VISCOEXCEL®-30

Precipitated Calcium Carbonate

SHIRAISHI KOGYO KAISHA,LTD.

Precipitated calcium carbonates (PCC) are used in a wide variety of applications. The dimensional stability, uniform dispersion and reliable consistency are the properties that make PCC ideal for adhesives, sealants and coatings. Shiraishi's product consistency gives optimum rheology in the most critical transportation, infrastructure and construction applications.

Formula

		Fumed Silica	Viscoexcel-30
Formulation			
Polypropylene Glycol	parts	100	100
Fumed Silica	parts	20	–
Viscoexcel-30	parts	–	100

Viscoexcel-30

Viscoexcel-30 can solve many issues that occur when using conventional anti-sagging agents.

- Mineral particles are 30 nm in size.
- It provides a high level of viscosity and thixotropy.
- It is applicable for many kinds of polymer.
- It can be used without the strict temperature control during the mixing stage.
- It can provide excellent storage properties after mixing.

Anti-Sagging

Workability

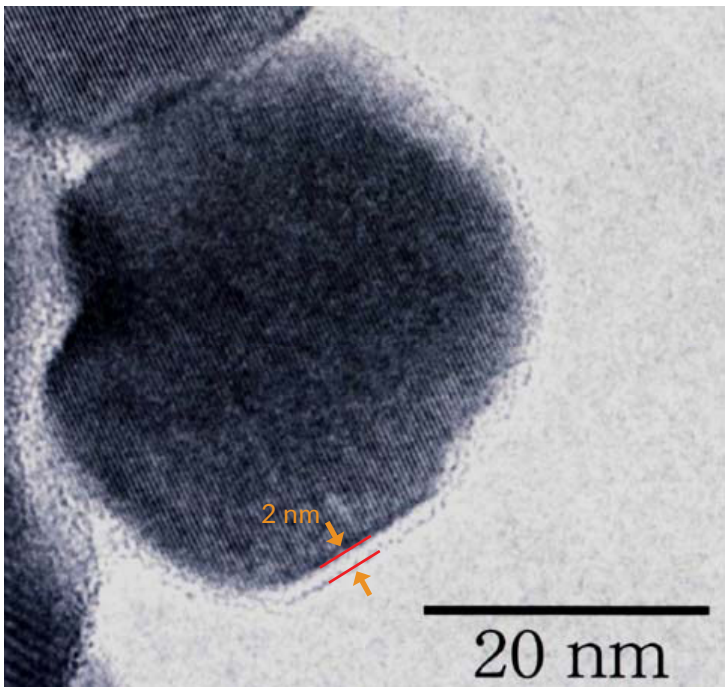
Extrusion Rate

Sprayability

Classification		
Molecular Formula		$CaCO_3$
CAS Number		471-34-1
PRTR Chemical Substance Inventory		does not apply

Crystal Properties		
Crystal Structure		Calcite
Particle Shape		Rhombohedral
Specific Gravity	g/cm^3	2.4-2.6
Refractive Index		1.5-1.7

Powder Properties		
BET Specific Surface Area	m^2/g	32.3
Average Particle Size	nm	30
Boiled Linseed Oil Absorption	$cm^3/100\ g$	26.0
Bulk Density	g/cm^3	0.37
Whiteness	%	91
pH	–	9.7
Moisture	%	0.6

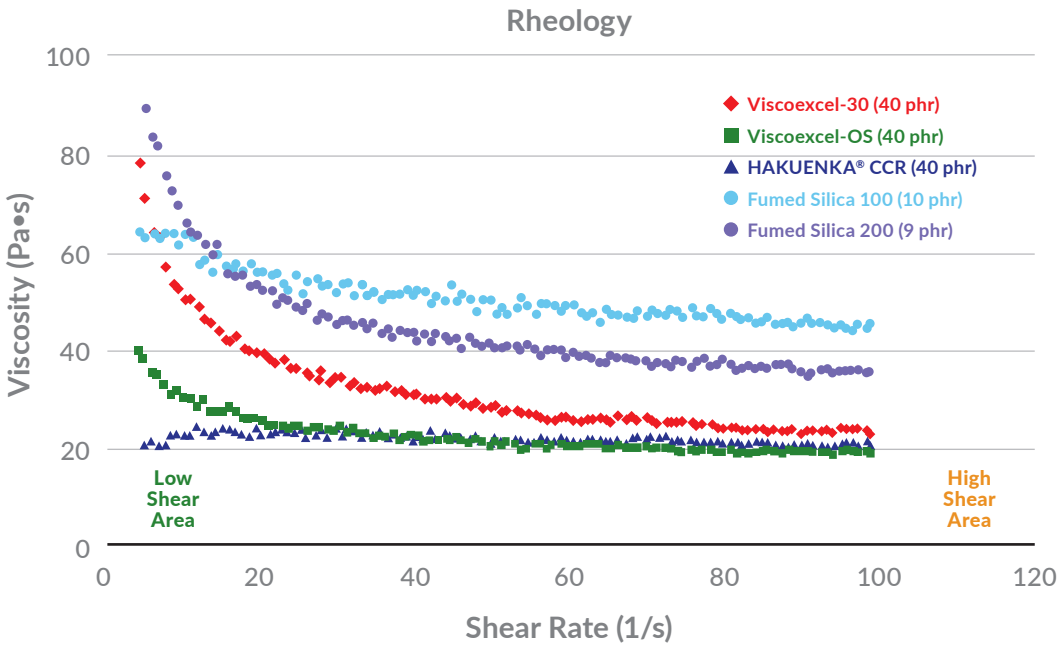


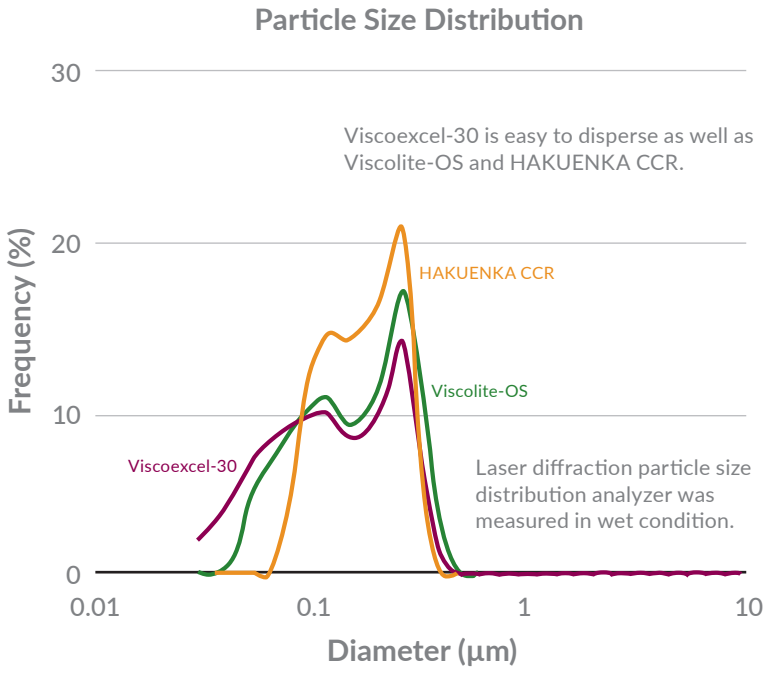
TEM Image

The fatty acid surface treatment has a uniform 2 nm coating on the surface of Viscoexcel-30.

Characteristics

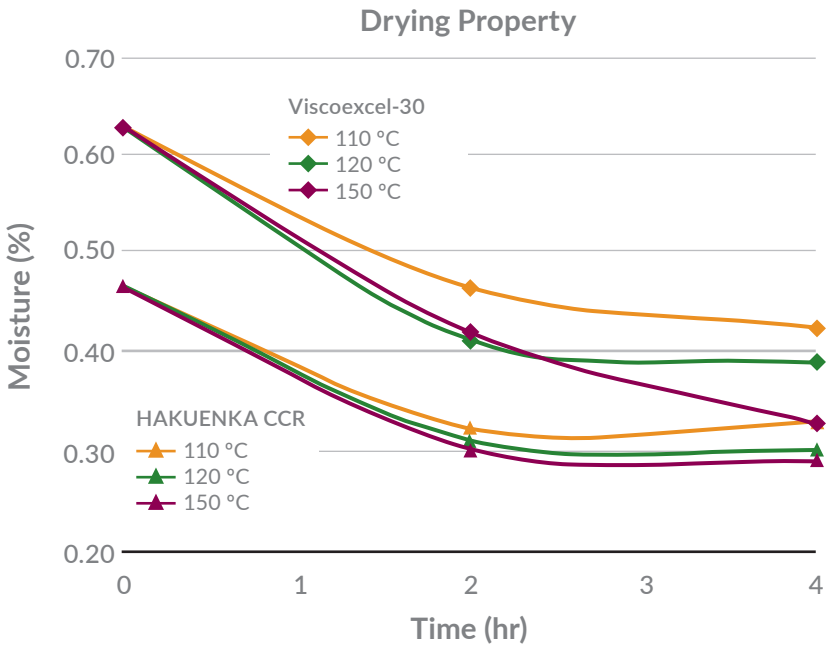
- Viscoexcel-30 has excellent rheology. It has low viscosity in high shear and high viscosity in low shear as shown in the figure below.
- This rheology contributes to improved workability, sprayability, anti-sag and extrusion rate.
- Viscoexcel-30 can be easily dispersed with low shear as shown in the figure below.

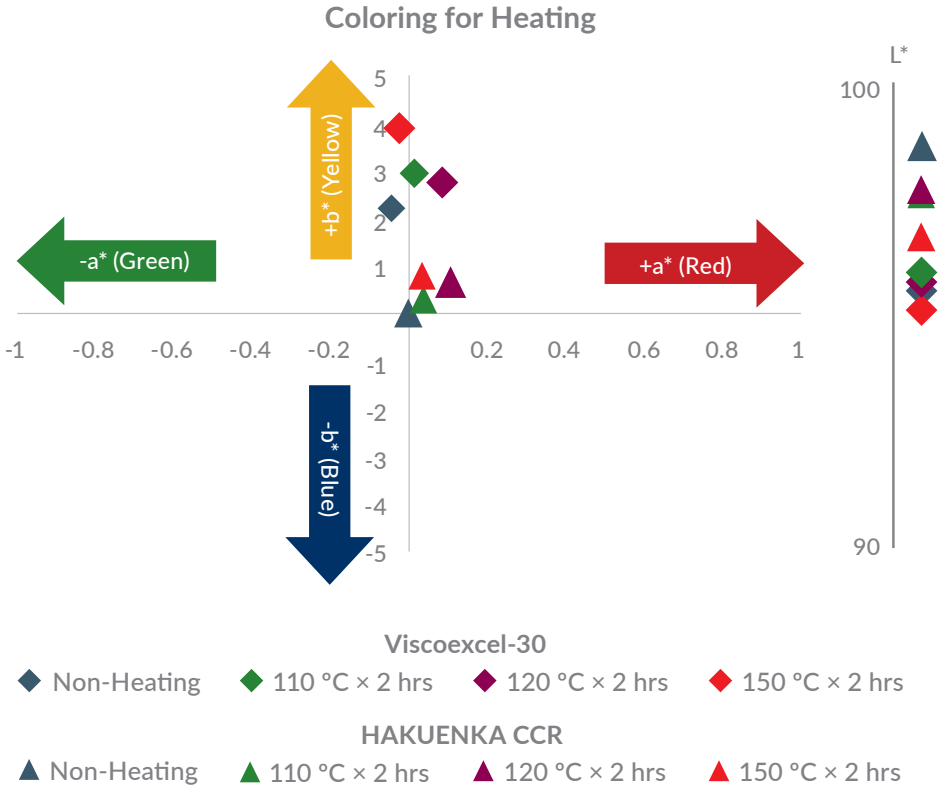




How to Use

- In order to prevent possible moisture reactions in the formulation of one-component sealants, Viscoexcel-30 may require a preliminary drying step.
- Drying is recommended at 110-120 °C for 2 hours as shown in the figure below.
- Optimum drying achieves almost unchangeable color of powder as shown in the figure below.





- Viscoexcel-30 provided the same viscosity as fumed sIlica with 4.8-6.7 times the dosage in a formula containing dioctyl phthalate (DOP), silicone and modified silicone as shown in the table below.
- Viscoexcel-30 showed a much better extrusion rate when compared to fumed silica as shown in the table below.
- Viscoexcel-30 plastisol with DOP also showed higher thixotropy than fumed silica 200 plastisol. It provides the same performance even if it is used in silicone or modified silicone.
- Viscoexcel-30 provides high thixotropy in many polymer systems.

Dosage

	Sample	DOP	Silicone	Modified Silicone
Dosage Ratio[1] Against Fumed Silica 200		4.8	6.7	4.8
Extrusion Rate[2] of the Plastisol (g/min)	Viscoexcel-30	171.6	1.6	1.1
	Fumed Silica 200	78.0	1.0	0.7
Thixotropy[3] of the Plastisol	Viscoexcel-30	6.8	4.2	4.8
	Fumed Silica 200	5.9	2.7	2.9

1 Dosage ratio is adjusted to equalize solvent viscosity between Viscoexcel-30 and fumed silica.
2 φ 1 mm, 3 kgf/cm²
3 Thixotropy = 2 rpm viscosity / 20 rpm viscosity

Applications

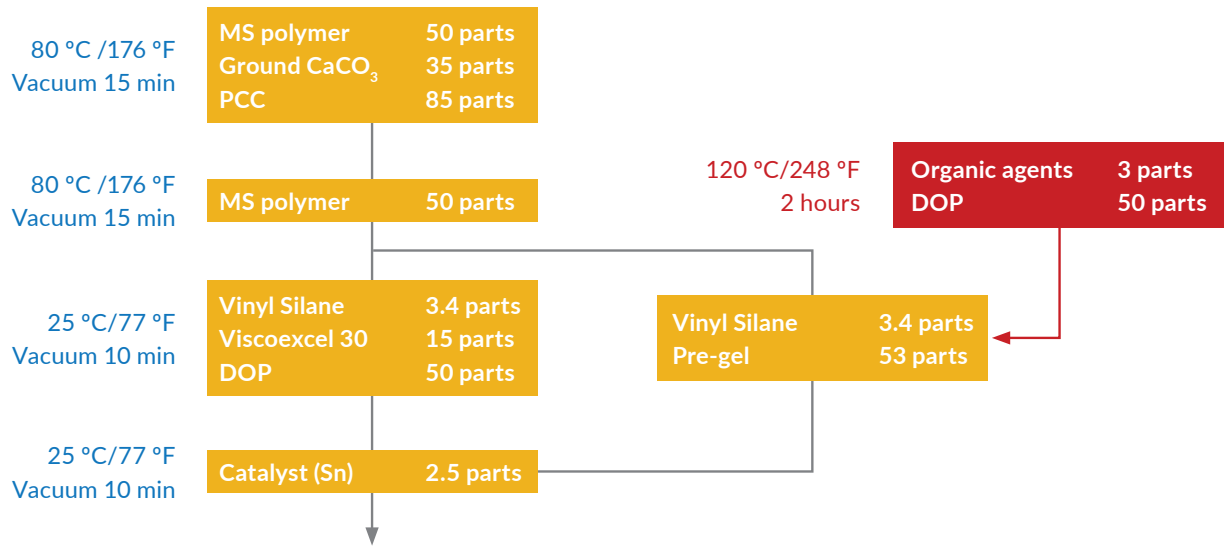
- At a 5 times loading, Viscoexcel-30 can replace fumed silica in a modified silicone sealant formula.
- Viscoexcel-30 also showed better long-term storage stability when compared to fumed silica.
- When using Viscoexcel-30, the pre-gel process can be skipped, which reduces fixed costs.

Modified Silicone Sealant

Formulation	Unit	Viscoexcel-30	Organic Agent	PCC Only
MS Polymer	parts	100	100	100
Ground $CaCO_3$	parts	35	35	35
PCC	parts	85	85	85
Organic Agents	parts	–	3	–
Viscoexcel-30	parts	15	–	–
DOP	parts	50	50	50
Vinyl Silane	parts	3.4	3.4	3.4
Catalyst (Sn)	parts	2.5	2.5	2.5
Total		290.9	278.9	275.9
Viscosity (1 Day Later, 20 °C/68 °F)				
2 rpm	Pa·s	850	780	440
20 rpm	Pa·s	154	149	91
TI (2 rpm/20 rpm)	–	5.5	5.2	4.8
Ratio of Viscosity Increase (14 Days Later/1 Day Later)				
2 rpm	%	122	151	127
20 rpm	%	149	160	133
Tack-Free Time				
Hardness*	hour	> 24	> 24	> 24
Stress-Strain Test*	-	26	27	28
50% Modulus	kPa	100	105	100
Tensile Strength	kPa	477	477	485
Tensile Elongation	%	783	736	724
Adhesion Failure	–	CF	CF	CF

**Keeping condition is 20 °C/68 °F, 14 days + 30 °C/86 °F, 14 days.*

Process



- Viscoexcel-30 is 3 times more efficient when compared to HAKUENKA CCR in a two-component polyurethane sealant formula.
- Viscoexcel-30 can help reduce overall formula costs.

Two-Polyurethane Sealant

Formulation	Unit	Viscoexcel-30	HAKUENKA CCR
Polyol A	parts	180	180
Polyol B	parts	120	120
Catalyst (Sn)	parts	0.5	0.5
HAKUENKA CCR*	parts	–	300
Viscoexcel-30*	parts	100	–
Whiton P30	parts	550	350
Total		950.0	950.0
Hardening Agent Viscosity at 20 °C			
1 rpm Viscosity	Pa·s	5,590	6,140
10 rpm Viscosity	Pa·s	782	895
TI (1 rpm/10 rpm)		7.1	6.9
Sealant Viscosity at 20 °C			
1 rpm Viscosity	Pa·s	1,260	1,810
10 rpm Viscosity	Pa·s	227	312
TI (1 rpm/10 rpm)	–	5.6	5.8
Curing Time	hr	8.5	7.0
Tack-Free Time	hr	9.7	8.1
Foaming at 20 °C, 60%	mm	0	0
Foaming at 50 °C, 60%	mm	1	1

** Dried at 110 °C for 2 hrs prior to use.*

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