Calcium Carbonates as functional fillers in Adhesives and Sealants

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THINKING OF TOMORROW

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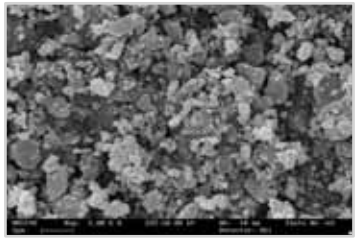
Agenda

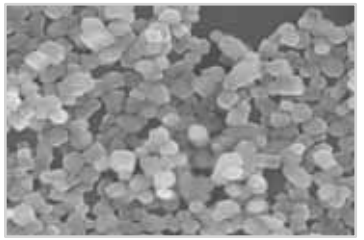
1. Calcium Carbonates for Adhesives and Sealants

2. Particle Size distribution of Ground Calcium Carbonate

3. Managing moisture in Ground Calcium Carbonate

4. Ultrafine Precipitated Calcium Carbonate





130 Years History

1884

Founded in Switzerland

1891

First production plant in France

1894

Start of trading activities in Switzerland

1952

First surface treated $CaCO_3$ to the PVC industry

1965

First $CaCO_3$ to the Paper industry

1968

Hydrocarb slurry for neutral sizing in Paper

70's – 80's

Expansion to USA, Thailand & Australia

Development of **ultrafine $CaCO_3$** for the Paint industry

1990's

Development & start production of **PCC**

2005

First plant certified ISO 22000 for Food compliance

00 – 10'

Expansion to Brazil, Russia, Middle East & Asia

2012

Globalisation of the Agriculture business

2013

First pilot plant for remineralisation of desalinated water

2015

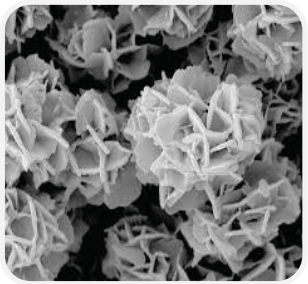
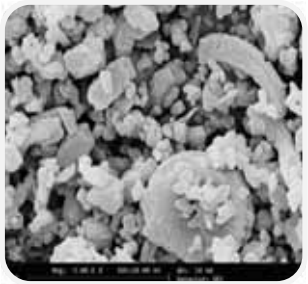
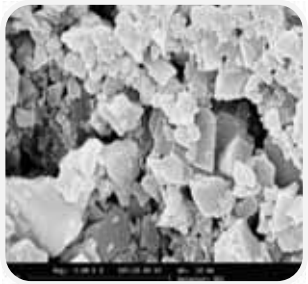
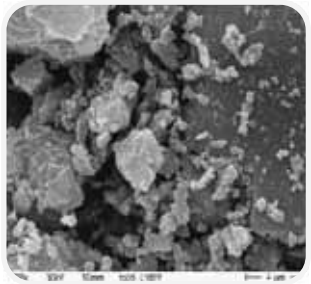
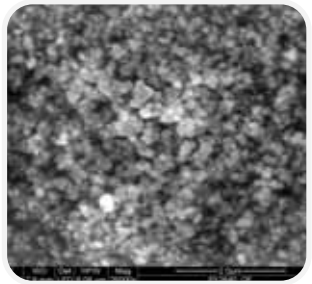
CPHI Innovation Award for **Omyapharm (FCC)**

2016

Inauguration of Pharma Lab in Switzerland

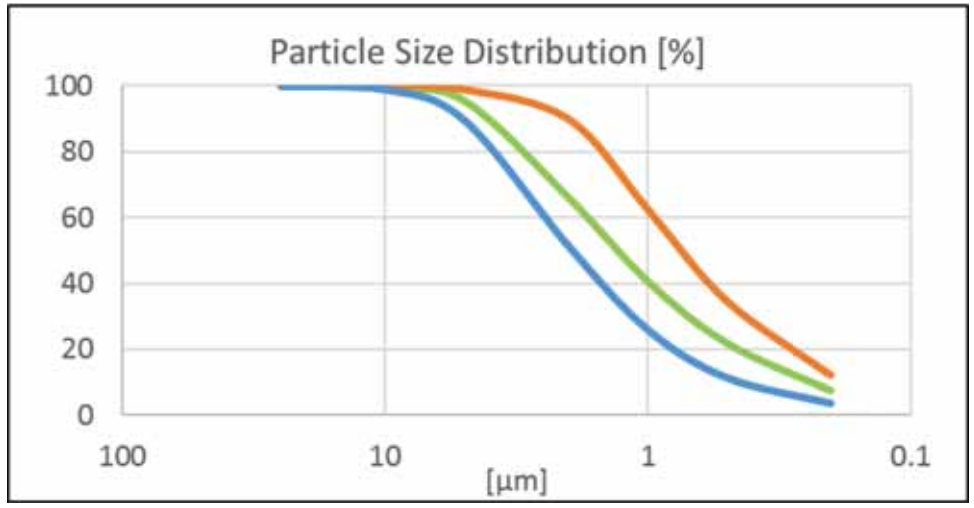
2017

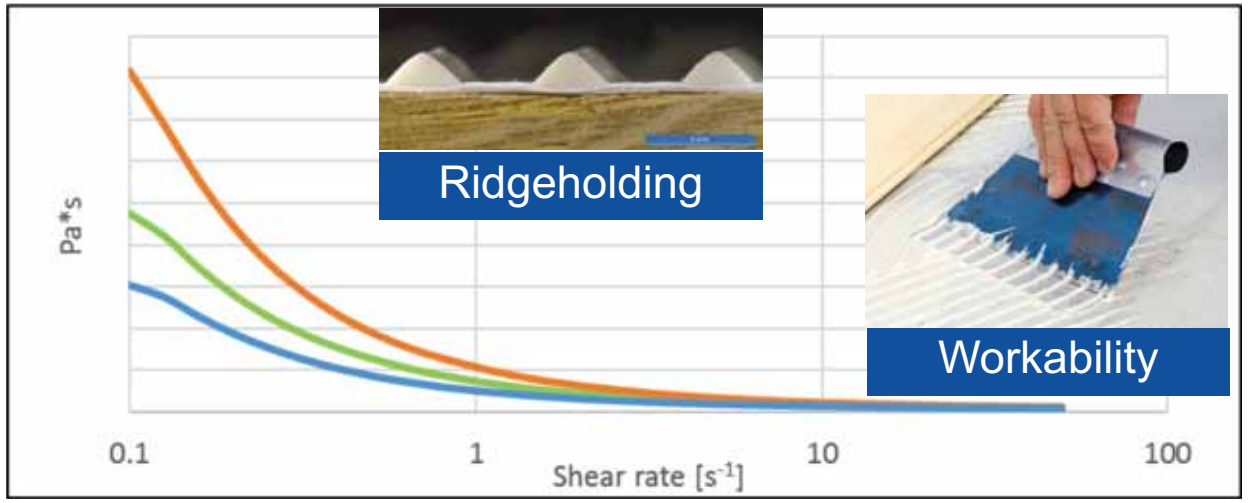
Omyadent (FCC) commercially available for Oral Care

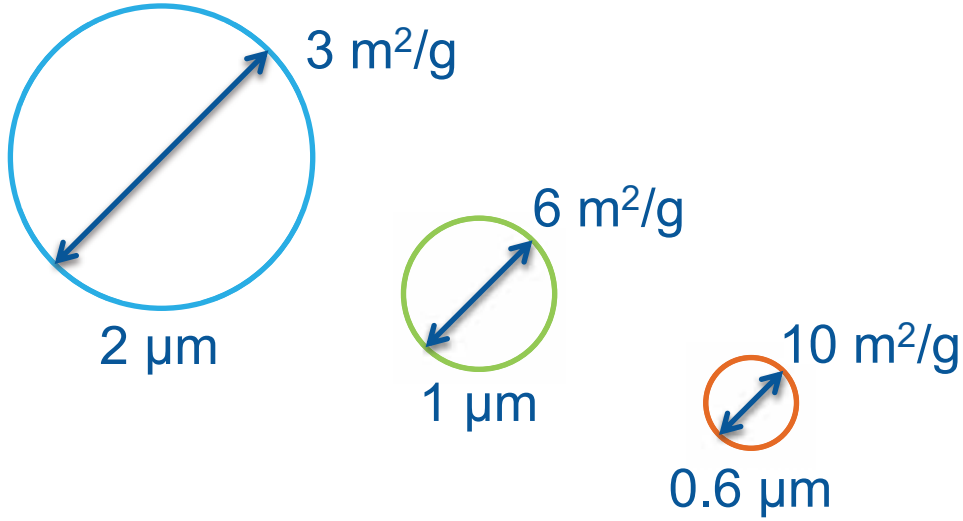
Modified Calcium Carbonate	Ground Calcium Carbonate		Ultrafine Ground Calcium Carbonate	Ultrafine Precipitated Calcium Carbonate
MCC	**GCC**		**UFGCC**	**PCC**
				
Untreated Development grades 1 to 100 µm	Untreated **Omyacarb** 1 to 100 µm	Treated **Omyacarb** 1 to 5 µm	Treated **Hydrocarb** 0.9 µm	Treated **Hakuenka** 0.1 - 0.03 µm
		Low moisture **Omyabond** 2 µm	Low moisture **Omyacoll** 0.6 µm	

Calcium Carbonates for Adhesives and Sealants

Particle Size ➔ Rheology of an Adhesive





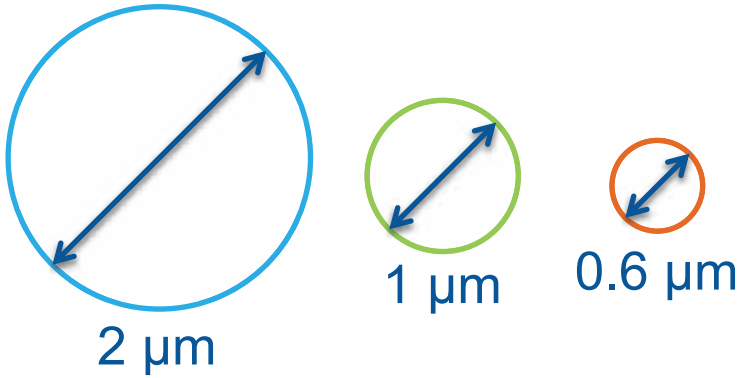


Smaller particle size

- higher surface area
- more particle-particle interactions

➔ more pronounced shear thinning

Particle Size ➔ Mechanical Properties



Particles ➔ stress concentrations

Smaller particles
➔ Less concentration (micro-level)
➔ Higher elongation (macro-level)

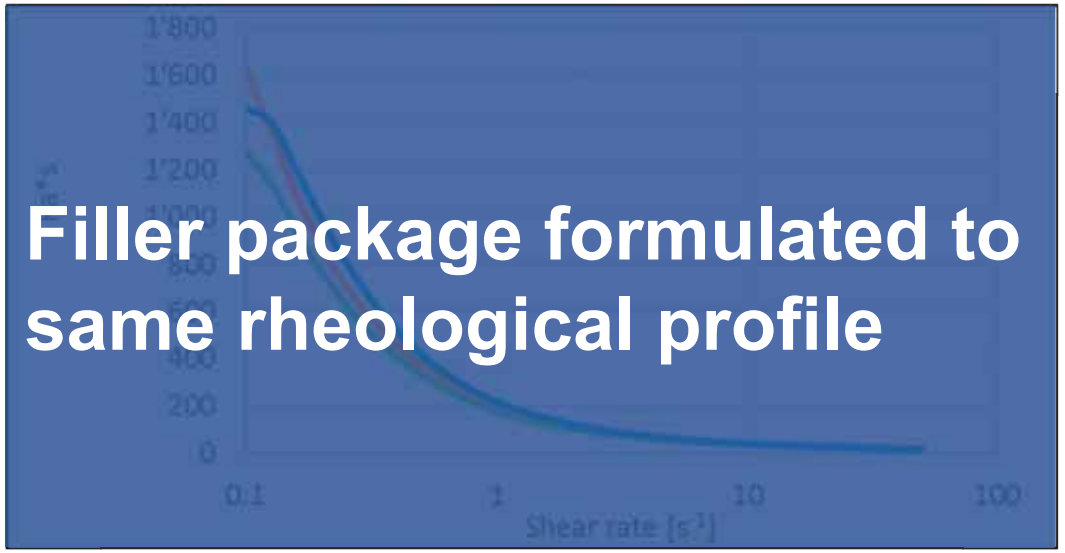
In theory, particle size has no effect on modulus

In reality, modulus depends on moisture

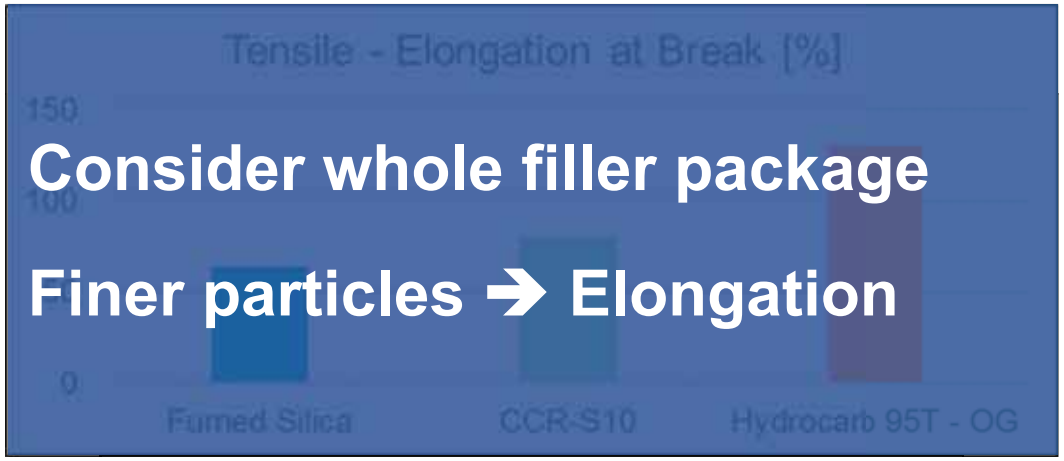
Elongation and Modulus
➔ Bond Strength

Reinforcement of 1K-SMP adhesives

Formulation			
SMP Polymer	214	214	214
Plasticizer	120	120	120
Fumed Silica	**15**	**-**	**-**
Hakuenka CCR-S10	**-**	**112**	**-**
Hydrocarb 95T - OG	**-**	**-**	**400**
Omyacarb 10 - AV	**624**	**527**	**239**
Moisture scavenger	20	20	20
Adhesions promoter	4	4	4
Catalyst	2	2	2
TOTAL	**1000**	**1000**	**1000**

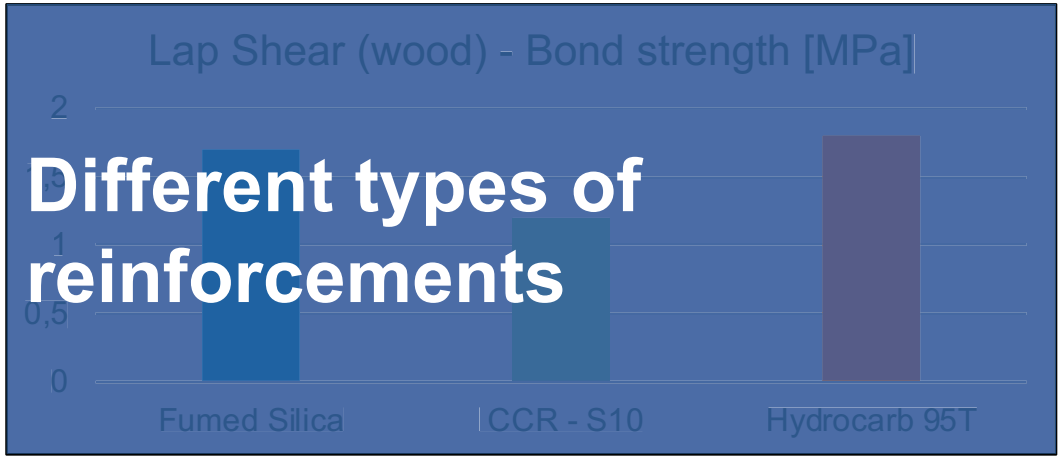


Filler package formulated to same rheological profile

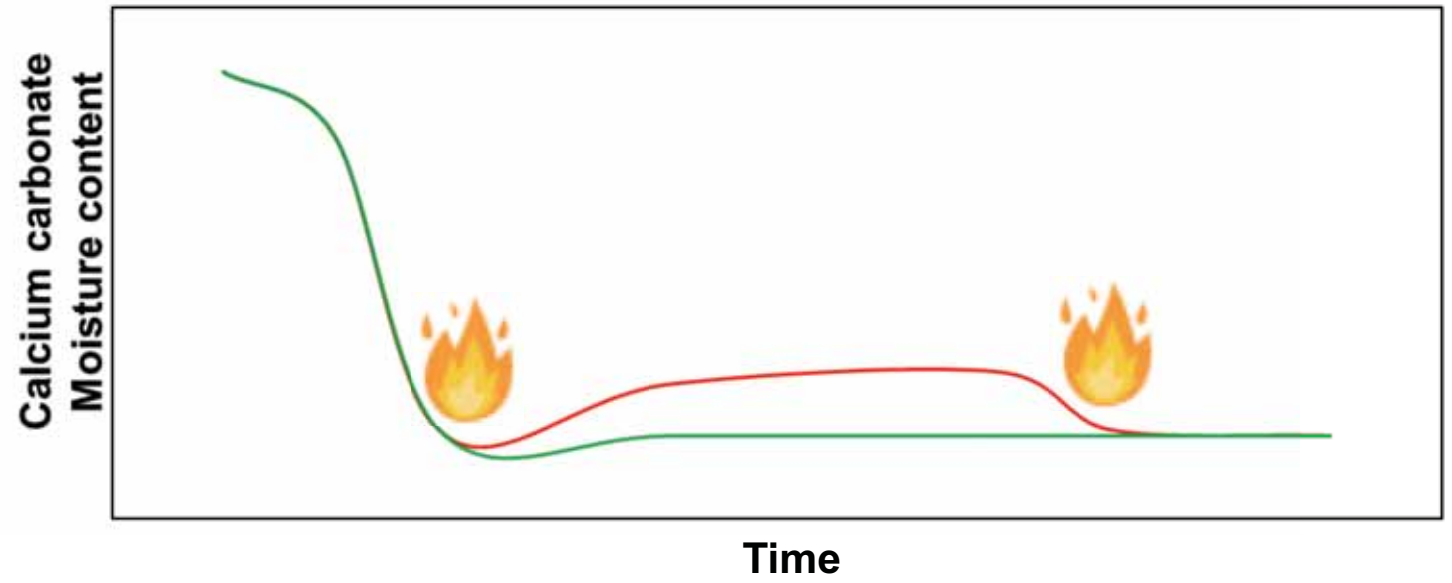


Consider whole filler package

Finer particles ➔ Elongation

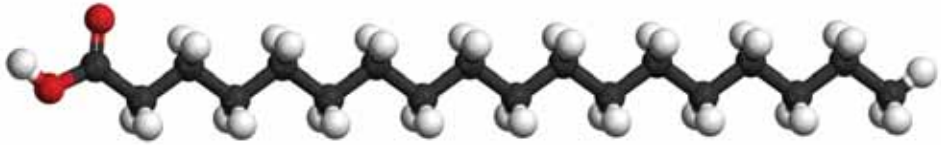


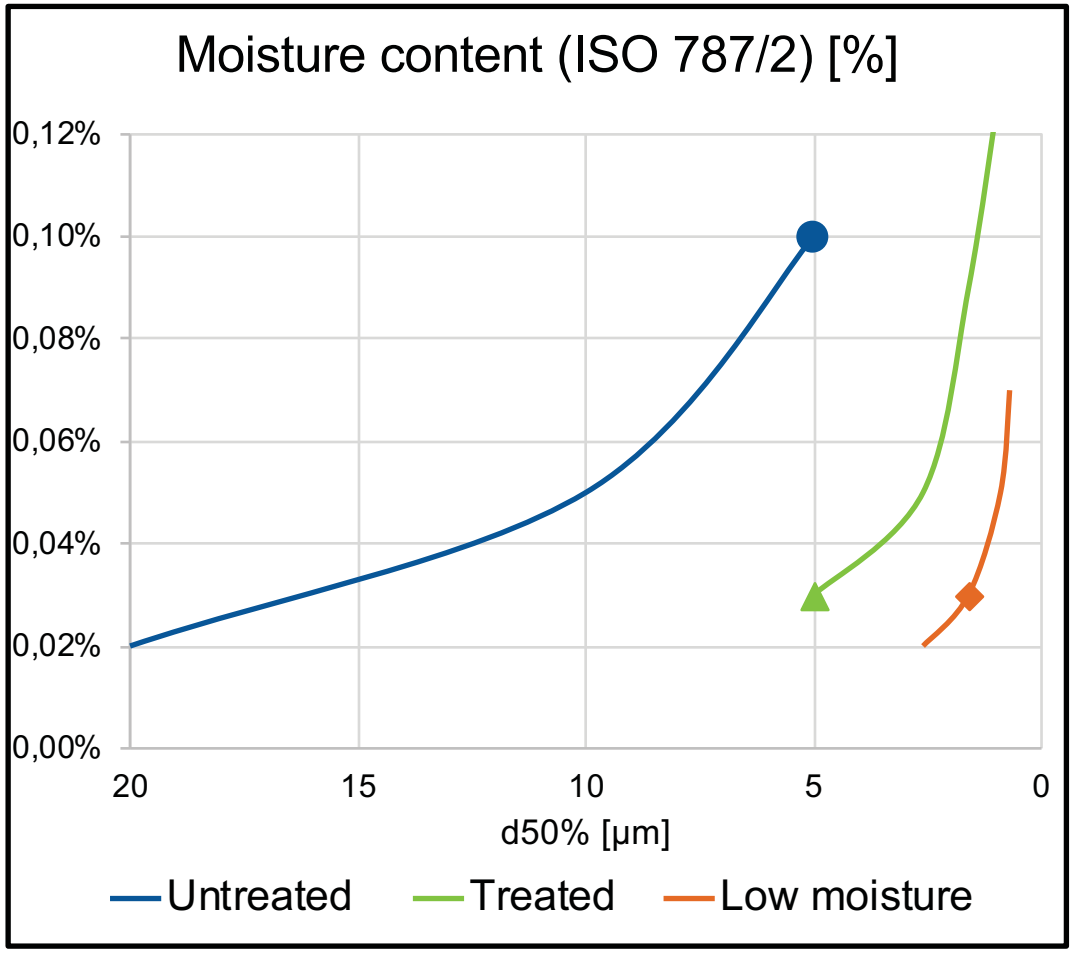
Different types of reinforcements

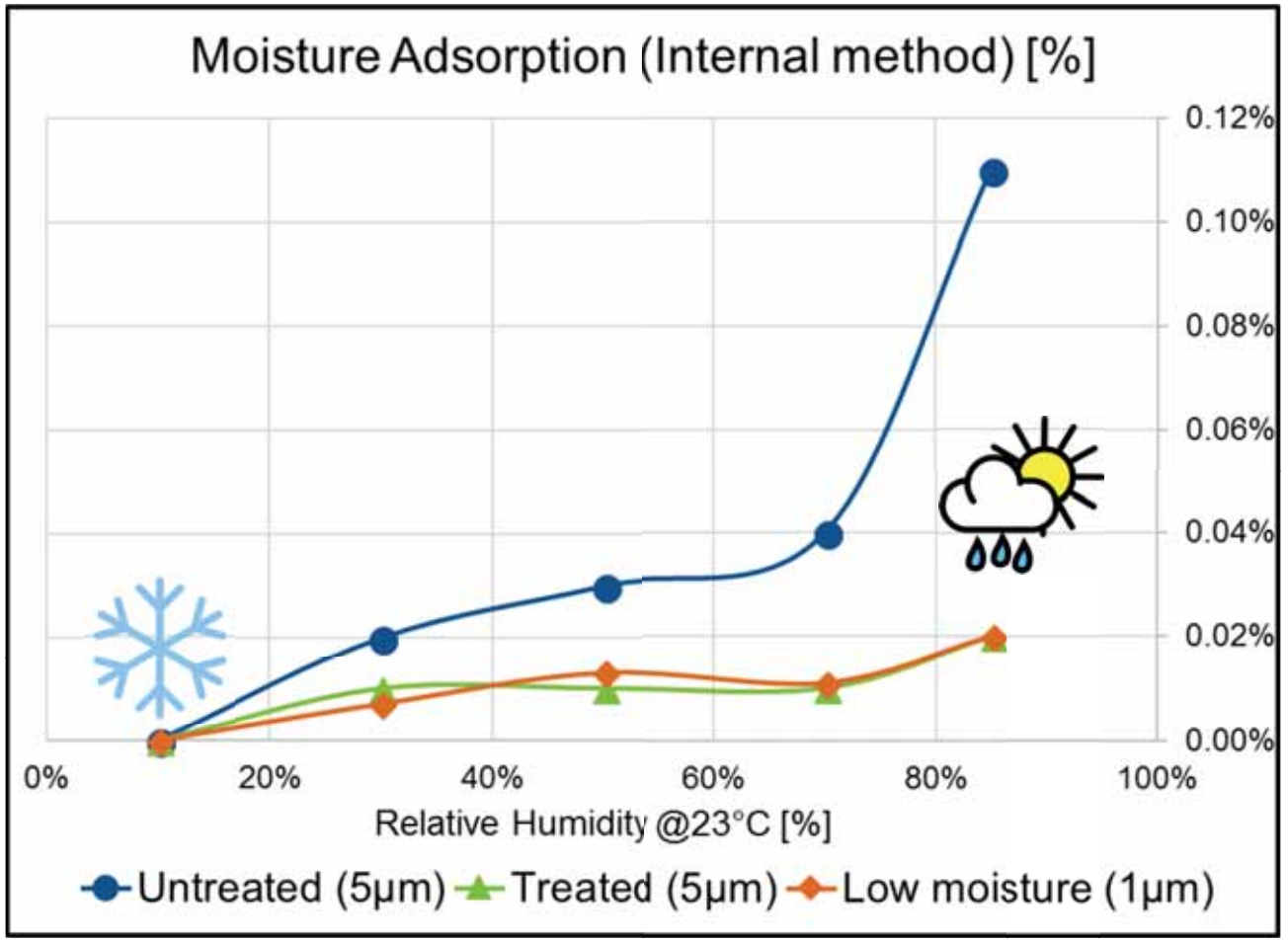


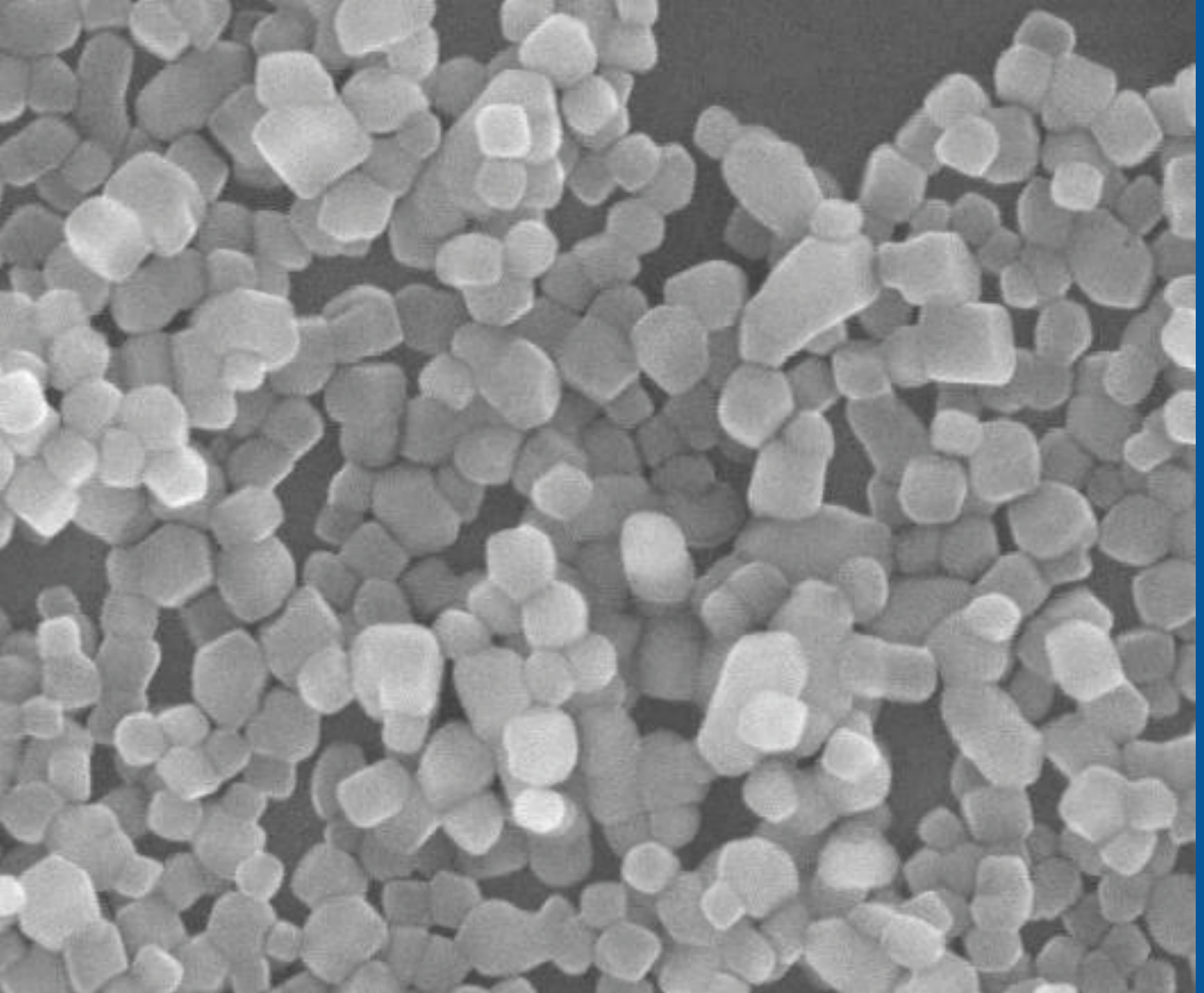
Moisture and Calcium Carbonate

Managing moisture in GCC









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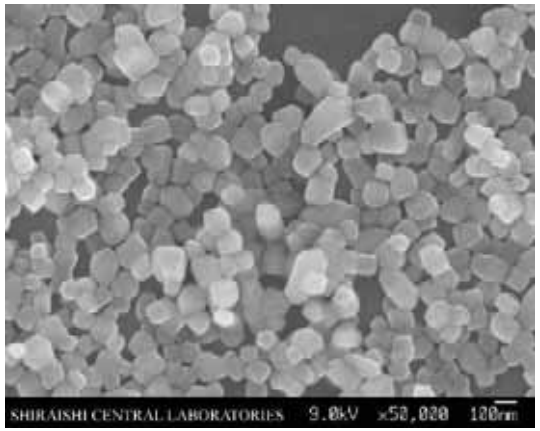
Hakuenka

Rheological modifiers and Reinforcing fillers

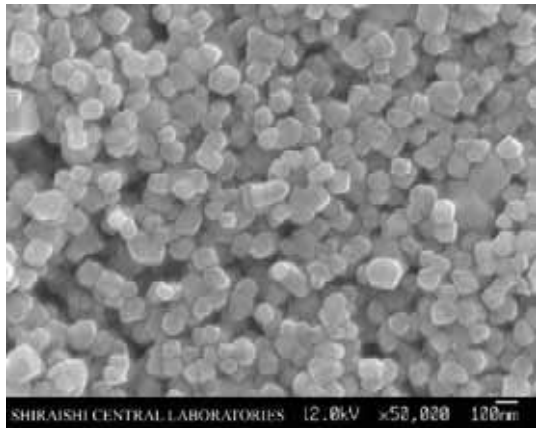
Ultrafine Precipitated Calcium Carbonates

80 nm



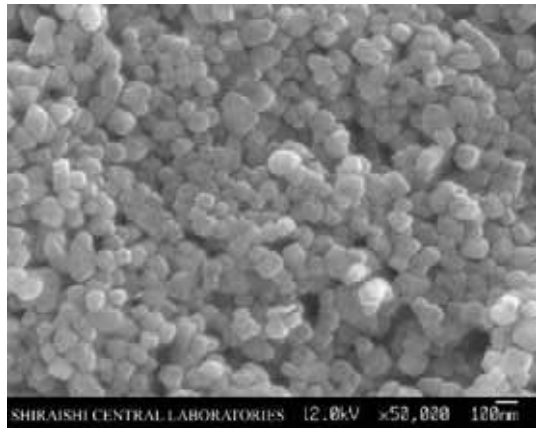
HAKUENKA® CC-R

80 nm



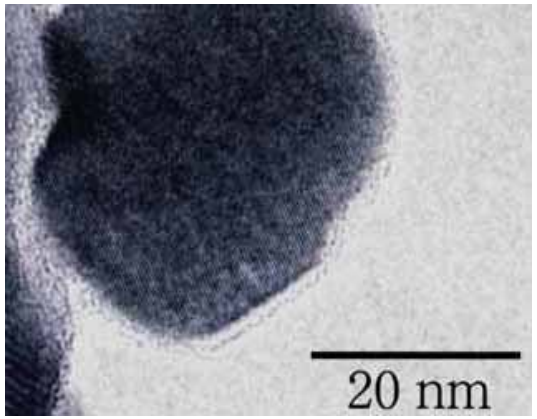
HAKUENKA® CCR-S

70 nm



HAKUENKA® CCR-S10

30 nm



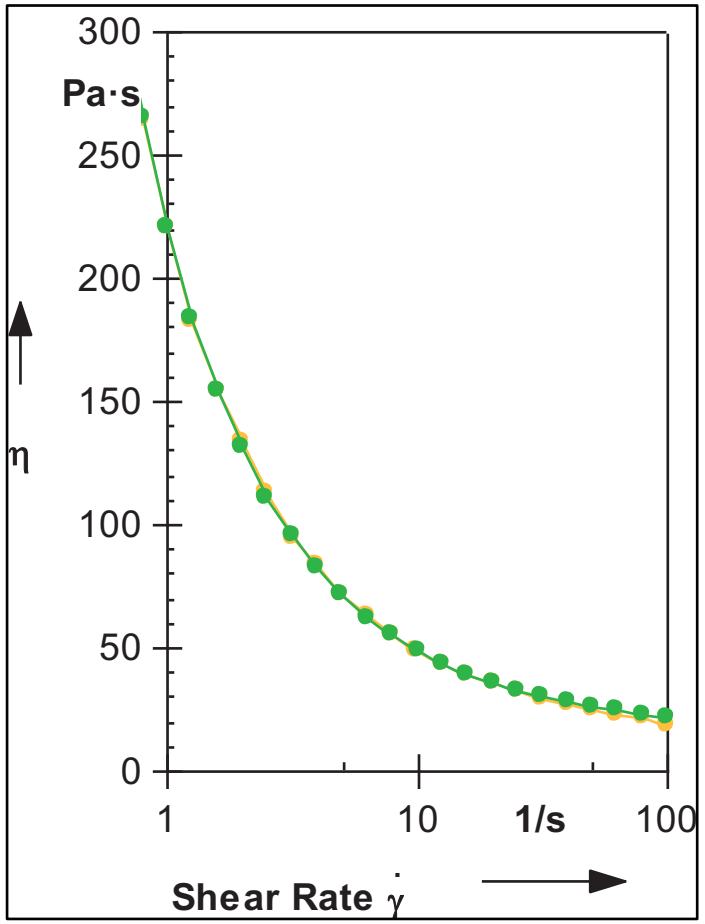
Viscoexcel® 30 - SG

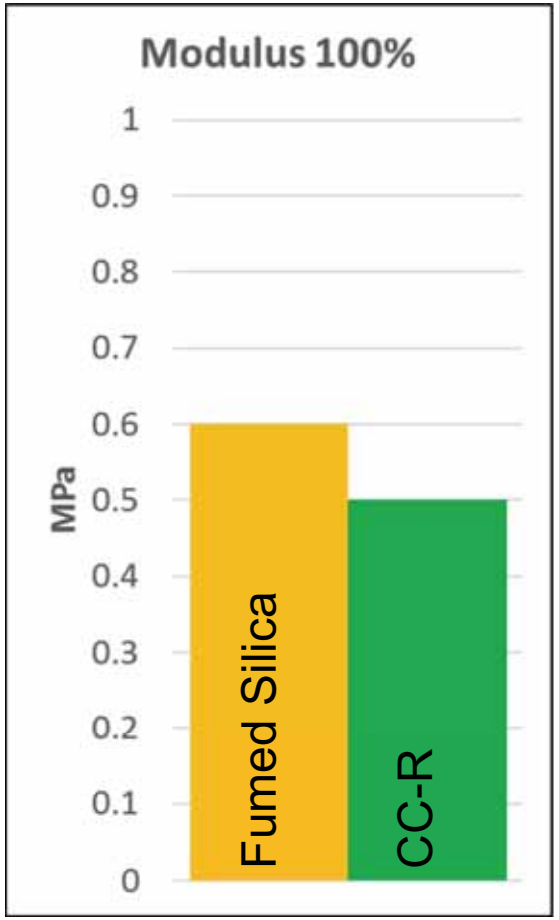
Hakuenka for Sealants

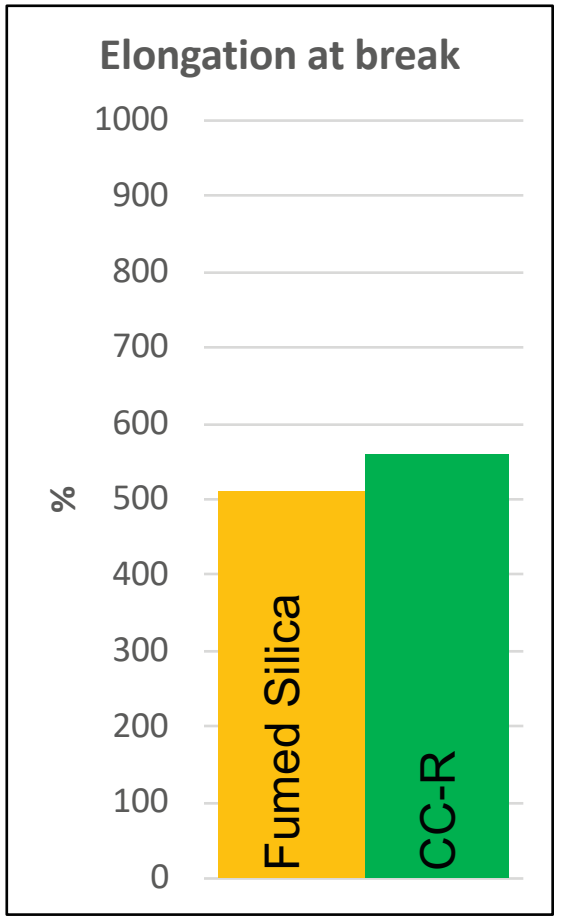
Raw Material	Unit	Reference	Hakuenka CC-R
Kaneka S327	g	258	258
Mesamoll	g	180	180
Omyacarb® 2T	**g**	**465**	**250**
Fumed Silica	**g**	**35**	**-**
Hakuenka CC-R	**g**	**-**	**250**
TiO_2	g	20	20
Dynasylan AMMO	g	9	9
Dynasylan VTMO	g	20	20
UV stabilisers	g	8	8
TIB Kat 223	g	5	5
Total	g	1000	1000

Hakuenka CC-R for Sealants

3.5% Fumed Silica | 25% Hakuenka CC-R







Conclusions

1. Calcium Carbonates for Adhesives and Sealants

   ➔ **Pick the right one for your application**

2. Particle Size distribution of Ground Calcium Carbonate

   ➔ **Fine and Ultrafine GCC as rheological and mechanical functional fillers**

3. Managing moisture in Ground Calcium Carbonate

   ➔ **Look beyond the content and consider production conditions**

4. Ultrafine Precipitated Calcium Carbonate

   ➔ **As a true rheological modifiers**

to you for your time and attention

…to the Omya people who contributed to this work

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Thanks

MINERAL COMPETENCE SINCE 1884