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VANDERBILT Technical Data

PYRAX® RG

Refractory Grade Pyrophyllite

R.T. Vanderbilt Company, Inc.
30 Winfield Street, P.O. Box 5150, Norwalk, CT 06856-5150
Telephone: (203) 853-1400
Fax: (203) 853-1452, Web Site: www.rtvanderbilt.com

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PYRAX® RG

Refractory Grade Pyrophyllite

Ceramics Department

Pyrophyllite is a hydrated aluminum silicate mineral. Industrial pyrophyllite (**PYRAX RG**) is low in alkalies.

Uses: PYRAX RG is a valuable refractory raw material for use in:

1) Insulating firebrick
2) Metal pouring refractories
3) Alumina-silica monolithic refractories
   Ramming mixes,
   Gunning mixes,
   Castable mixes
4) Kiln car refractories

General Description:

Description:	High pyrophyllite ore of low alkali content
Crystallinity:	Laminar to semi-massive
Hardness:	1 to 2 (Mohs scale)
Workability:	Nonplastic
Density:	2.8 to 2.9 Mg/m^3
PCE (ASTM C-24):	27 to 28

Typical Chemical Analysis:
(Calculated as oxides)

	%
Silicon dioxide (SiO_2)	71.5
Aluminum oxide (Al_2O_3)	20.8
Iron Oxide (Fe_20_3)	1.9
Magnesium oxide (MgO)	0.1
Calcium oxide (CaO)	0.1
Sodium oxide (Na_2O)	0.4
Potassium oxide (K_2O)	0.3
Titanium dioxide (TiO_2)	0.5
Ignition loss	4.0

X-ray and Petrographic Analysis:

Mineral	Composition	Amount %
Pyrophyllite	$Al_2O_3 \cdot 4SiOH_2O$	40 to 50
Quartz*	SiO_2	30 to 45
Kaolin	$Al_2O_3 \cdot 2SiO_2 2H_2O$	5 to 15
Muscovite	$K_2O \cdot 3Al_2O_3 6SiO_2 \cdot 2H_2O$	1 to 3

*See following table for quartz respirable fraction

Minus 10 µm α-quartz (respirable fraction) in total product:

PYRAX RG Grades:	**140** Mesh	**200** Mesh
	0.6%	1.1%

Typical Screen Analysis and Bulk Densities of **PYRAX RG**

Screen Numbers		Cumulative Percent Retained	
U.S. Series	µm	**140** Mesh	**200** Mesh
100	150	1.0	Trace
200	75	14.0	1.0
325	45	21.5	4.6
Compact Bulk			
lbs/ft^3		61	59
kg/m^3		977	945

Properties:

PYRAX RG has the following properties of particular interest for refractory applications:

1) Permanent expansion
2) Excellent reheat stability
3) Low hot load deformation
4) Low reversible thermal expansion
5) Low bulk density
6) Low thermal conductivity
7) Highly resistant to corrosion by molten metals and basic slags

The *permanent expansion* of **PYRAX RG** is due to physical changes taking place during dehydration. The greatest expansion occurs between 650°C (1200°F) and 870°C (1600°F) which corresponds approximately to the range of greatest weight loss. The amount of expansion is dependent on the particle size.

The *reversible thermal expansion* of **PYRAX RG** is low for specimens fired below C/13 (1330°C or 2430°F). This characteristic is dependent on the heat level, for at higher temperatures the silica is gradually converted to cristobalite and there is a corresponding increase in the expansion.

The excellent *dimensional stability* of **PYRAX RG** is well-established.

Pyrophyllite compositions show *superior hot load bearing ability*, as was demonstrated by W. Gower and W. C. Bell.

There is high *resistance to thermal shock* (spalling) by virtue of pyrophyllite's *low thermal conductivity* and *low coefficient of thermal expansion*.

Above 1050°C a *transformation of pyrophyllite to mullite* corresponds to significant increases in mechanical properties, such as compressive strength, flexural strength and hardness.

PYRAX RG Applications:

PYRAX RG 140 and **PYRAX RG 200** are used in *insulating firebrick* of classes 2500 and 2600.

U.S. patent (No. 4,123,284) relating to porous ceramic bodies with large quantities of pyrophyllite uses the hydrophobic character of the material.

PYRAX RG 140 is used in metal *pouring refractories* such as gate tile, runner tile, strainers, riser tubes and mold coatings.

H. O. Reisener described how pyrophyllite used as a *mold dressing* inhibits the formation and structure of a skin on iron castings.

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