

USG CAS-20™ -4 Calcium Sulfate Filler

In Rigid PVC

Product Features

- CAS-20™-4, anhydrous calcium sulfate, provides PVC processors with:
- High purity, whiteness
 - Soft, low abrasion
 - Resistance to mild acids
 - Excellent impact properties
 - Good electrical properties
 - Good processability
 - Cost savings potential

CAS-20-4 filler can be used at high loadings and consistently provides an excellent balance of properties and good surface appearance. Its low Mohs hardness minimizes abrasion to processing equipment. Because of its high brightness, CAS-20-4 is also used as a partial replacement for titanium dioxide.

Applications

- CAS-20-4 filler is ideal for many rigid PVC applications, including:
- Vinyl siding
 - Window frames
 - Moldings
 - Conduit
 - Pipe

Product Comparison **Test 1**

Capstock tests indicate that calcium sulfate can provide equivalent or better properties than higher priced calcium carbonates. This test was conducted on four vinyl siding capstock formulations. #1 and #2 contained calcium carbonate and #3 and #4 contained calcium sulfate (CAS-20-4). All other additives were held constant. Dry blends were prepared by Vista Chemical. 7" x 45 mil profiles were processed by a major vinyl siding manufacturer on a 40 mm American Maplan twin-screw extruder. Formulations and test results were as follows.

Brand Name	Formulations				Description of Ingredients-phr		
	10 phr CaCO ₃ #1	15 phr CaCO ₃ #2	10 phr CaSO ₄ #3	15 phr CaSO ₄ #4	Function	Composition	Supplier
Vista 5385	100	100	100	100	PVC resin	0.92 IV homopolymer	Vista Chemical
TM181	1.5	1.5	1.5	1.5	Thermal stabilizer	Tin mercaptide	Morton International
Extra-Dense G	1.2	1.2	1.2	1.2	Lubricant	Calcium stearate	Witco Corp.
Rheolub 165-010	1.2	1.2	1.2	1.2	Lubricant	Paraffin wax	Rheochem Mfg. Co.
AC629A	0.2	0.2	0.2	0.2	Lubricant	Polyethylene wax	Allied Signal Inc.
K120N	1	1	1	1	Processing aid	Acrylic copolymer	Rohm & Haas Co.
KM334	6	6	6	6	Impact modifier	Acrylic copolymer	Rohm & Haas Co.
OMYACARB® UFT	10	15	—	—	Filler	Calcium carbonate	Omya Inc.
CAS-20-4	—	—	10	15	Filler	Calcium sulfate	U.S. Gypsum Co.
CR834	10	10	10	10	White pigment	Titanium dioxide	Kerr McGee



Results

ASTM D638	10 phr CaCO₃ #1	15 phr CaCO₃ #2	10 phr CaSO₄ #3	15 phr CaSO₄ #4
Tensile Strength at Yield, psi	6,390	6,180	6,270	6,070
Tensile Strength at Yield, kPa	44,060	42,610	43,230	41,850
Tensile Modulus x 10 ³ , psi	4.35	4.89	3.81	4.46
Tensile Modulus x 10 ³ , kPa	3.00	3.37	2.62	3.07
Elongation at Yield, %	2.9	3.0	3.4	3.0

ASTM D3029

Falling Weight Impact, in.-lb.	87.0	75.2	102.7	71.2
Falling Weight Impact, J	9.8	8.5	11.6	8.0

Capstock tests indicate that calcium sulfate can provide equivalent or better properties than calcium carbonate.

Test 2

This independent study was conducted on two typical vinyl siding substrate formulations, one containing 8 phr of calcium carbonate and one containing 8 phr of calcium sulfate (CAS-20-4). Dry blends were prepared on site by a vinyl siding manufacturer. All other additives were held constant. Profiles, measuring 7" x 40 mil, were processed on a 40 mm American Maplan twin-screw extruder.

Results

ASTM D638	8 phr CaCO₃ (OMYACARB[®] UFT) #1	8 phr CaSO₄ (CAS-20-4) #2
Tensile strength at yield, psi	6,750	6,810
Tensile strength at yield, kPa	46,540	46,950
Tensile modulus x 10 ³ , psi	3.45	4.46
Tensile modulus x 10 ³ , kPa	2.38	3.07
Elongation at yield, %	3.9	3.8

ASTM D3029

Falling weight impact, in.-lbs.	102.7	100.0
Falling weight impact, J	11.6	11.3

Substrate tests demonstrate that, at comparable loading levels, CAS-20-4 can provide significantly higher modulus and equivalent impact strength versus ultrafine treated carbonate.

**Typical Properties
of CAS-20-4
Calcium Sulfate Filler**

CAS-20-4, anhydrous calcium sulfate, is an extremely white, finely divided particulate filler. It is manufactured from high purity gypsum rock using fine grinding and controlled calcination, which greatly reduces its moisture affinity. Its narrow particle size distribution gives optimum impact properties for thermoplastic applications.

Physical Properties		Chemical Analysis	
Specific Gravity	2.96	CaSO ₄	98.7%
pH—10% Slurry	10.8	CaCO ₃ • MgCO ₃	0.5%
Mohs Hardness ¹	2-3	CaCO ₃	0.3%
Refractive Index ²	1.58	Aggregate	0.3%
Oil Absorption ³	24-26	Free Moisture at 45 °C ⁶	0.1%
Blaine Surface Area (cm ² /g)	10,000-14,000	Combined Moisture at 225 °C ⁶	0.2%
Loose Bulk Density (lb./ft. ³)	45		
Packed Bulk Density (lb./ft. ³)	65		
Reflectance (L,a,b values) ³	93.6, -0.9, 1.3		
Brightness (%) ⁴	98-99		
Median Particle Size (microns) ⁵	4.3		
Top Particle Size (microns)	20.0		

Particle Size Distribution	Volume (Microtrac) ⁵	Cumulative % Passing	Weight (Sedigraph) ⁷	% Smaller Than
20 microns	100.0	100.0	20 microns	100.0
10 microns	87.0	87.0	10 microns	92.3
5 microns	55.5	55.5	5 microns	68.4
4.3 microns (median)	50.0	50.0	3.5 microns (median)	50.0
2 microns	22.0	22.0	2 microns	30.1
1 micron	8.9	8.9	1 micron	4.1

1. Literature value
2. ASTM D1483, Gardner Coleman method, gm oil/100 gm filler
3. HunterLab D25-PC2 Colorimeter L,a,b values
4. Beckman Model 5260 Spectrophotometer, reported in %, relative to a BaSO₄ standard
5. Leeds and Northrup SPA Microtrac Particle Size Analyzer
6. Computrac Max 50 Moisture Analyzer
7. Micromeritics Sedigraph 5000 ET Particle Size Analyzer

Product Information

See usg.com for the most up-to-date product information.

Warning

Dust can be generated during use and handling. Dust may cause eye, skin, nose, throat or upper respiratory irritation. Avoid inhalation of dust and eye contact. Use proper ventilation to reduce dust exposure. If dusty, wear a NIOSH/MSHA-approved dust respirator. Wear eye protection. If eye contact occurs, flush thoroughly with water for 15 minutes. If irritation persists, call physician. Do not ingest. If ingested, call physician. Product safety information: (800) 507-8899 or www.usg.com

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