Vitro Minerals

www.vitrominerals.com

VitroBloc™ Technical Data

CUSTOM ENGINEERED, HIGH PERFORMANCE ANTIBLOCK ADDITIVES

Description

VitroBloc™ glass powders are high clarity, inorganic antiblock additives made from glass with a unique chemistry. The feedstock for VitroBloc™ is pure amorphous glass, which is completely free of crystalline silica or mineral impurities. VitroBloc™ products, VB-500 and VB-800, are finer than 40 µm and 30 µm, respectively, with plus 90 brightness. These products are designed for excellent antiblocking and clarity properties, and have a refractive index of 1.51, which is optimal for superior clarity. See accompanying application guide.

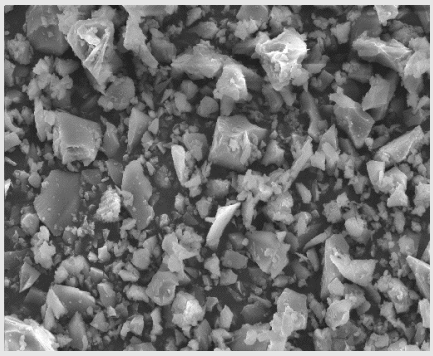
Typical Chemical Analysis

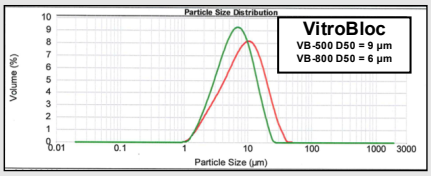
NOT FOR SPECIFICATION PURPOSES

VitroBloc™ Glass Powders are amorphous (non-crystalline) and free of crystalline silica.

Chemical Composition: SiO_2 65-75%; Na_2O 12-14%; CaO 8-10%; MgO 3-4%; Fe_2O_3 <1%; Al_2O_3 <0.5%; K_2O <0.1%; TiO_2 <0.1%; B_2O_3 <0.1%; LOI <0.5%.

These oxides are combined in amorphous state in a silicate glass.





Scanning electron microscope (SEM) image of VitroBloc *(left)*; and
Mastersizer laser particle size analysis curves for VB-500 (red) and VB-800 (green) *(right)*.

Under a microscope (shown above), VitroBloc™ glass particles are irregularly shaped, transparent particles with smooth surfaces. These glass particles exhibit minimal interactions with slip and other additives normally present in LDPE and LLDPE resin systems.

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Typical Physical Properties

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	VB-500	VB-800	Test Procedure
Specific Gravity	2.5	2.5	ASTM D-153
Bulk Density, lb/ft^3	45	35	ASTM C-110
% passing 325 mesh	99.9	99.99	ASTM C-25
% passing 400 mesh	99.5	99.9	ASTM C-25
d98 top size, µm	45	20	Laser interferometer
d50 median size, µm	9-10	6-7	Laser interferometer
Oil absorption	25	29	ASTM D-281
pH	10.5	10.5	AFS 113-87-S
Hardness	5.5	5.5	Mohs Scale
Refractive Index	1.51	1.51	ASTM D-801
Free moisture, %	0.5	0.5	ASTM C-566
Brightness, Y value	92-93	92-93	PhotoVolt 577PC
Specific Resistance, ohm-cm	3500	3500	ASTM D-2448

Product Information/Customer Service

Phone: 678-729-9333 Fax: 678-750-0105
Email: technicalsales@vitrominerals.com

Standard Package: 50-lb. bags, 2,800 lbs./pallet, 40 x 48 pallet, shrink-wrapped. Product also available in supersacks in weight ranges 2,000 – 3,000 lbs.

FOB plant: Jackson, Tennessee

Health Hazard Warning: Prolonged inhalation of dust associated with the materials described in this data sheet can cause delayed lung injury. Avoid creating dust when handling, using or storing. Follow OSHA Safety and Health Standards for fugitive dust. Current Material Safety Data Sheet containing safety information is available and should be consulted before usage.

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VitroBloc™ Application Guide

Property	Characteristics
Blocking Force:	The antiblock characteristics of VitroBloc™ are achieved with loadings ranging from 2500 to 5000 ppm (0.25-0.5 weight percent of resin). The loading levels required for VitroBloc™ (VB) are slightly higher than diatomaceous earth (DE) and talc, and equivalent to nepheline syenite (NS) antiblock additives.
Equipment Abrasion:	VitroBloc™ is less abrasive than DE, slightly more abrasive than talc-containing antiblocks, and has similar abrasive characteristics as silica or nepheline syenite powders. According to the Mohs hardness scale, DE is 7, NS is 6, glass is 5.5, calcium carbonate is 3, and talc is 1.
Particle Size Distribution:	VitroBloc™ VB-500 and VB-800 grades are designed to minimize fines smaller than 3 µm to achieve maximum clarity in the film. VB-500 is slightly coarser in particle size for use in thicker films, and VB-800 is for finer gauges.
Clarity and Haze:	Clarity is a function of differing refractive indices between the antiblock particles and the host polymers, as well as subtle differences in particle size distribution. The refractive index of DE is approximately 1.48; NS is 1.50-1.53; and glass powders are 1.51. Both talc and calcium carbonate are in the 1.59-1.60 range, and therefore are not suitable for high clarity films.
Specific Gravity (SG):	SG is a measure of the intrinsic density of a mineral, with higher SG able to displace less resin and thereby be more costly on a unit-volume basis. DE has an SG of 2.3; NS is 2.57; while talc and calcium carbonate are both in the 2.7 range. VB-500 and VB-500 is in the 2.5 range.
Brightness:	Most inorganic antiblock additives are available in brightness exceeding 90 Y value.

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Comparative Testing of Vitrobloc™ VB-500 with Other Antiblock Additives

Testing was performed using Extrusion Film Grade LLDPE with a 1% addition of Antiblock.

Antiblocks tested were:

- Minbloc HC1400, nepheline syenite;
- Superfloss, diatomaceous earth (DE);
- VitroBloc™ VB-500, Vitro Minerals glass powder.

All tests conducted by an independent certified laboratory.

Dart Impact and Elmendorf Tear

Film / Antiblock	Thickness (mil)	Dart Impact (g)	Elmendorf Tear (g/mil)
			MD
LLDPE Natural	1.02	142	105
LLDPE / 1% Minbloc	1.02	149	117
LLDPE / 1% DE	1.02	145	123
LLDPE / 1% Vitrobloc VB-500	1.02	148	179

Tensile Properties

Film / Antiblock	Thickness (mil)	Tensile @ break (psi)	Modulus	Elongation %
		MD/TD	MD/TD	MD/TD
LLDPE Natural	1.02	3093/1307	1270/1154	322/280
LLDPE / 1% Minbloc	1.02	1474/1443	1145/1114	175/301
LLDPE / 1% DE	1.02	4132/1314	1846/1105	304/256
LLDPE / 1% Vitrobloc VB-500	1.02	2315/1217	1375/1160	304/321

Optical Properties

Film / Antiblock	Thickness (mil)	Haze (%)	Gloss (45º)
LLDPE Natural	1.02	7	28
LLDPE / 1% Minbloc	1.02	9	19
LLDPE / 1% DE	1.02	8	16
LLDPE / 1% Vitrobloc VB-500	1.02	8	32

Summary

Under the test conditions used, all three antiblocks performed equally well in reducing blocking of the films. Physical properties did not alter much by the addition of Vitrobloc VB-500 to the film. At 1% addition of the antiblock, haze slightly increased for all three addives, but VB-500 maintained the gloss compared to the Minbloc and DE.