

## **THERMAL DIFFUSIVITY OF PYROCERAM 9606**

Pyroceram is a ceramic base glass and its main advantage, speaking about commercial use is the possibility to be used at high temperatures (it supports 1000 °C, short-term: 760 °C, long term usage: 680 °C) and specially as this material has a very low thermal expansion it withstands temperature shocks.

### **SAMPLE:**

Sample specifications:

Supplier: Anter Corporation

#### ***Sample 2:***

P/N: 5000-984

S/N: 98707

Manufacturer: Corning, Inc.

Temperature range of use: 50 to 1000 °C.

Grade: 9606.

Brand: pyroceram.

Expiration date: February 26, 2000.

Thickness of the sample without coating: .....mm.

Thickness with graphite coating (Graphit 33, Kontakt Chemie, CRC Industries Deutschland GmbH): 2.58 mm.

***Sample 1:*** thickness 2.34 mm with coating, provided by Anter.

## RECOMMENDED VALUES

Declaration of Reference Material Conformity – DRMC0105.

Thermal Diffusivity of Pyroceram	
Recommended values (*)	
T / K	k / cm <sup>2</sup> .s <sup>-1</sup>
323.15	0.01827
373.15	0.01607
423.15	0.01462
473.15	0.01357
523.15	0.01278
573.15	0.01216
623.15	0.01166
673.15	0.01124
723.15	0.01088
773.15	0.01057
823.15	0.01029
873.15	0.01005
923.15	0.009833
973.15	0.009633
1023.15	0.009451
1073.15	0.009282
1123.15	0.009125
1173.15	0.008978
1223.15	0.00884
1273.15	0.008709

(\*) Baba et al, "Thermal diffusivity measurements of pyroceram 9606 by laser flash method",  
13th Japan Symposium on Thermophysical Properties [1992]

## OUR RESULTS – Tables

Table 1:

Thermal diffusivity of Sample 1 cm <sup>2</sup> .s <sup>-1</sup>					
T/K	Serie 1a	Serie 1b	Serie 1c	Serie 1d	Serie 1e
321.15	0.0176	0.0184	0.0179	0.0180	0.0180
370.15	0.0158	0.0158	0.0160	0.0154	0.0162
420.15	0.0144	0.0144	0.0140	0.0148	0.0147
470.15	0.0135	0.0126	0.0139	0.0140	0.0133
521.15	0.0128	0.0128	0.0125	0.0125	0.0126
570.15	0.0119	0.0118	0.0119	0.0119	0.0120
620.15	0.0118	0.0115	0.0115	0.0115	0.0112
669.15	0.0114	0.0111	0.0108	0.0108	0.0106
719.15	0.0100		0.0095		0.0110
772.15			0.0102	0.0110	0.0107
821.15	0.0103	0.0102	0.0100	0.0100	0.0100
873.15	0.0097	0.0098	0.0095	0.0097	0.0097
922.15	0.0095	0.0096	0.0096	0.0097	0.0094
974.15	0.0092	0.0094	0.0089	0.0092	0.0094
1024.15	0.0091	0.0092	0.0092	0.0085	0.0090
1073.15	0.0090	0.0089	0.0087	0.0091	0.0092
1122.15	0.0088	0.0088	0.0083	0.0086	0.0088
1174.15	0.0083	0.0090	0.0087	0.0082	0.0084
1224.15	0.0083	0.0086	0.0081	0.0078	0.0080
1275.15	0.0084	0.0083	0.0083	0.0080	0.0084

Thermal diffusivity of Sample 1 cm <sup>2</sup> .s <sup>-1</sup>					
T/K	Serie 2a	Serie 2b	Serie 2c	Serie 2d	Serie 2e
319.15	0.0176	0.0175	0.0174	0.0173	0.018
368.15	0.0152	0.0155	0.016	0.0151	0.0162
417.15	0.0143	0.0146	0.0146	0.0146	0.0145
467.15	0.0136	0.0138	0.0137	0.0133	0.0135
519.15	0.0124	0.0128	0.0129	0.0125	0.0126
570.15	0.0126	0.0122	0.0122	0.0118	0.0119
621.15	0.0116	0.0113	0.0114	0.0114	0.0118
672.15	0.0105	0.0109	0.0109	0.0111	0.0106
721.15	0.0107	0.0106	0.0105	0.0106	0.0101
772.15	0.0099	0.01	0.0092	0.0104	0.0095
820.15	0.01	0.0099	0.0099	0.0098	0.01
871.15	0.0099	0.0097	0.0099	0.0097	0.0098
922.15	0.0093	0.0092	0.0092	0.0094	0.0096
972.15	0.0095	0.0092	0.009	0.0094	0.0092
1021.15	0.009	0.0091	0.009	0.009	0.009
1071.15	0.0091	0.0086	0.0087	0.0088	0.0089
1122.15	0.0083	0.0085	0.0088	0.0086	0.0081
1172.15	0.0082	0.0081	0.0092	0.0085	0.0081
1223.15	0.0081	0.0083	0.0082	0.0085	0.0084
1274.15	0.0084	0.008	0.0078	0.0082	0.0084

Thermal diffusivity of Sample 1 cm <sup>2</sup> .s <sup>-1</sup>			
T/K	Serie 3a	Serie 3b	Serie 3c
326.15	0.0183	0.0184	0.0179
373.15			0.0162
421.15	0.0153	0.0145	0.0142
471.15		0.0138	0.0140
522.15	0.0131		0.0129
621.15	0.0119	0.0119	0.0119
671.15	0.0114	0.0118	0.0115
720.15	0.0111	0.0112	0.0109
771.15	0.0108		0.0109
821.15	0.0102	0.0104	0.0101
871.15	0.0102	0.0104	0.0098
923.15	0.0097	0.0099	0.0092
973.15	0.0093	0.0097	0.0092
1021.15	0.0092	0.0096	0.0093
1071.15	0.0088	0.0089	0.0091
1121.15	0.0093	0.0091	0.0093
1171.15	0.0090	0.0086	0.0090
1221.15	0.0091	0.0078	0.0088
1271.15	0.0080	0.0087	0.0096

Table 2: Thermal diffusivity of pyroceram (sample 2)

Thermal diffusivity of Sample 2 cm <sup>2</sup> .s <sup>-1</sup>			
T/K	Serie 1a	Serie 1b	Serie 1c
324.15	0.0178	0.0180	0.0182
371.15	0.0163	0.0160	0.0167
420.15	0.0144	0.0156	
471.15	0.0145	0.0141	0.0145
521.15	0.0134	0.0133	0.0134
571.15	0.0122	0.0127	0.0126
621.15	0.0120	0.0119	0.0118
671.15	0.0115	0.0117	0.0113
722.15	0.0113	0.0112	0.0112
772.15	0.0108	0.0109	0.0111
821.15	0.0105	0.0100	0.0102
872.15	0.0102	0.0096	0.0103
921.15	0.0102	0.0092	0.0098
971.15	0.0095	0.0101	0.0099
1021.15	0.0096	0.0090	0.0097
1070.15	0.0087	0.0093	0.0090
1121.15	0.0091	0.0089	0.0090
1171.15	0.0095	0.0093	0.0088
1222.15	0.0086	0.0090	0.0091
1272.15	0.0083	0.0080	0.0079

**OUR RESULTS – Plot: Thermal diffusivity as a function of temperature**

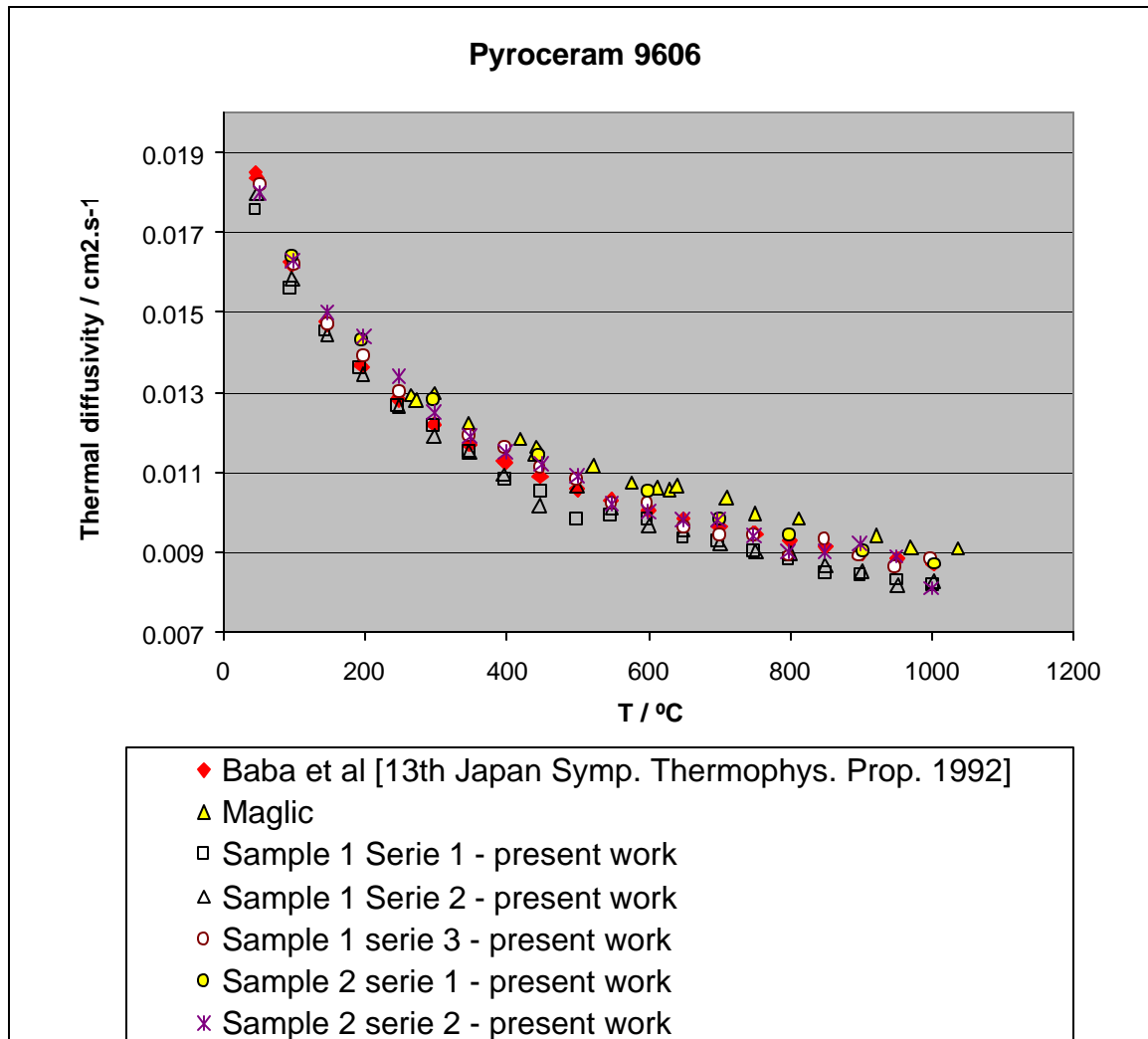


Figure 1:  
Thermal diffusivity of pyroceram 9606 as a function of temperature.

## OUR RESULTS – Deviation Plot

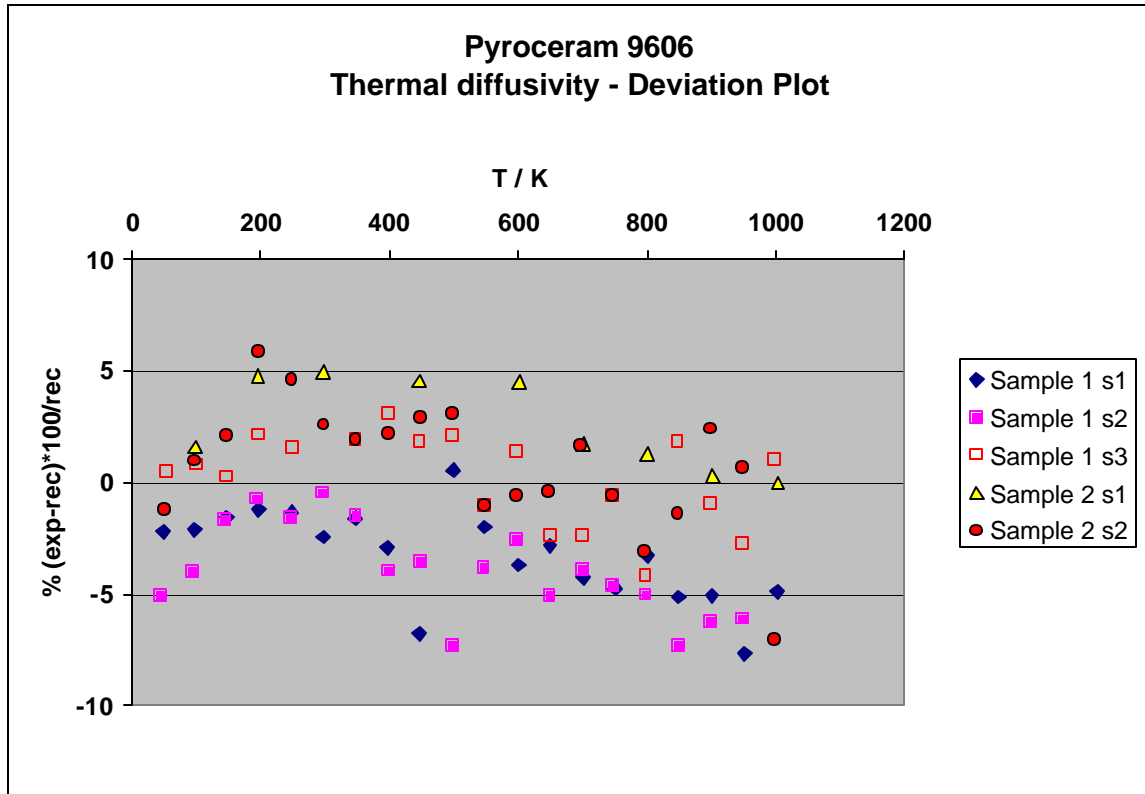


Figure 2:  
Thermal diffusivity of pyroceram 9606; deviation between the experimental data (exp) and recommended ones (rec).

The experimental data were adjusted by a non linear curve fitt (Levenberg-Marquardt algorithm) using the following expression:

$$k = \frac{a}{b + T} + c + d.T$$

where  $k$  is the thermal diffusivity in  $\text{m}^2.\text{s}^{-1}$  ( $\times 10^{-6}$ ). The coefficients of table 3 represents present data with a standard deviation of 2.9 %. The software Origin<sup>®</sup> was used for that purpose.

Table 3: Coefficients of equation (1).

Coefficient	value
a	293.4695
b	-58.7334
c	0.70094
d	-0.00008