

Perlite Volcanic Glass as a Glass Flake Filler

Formerly Perlite as an Ultra-Fine Filler

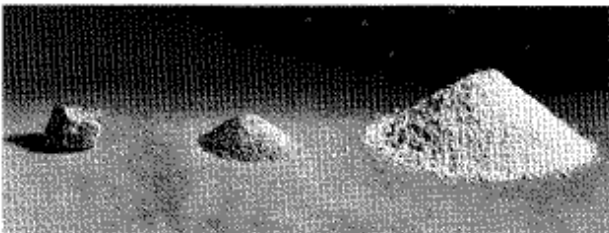
What is Perlite?

Perlite is not a trade name but a generic term for naturally occurring siliceous volcanic rock. The distinguishing feature which sets perlite apart from other volcanic glasses is that when heated to a suitable point in its softening range, it expands from four to twenty times its original volume.

This expansion process is due to the presence of two to six percent combined water in the crude perlite rock. When quickly heated to above 1600°F (870°C) the crude rock pops in a manner similar to popcorn as the combined water vaporizes and creates countless tiny bubbles in the heat softened glassy particles. It is these tiny glass-sealed bubbles which account for the amazing light weight and other exceptional physical properties of expanded perlite.

The expansion process also creates one of perlite's most distinguishing characteristics: its white color. While the crude perlite rock may range from transparent to light gray to glossy black, the color of expanded perlite ranges from snowy white to grayish white.

Expanded perlite can be manufactured to weigh from 2 lb/ft³ (32 kg/m³) to 15 lb/ft³ (240 kg/m³) making it adaptable for numerous uses, including filtration, horticultural applications, insulation, inert carriers and a multitude of filler applications.

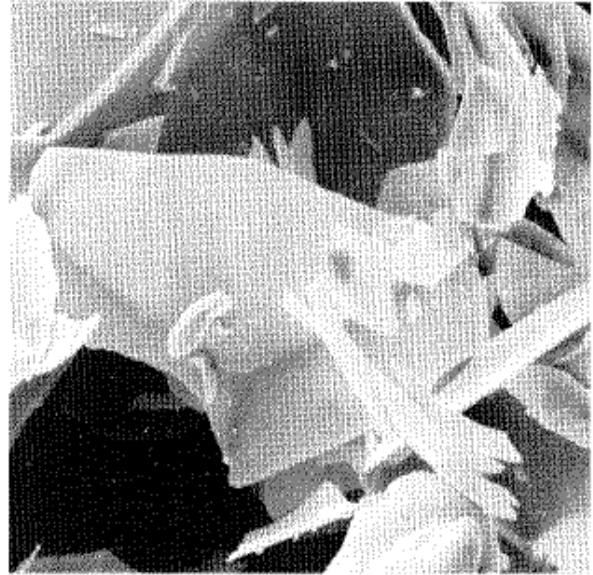


Crude
Perlite

Crushed
Crude
Perlite

Expanded
Perlite

Three stages of perlite production shown above illustrate the great increase in volume after furnacing. The same weight of perlite, 1 oz (28 gm) is shown in each photo.



Milled and classified perlite filler particles.

Perlite as a Filler

As a filler, perlite ore is not that much different than any other non-white kind of a rock, other than its small amount of chemically bound water. The expansion described above creates the characteristic white color and the rounded shape of each perlite particle. Perlite glass flake is then produced by further processing. The large, rounded particles are then milled to form glass flakes with an interlocking, three-dimensional structure. This structure helps reduce shrinkage upon drying or curing, maintaining the physical dimensions of a finished part.

Applications in which perlite glass flakes are desired include their use as fillers in water-based construction compounds, paints, asphalt, concrete, plaster, and resin-based castings. They are commonly used in elastomer formulations and specialty applications such as seed coatings as well.

TYPICAL CHEMICAL ANALYSIS*

Silicon	33.8
Aluminum	7.2
Potassium	3.5
Sodium	3.4
Iron	0.6
Calcium	0.6
Magnesium	0.2
Traces	0.2
Oxygen (by difference)	<u>47.5</u>
Net Total	97.0
Bound Water	<u>3.0</u>
Total, %	100.0

* All analysis are shown in elemental form.

TYPICAL PRODUCT DATA

Color	White	
G.E. Brightness, %	70-80	
Refractive Index	1.47	
Specific Gravity	2.2-2.4	
Apparent or Bulk Density, lb/ft ³	5-15	
	gm/cc	.08-.24
pH	neutral	
Oil Absorption,	120-240*	
Softening Point, °F	1800	
	°C	980
Moisture, %	<1.0	
Water Absorption	195-350*	
Ignition Loss, 3 hr 1700°F (930C)	1.5% max**	
Mean Particle Diameter, Microns	as small as 10***	

* lbs (kgs) oil or water/100 lbs (kgs)

** Due to residual combined water

*** Varies with product

Perlite glass flakes are used to provide the following in a formulation:

- Weight reduction
- Shrink and/or crack resistance
- Water and/or air permeability
- Low volume-based cost compared to binders and some other fillers
- Whiteness
- Impact resistance
- Machinability & ease of sanding
- Nail and screw holding ability
- Flexural strength modification
- Very fine texture in coatings
- Elimination of gloss and sheen
- Pigment extension (aluminum in asphalt roof coatings, for example)
- Inertness and non-toxicity
- Improvement of physical properties at cryogenic temperatures

- Solid carrier for a liquid ingredient resulting in a more even dispersion in blends

These flakes are generally smaller than 300 microns in diameter and, depending on the grade, average between 20 and 70 microns in diameter. Despite their small size and actual specific gravity between 2.0 and 2.3, bags containing 2.5 to 4 cubic feet (0.07 to 0.113 cubic meters) of these flakes are surprisingly light, ranging in weight from 10 to 50 pounds (4.55 to 22.73 kilograms) depending on the grade and the supplier.

For further information about this type of filler or any other grade of perlite, please contact your local perlite supplier or the Perlite Institute.



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