

**Custom-engineered, high performance, pozzolanic mineral additives
for use in white cement, mortar, and concrete products**

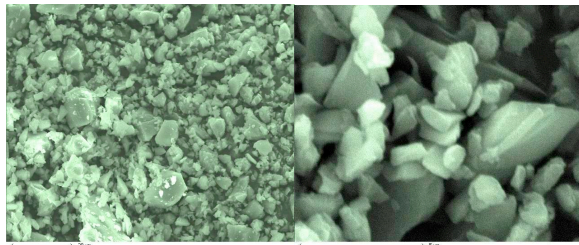
www.vitrominerals.com

Product Description

VCAS™ (vitreous calcium aluminosilicate) pozzolans are new custom-engineered, high performance supplementary cementing materials for use in white Portland cement, mortar, and concrete products.

After primary sizing and drying, the feedstock is finely ground and processed through high efficiency classifiers to produce a fine bright white powder with quality assured physical properties. The consistent chemical composition and tightly controlled particle size distribution result in highly reactive and superior quality pozzolans for concrete applications.

Currently, the VCAS™ patented technology produces white pozzolans in four grades: **VCAS-8** and **VCAS-MicronHS**, engineered with higher fineness and higher brightness for exacting applications; and **VCAS-140** and **VCAS-160** for less demanding applications, as described in this technical summary.

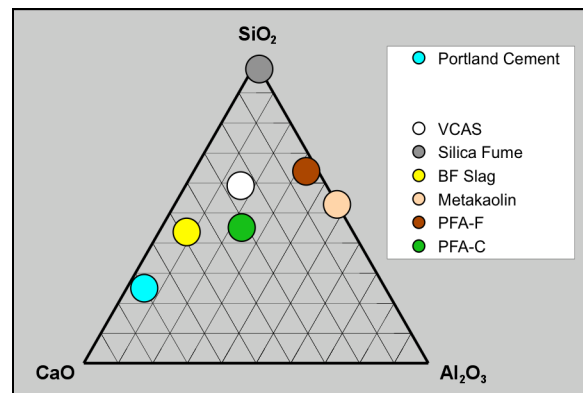


Unlike silica fume, coal fly ash, ground granulated blast furnace slag, and other by-products, VCAS™ White Pozzolans are free of iron, manganese, and other undesirable color-inducing impurities, making them ideally suited for all applications using white cement and in pigmented concrete.

VCAS™ pozzolans are value-added supplementary cementing materials that exhibit pozzolanic activity comparable to silica fume and metakaolin when tested in accordance with ASTM C618 and ASTM C1240. VCAS™ pozzolans react with calcium hydroxide produced during the hydration of Portland cement to form additional cementitious compounds such as calcium silicate and aluminosilicate hydrates. Pozzolans are widely used in cement and concrete technology to increase concrete strength, density, and resistance to chemical attack as well as control efflorescence.

Chemical Composition of VCAS™ Pozzolans			
Silica, SiO ₂	50–55%	Titania, TiO ₂	< 1%
Alumina, Al ₂ O ₃	15–20%	Phosphorus oxide, P ₂ O ₅	< 0.1%
Iron oxide, Fe ₂ O ₃	< 1%	Manganese oxide, MnO	< 0.01%
Calcium, CaO	20–25%	Boron oxide, B ₂ O ₃	0–6%
Magnesia, MgO	< 1%	Sulphur oxide, SO ₃	< 0.1%
Sodium oxide, Na ₂ O	< 1%	Chloride, Cl	< 0.01%
Potassium oxide, K ₂ O	< 0.2%	Loss on ignition, L O I	< 0.5%

Chemically, VCAS™ pozzolans are comprised largely of oxides of silicon, aluminum and calcium with no deleterious impurities. The CaO-SiO₂-Al₂O₃ proportions, the low alkali metal content, and the amorphous structure are ideal for a pozzolanic additive in hydraulic concrete. The low iron content makes them particularly well suited for applications using white cement, such as mortars, stuccos, terrazzo, artificial stone, and cast-in-place or precast concrete products.



Ternary diagram (CaO-SiO₂-Al₂O₃) for the composition of VCAS™ pozzolans relative to Portland cement and the common pozzolans.

VCAS™ pozzolans have superior powder handling compared with silica fume and metakaolin. Tight process control provides consistent product quality and physical properties.

Physical Properties of VCAS™ Pozzolans				
	VCAS-8	VCAS-MicronHS	VCAS-140	VCAS-160
Specific Gravity	2.6	2.6	2.6	2.6
Bulk Density, Loose lb/ft ³	50-55	40-44	50-55	45-50
Passing No. 325 Mesh, %	95	>99	95	98
Pozzolanic Strength Index, % control	106	115	104	110
Brightness, %	87-90	87-90	82-85	82-85
Melting Point, °C	1200	1200	1200	1200
Hardness, Mohs	5.5	5.5	5.5	5.5

**New high brightness,
high fineness grades**

Benefits of VCAS™ Pozzolans

Fresh Concrete:

- Improved workability
- Reduction in water requirements
- Ease of dispersability
- Reduction in superplasticizer
- Reduction in bleeding
- Reduction in aggregate segregation

Hardened Concrete:

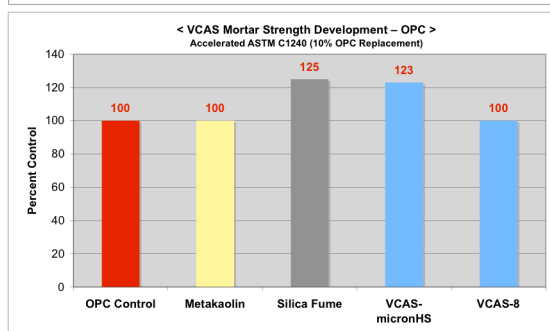
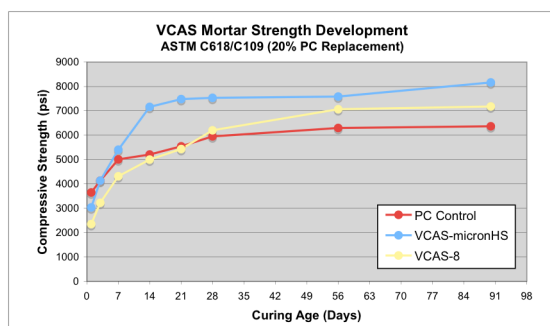
- Increased compressive strength
- Decreased permeability
- Increased durability

Added-Value:

- Mix-color neutrality and brightness
- Improved retention of mold detail
- Sustainability

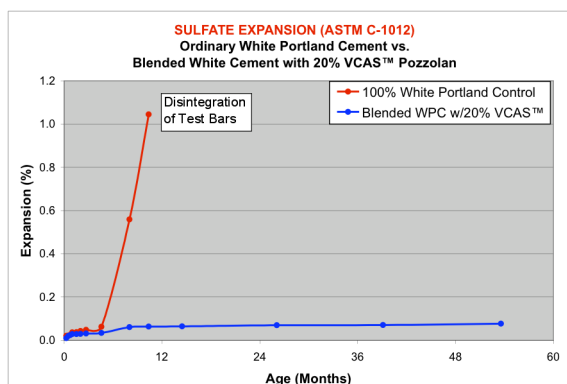
High Performance

VCAS™ White Pozzolans meet the technical requirements of ASTM C618 for use as supplementary cementitious materials in concrete. Blended pozzolanic cements produced with VCAS pozzolans also comfortably exceed the requirements of ASTM C1157: Standard Performance Specification for Hydraulic Cement. Typical strength curves at 20% cement replacement are shown below. VCAS-micronHS™ exceeds the control before 3 days, making it an excellent choice for high performance applications where high early strength and excellent color are required. VCAS-micronHS™ also meets the accelerated pozzolanic activity index, ASR control, and sulfate resistance requirements of ASTM C1240 for silica fume. Coupled with low water demand, reduced efflorescence, and improved chloride resistance, VCAS™ pozzolans are extremely cost effective.



Enhanced Durability

VCAS™ pozzolans provide white Portland cement with superior resistance to sulfate attack (ASTM C1012). The graph below shows the excellent dimensional stability of a white cement mortar with 20% VCAS replacement after over 4 years of exposure. Under these harsh test conditions, the 100% white cement control mortar disintegrated in less than 200 days. VCAS is also very effective at controlling expansion due to the alkali-silica reaction (ASTM C441) and reducing chloride ion penetration (ASTM C1202).



Comparison with Other Pozzolans

VCAS™ pozzolans are excellent high reactivity materials for use with white cement to produce durable, high performance architectural concrete structures and reflective highway barriers.

Pozzolan	% Replacement	Reactivity	Color (Powder)	Water Demand	Environmental
VCAS-8™	10-30	Mod	White	Reduction	Positive
VCAS-micronHS™	10-30	High	White	Reduction	Positive
Silica Fume	5-8	High	Dark grey	Large increase	Positive
Metakaolin	5-8	High	Cream/pink	Large increase	Negative
Blastfurnace Slag	25-50	Mod	Buff	Neutral	Positive
Fly ash	10-30	Low	Dark	Reduction	Positive

Environmental, Health & Safety

VCAS™ pozzolans have an important role to play in sustainable construction by increasing service life and reducing the net greenhouse gas emissions (GHG) for a cubic yard of concrete.

VCAS™ pozzolans are non-toxic, contain no crystalline silica, and are classed as a nuisance dust, in common with other common fine particulate industrial minerals.

Product Availability

VCAS™ pozzolans are sold in 50 lb bags. Contact Vitro for the availability of 1-ton super-sacks and bulk tanker trucks in your area.

Disclaimer: The statements in this bulletin are based on data which is believed to be reliable, and is offered in good faith to be applied accordingly to the user's best judgment. Since operating conditions at customer's sites are beyond our control, Vitro Minerals will not assume responsibility for the accuracy of this data, or liability which may result from the use of its products. Likewise, no patent liability is assumed for use of Vitro Mineral products in any manner which could or would infringe on patent rights of others.

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