PERLITE PRODUCT GUIDE

PERLITE/SILICATE COMPOSITES FOR HIGH TEMPERATURE INSULATION AND FORMED SHAPES

Perlite/Silicate Composites

Expanded perlite granules can be bonded to form rigid shapes for a very wide range of applications. The most suitable binder for many purposes is a liquid sodium silicate similar to traditional "waterglass". The liquid sodium silicates are solutions of water soluble glasses manufactured from varied proportions of Na_2CO_3 and SiO_2, providing a wide range of chemical and physical properties.

Sodium silicates are widely used as high temperature adhesives and binders due to the following properties.

- Low cost
- Inorganic
- Easy to handle
- Rapid controlled set
- High strength
- Insolubility (when aired)
- Chemical stability

Silicate-bonded perlite makes an insulation material which is completely non-flammable, the refractory nature of the bond being a major advantage.

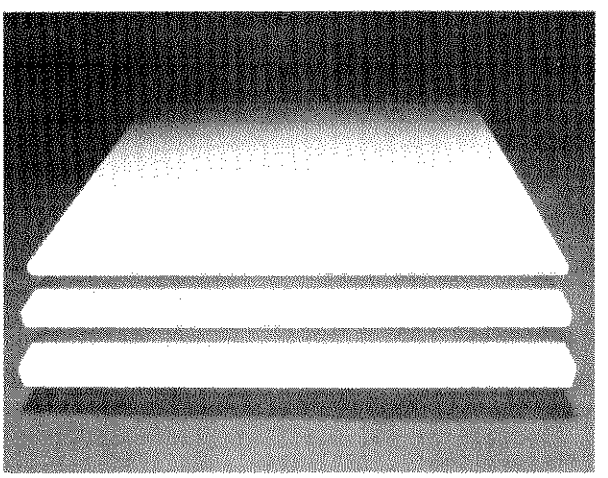
Potassium silicate is sometimes preferred for applications where heat insulation and fire resistance are the main objectives. This material has a slightly higher softening point than its sodium counterpart.

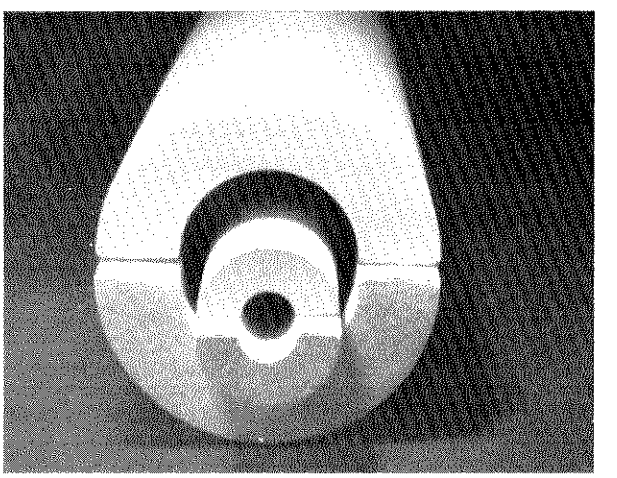
TYPICAL PROPERTIES* OF PERLITE/SODIUM SILICATE COMPOSITES

Thermal Conductivity (ASTM C-177, C-325)	
Mean Temp. 250°F (120°C)	0.40 Btu·in/h·ft^2·°F (0.058 W/m·K)
450°F (230°C)	0.56 Btu·in/h·ft^2·°F (0.081 W/m·K)
660°F (350°C)	0.65 Btu·in/h·ft^2·°F (0.094 W/m·K)
Temperature Limit (ASTM C-447)	1200°F (650°C)
Density (ASTM C-447)	11-16 lb/ft^3 (180-260 kg/m^3)
Modulus of Rupture (ASTM C—203, C-446)	
Minimum	50-60 lb/in^2 (0.34-0.41 N/mm^2)
Compressive Strength (ASTM C-165)	
Minimum	75-88 lb/in^2 (0.52-0.61 N/mm^2)
Linear Shrinkage (ASTM C-356)	
	less than 2% at 1200°F (650°C)
Water Absorption - Under 10% by volume after 24 hrs.	

*Heating of the molded product within the range 300-500°F (150-260°C), depending on formulation, enhances the strength and water resistance of the composite material.

Sodium silicate is widely used as a binder for molding sand in foundries. The technology for perlite/sodium silicate composite manufacture is based largely on this foundry industry experience.





APPLICATIONS OF PERLITE/SILICATE COMPOSITES

High Temperature Insulation
Pipe covering
Furnace lining
Industrial ovens/kilns
Domestic oven lining
Firebricks and stoves
Chimney insulation
Foundry molds and coves
Runner insulation shapes
Refractory shapes

Fire Protection
Fire doors
Fire resistant coatings
Steelwork cladding
Roof truss insulation
Fire-safe cabinets
Document boxes
Computer disk storage boxes
Electrical control cabinets

Building Construction
Ceiling tiles
Accoustical panels
Sandwich panels
Wall insulation blocks
Cryogenic tank base insulation
Decorative moldings and shapes
Sprayed coatings
Acid resistant blocks
Roofing tiles

Other Applications
Liquid waste solidification
Asbestos encapsulation
Oil absorbents
Welding rod coatings

Perlite/Sodium Silicate Technology

A wide range of formulations of perlite, sodium silicate solution and setting agent can be used, together with additives to control the absorbency of the perlite and the speed of setting of the mix. General guidelines are given as a starting point.

Soluble Silicate Grades

The choice of grade of sodium silicate solution depends on the application and setting process being used. Generally, a higher silicate to alkali ratio gives faster setting while lower ratios and higher solids contents give greater strength in the finished product.

Setting Process	Silica/Alkali Ratio	Solids Content, %
Gas Injection	2.00-2.50:1	43-50
Liquid Hardeners	2.50-2.90:1	40-45
Solid Hardeners	2.00-2.30:1	45-50

Setting Agents

Gas — Carbon dioxide - usually blown through the molded shape

Liquids — Glycerol Diacetate plus either Glycerol Triacetate or Ethylene Glycol Diacetate

Solids — Calcium silicates - e.g. Portland cement
Calcium sulphate - e.g. gypsum
Silicides - e.g. Ferrosilicon or Calcium Silicide
Silicofluorides or fluorosilicates
Ground metallurgical slag
Heavy metal salts-e.g. carbonates or phosphates

SUGGESTED FORMULATIONS USING DIFFERENT SETTING AGENTS

Material*	Gas Setting	Liquid Setting	Solid Setting
Sodium silicate solution as % by volume of perlite	2.5-5%	5-10%	5-15%
Setting agent as % by weight of sodium silicate	15-25% at 68°F (20°C)	8-14%	25-50%

*Amount of silicate needed will depend on the particle size, density and absorbency of the perlite used.

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