.079	0.272
	L_8	52.66	36.79	2.233	1.161	0.035	0.781	0.995	0.773	2.664	1.640	0.061	0.247
	L_9	52.77	36.89	2.230	1.189	0.034	0.806	1.002	0.745	2.600	1.626	0.056	0.275
Average	$(\bar{\bar{x}})$	52.801	36.693	2.2118	1.1646	0.0322	0.7862	1.0248	0.7694	2.6238	1.6140	0.0696	0.2648
Standard deviation (Reproducibility)	$s_{\bar{x}}$	0.170	0.180	0.0289	0.0233	0.0021	0.0100	0.0190	0.0295	0.0276	0.0305	0.0126	0.0126
deviation (Reproducibility without laboratories)	$s_{I(T)}$ * 1	0.139	0.082	0.0252	0.0106	0.0015	0.0109	0.0136	0.0097	0.0193	0.0146	0.0024	0.0113
Uncertainty C (95%)	* 2	0.13	0.14	0.022	0.018	0.002	0.008	0.015	0.023	0.021	0.023	0.010	0.010

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

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ＪＲＲＭ　１３２　(Fireclay Refractory)

Results of Analyses

Unit : mass%

Constituent		SiO_2	Al_2O_3	Fe_2O_3	TiO_2	MnO	CaO	MgO	Na_2O	K_2O	P_2O_5	Cr_2O_3	ZrO_2
Certified value		50.69	39.18	1.647	0.298	0.119	1.300	0.349	2.165	0.799	2.390	0.116	0.753
Laboratories	L_1	50.50	39.22	1.619	0.298	0.135	1.306	0.363	2.105	0.757	2.382	0.121	0.717
	L_2	50.94	39.11	1.627	0.293	0.119	1.288	0.358	2.208	0.828	2.395	0.113	0.765
	L_3	50.71	38.89	1.693	0.293	0.122	1.291	0.337	2.200	0.830	2.319	0.108	0.796
	L_4	50.69	39.33	1.639	0.307	0.110	1.304	0.358	2.167	0.819	2.331	0.122	0.743
	L_5	50.59	39.13	1.648	0.278	0.124	1.300	0.344	2.207	0.815	2.359	0.112	0.785
	L_6	50.50	39.25	1.646	0.292	0.098	1.310	0.338	2.175	0.773	2.505	0.139	0.736
	L_7	50.78	39.21	1.607	0.296	0.126	1.286	0.356	2.116	0.779	2.412	0.125	0.769
	L_8	50.74	39.37	1.663	0.310	0.129	1.302	0.326	2.159	0.803	2.382	0.108	0.729
	L_9	50.77	39.04	1.685	0.319	0.109	1.312	0.362	2.148	0.783	2.421	0.099	0.740
Average	$(\bar{\bar{x}})$	50.691	39.176	1.6474	0.2984	0.1191	1.2999	0.3491	2.1650	0.7986	2.3896	0.1163	0.7533
Standard deviation (Reproducibility)	$s_{\bar{x}}$	0.132	0.153	0.0287	0.0119	0.0114	0.0096	0.0131	0.0373	0.0260	0.0551	0.0117	0.0266
deviation (Reproducibility without laboratories)	$s_{I(T)}$ * 1	0.123	0.117	0.0206	0.0032	0.0034	0.0103	0.0061	0.0330	0.0105	0.0307	0.0061	0.0101
Uncertainty C (95%)	* 2	0.10	0.12	0.022	0.009	0.009	0.007	0.010	0.029	0.020	0.042	0.009	0.020

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

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(5) Date of preparation : December, 1993

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The Technical Association of Refractories, Japan

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

ＪＲＲＭ　１３３　(Fireclay Refractory)

Results of Analyses

Unit : mass%

Constituent		SiO_2	Al_2O_3	Fe_2O_3	TiO_2	MnO	CaO	MgO	Na_2O	K_2O	P_2O_5	Cr_2O_3	ZrO_2
Certified value		50.15	39.05	3.697	1.934	0.017	0.109	2.035	0.335	0.915	0.344	1.278	0.574
Laboratories	L_1	50.28	39.14	3.695	1.963	0.018	0.119	2.089	0.325	0.873	0.323	1.314	0.538
	L_2	50.11	38.75	3.660	1.896	0.015	0.106	2.024	0.348	0.945	0.342	1.246	0.565
	L_3	50.39	38.87	3.772	1.937	0.018	0.111	2.003	0.344	0.924	0.342	1.324	0.619
	L_4	50.03	39.38	3.630	1.985	0.018	0.120	2.079	0.340	0.937	0.361	1.253	0.591
	L_5	50.07	39.33	3.725	1.909	0.018	0.110	2.034	0.350	0.923	0.347	1.277	0.558
	L_6	50.18	39.52	3.714	1.927	0.016	0.100	2.079	0.332	0.887	0.342	1.271	0.597
	L_7	50.04	38.91	3.625	1.950	0.018	0.103	2.030	0.324	0.895	0.344	1.314	0.575
	L_8	50.05	38.74	3.738	1.935	0.018	0.103	1.987	0.333	0.927	0.354	1.275	0.542
	L_9	50.19	38.85	3.712	1.906	0.018	0.110	1.994	0.322	0.922	0.340	1.231	0.580
Average	$(\bar{\bar{x}})$	50.149	39.054	3.696 8	1.934 2	0.017 4	0.109 1	2.035 4	0.335 3	0.914 8	0.343 9	1.278 3	0.573 9
Standard (Reproducibility)	$s_{\bar{x}}$	0.117	0.294	0.049 3	0.028 7	0.001 0	0.006 8	0.038 6	0.010 7	0.024 0	0.010 4	0.032 6	0.026 0
deviation (Reproducibility without laboratories)	$s_{I(T)}$ * 1	0.120	0.082	0.037 2	0.023 6	0.001 1	0.004 3	0.018 6	0.004 6	0.015 9	0.011 3	0.009 8	0.010 4
Uncertainty C (95%) * 2		0.09	0.23	0.038	0.022	0.001	0.005	0.030	0.008	0.018	0.008	0.025	0.020

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

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(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.

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The Technical Association of Refractories, Japan

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

ＪＲＲＭ　１３４　(Fireclay Refractory)

Results of Analyses

Unit : mass%

Constituent		SiO_2	Al_2O_3	Fe_2O_3	TiO_2	MnO	CaO	MgO	Na_2O	K_2O	P_2O_5	Cr_2O_3	ZrO_2
Certified value		47.35	44.43	1.080	1.742	0.245	0.200	0.205	0.132	0.376	3.840	0.244	0.359
Laboratories	L_1	47.38	44.50	1.074	1.749	0.271	0.217	0.217	0.143	0.355	3.761	0.265	0.347
	L_2	47.30	44.13	1.053	1.712	0.243	0.194	0.205	0.115	0.382	3.781	0.252	0.366
	L_3	47.69	44.41	1.080	1.737	0.236	0.210	0.196	0.141	0.388	3.790	0.232	0.361
	L_4	47.31	44.64	1.067	1.728	0.236	0.212	0.220	0.136	0.372	3.900	0.246	0.358
	L_5	47.27	44.36	1.080	1.751	0.244	0.208	0.200	0.140	0.393	3.965	0.250	0.383
	L_6	47.21	44.42	1.098	1.764	0.232	0.186	0.213	0.116	0.352	3.777	0.237	0.349
	L_7	47.31	44.52	1.057	1.802	0.254	0.182	0.212	0.121	0.374	3.839	0.258	0.385
	L_8	47.28	44.46	1.110	1.728	0.256	0.194	0.189	0.136	0.405	3.890	0.230	0.336
	L_9	47.37	44.40	1.104	1.711	0.233	0.198	0.192	0.140	0.363	3.857	0.228	0.345
Average	$(\bar{\bar{x}})$	47.347	44.427	1.0803	1.7424	0.2450	0.2001	0.2049	0.1320	0.3760	3.8400	0.2442	0.3589
Standard (Reproducibility)	$s_{\bar{x}}$	0.130	0.138	0.0202	0.0287	0.0129	0.0125	0.0113	0.0114	0.0174	0.0688	0.0132	0.0167
deviation (Reproducibility without laboratories)	$s_{I(T)}$ * 1	0.149	0.124	0.0290	0.0152	0.0065	0.0098	0.0037	0.0033	0.0117	0.0241	0.0063	0.0116
Uncertainty C (95%)	* 2	0.10	0.11	0.016	0.02	0.010	0.010	0.009	0.009	0.013	0.053	0.010	0.013

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

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ＪＲＲＭ　１３５　(Fireclay Refractory)

Results of Analyses

Unit : mass%

Constituent		SiO_2	Al_2O_3	Fe_2O_3	TiO_2	MnO	CaO	MgO	Na_2O	K_2O	P_2O_5	Cr_2O_3	ZrO_2
Certified value		37.33	49.01	3.063	0.076	0.049	2.364	1.248	2.884	2.781	0.488	0.428	0.203
Laboratories	L_1	37.51	49.15	3.176	0.076	0.054	2.386	1.272	2.882	2.764	0.478	0.453	0.190
	L_2	37.18	49.02	3.127	0.071	0.049	2.355	1.238	2.885	2.808	0.481	0.427	0.182
	L_3	37.53	48.91	3.047	0.078	0.048	2.359	1.225	2.877	2.861	0.497	0.411	0.202
	L_4	37.21	49.21	3.023	0.077	0.044	2.362	1.272	2.823	2.742	0.500	0.411	0.198
	L_5	37.20	49.12	2.966	0.068	0.050	2.398	1.262	2.899	2.784	0.487	0.428	0.216
	L_6	37.17	48.59	3.077	0.076	0.048	2.323	1.261	2.825	2.738	0.495	0.456	0.204
	L_7	37.43	48.77	3.027	0.081	0.052	2.362	1.258	2.908	2.776	0.469	0.447	0.202
	L_8	37.30	49.10	3.071	0.082	0.054	2.349	1.234	2.918	2.827	0.493	0.407	0.205
	L_9	37.46	49.23	3.050	0.072	0.046	2.383	1.207	2.938	2.729	0.495	0.413	0.224
Average	$(\bar{\bar{x}})$	37.332	49.011	3.0627	0.0757	0.0494	2.3641	1.2477	2.8839	2.7810	0.4883	0.4281	0.2026
Standard deviation (Reproducibility)	$s_{\bar{x}}$	0.145	0.210	0.0608	0.0048	0.0036	0.0220	0.0229	0.0386	0.0437	0.0104	0.0193	0.0127
(Reproducibility without laboratories)	$s_{I(T)}$ * 1	0.061	0.086	0.0473	0.0031	0.0024	0.0127	0.0147	0.0220	0.0192	0.0115	0.0072	0.0037
Uncertainty C (95%) * 2		0.11	0.16	0.047	0.004	0.003	0.017	0.018	0.030	0.034	0.008	0.015	0.010

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

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