

Organomodified Siloxanes (OMS) –

Performance Additives for Scratch Resistance

Compounds | Interface & Performance



Durable Scratch Resistance – e.g. in Cars

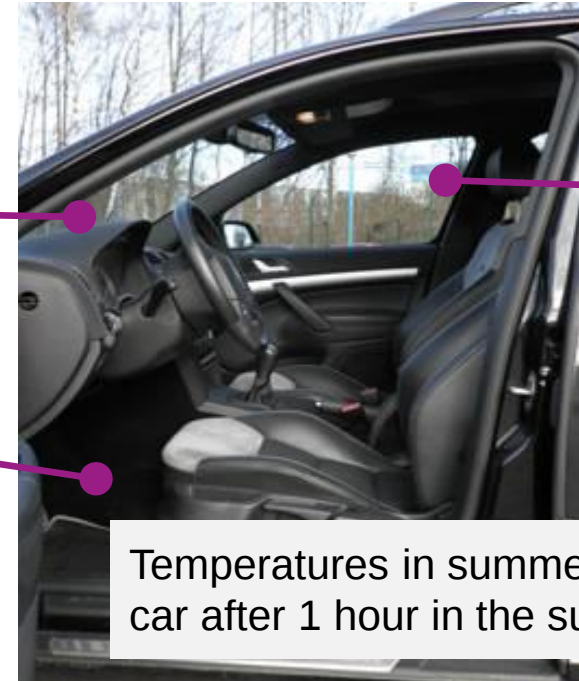
Ageing is crucial to evaluate additives for car interior applications

An unscratched interior after extensive use gives a higher value brand recognition especially with **rental cars or taxis**

Dashboard:
up to 80 °C

Foot space:
up to 60 °C

Head room:
up to 70 °C



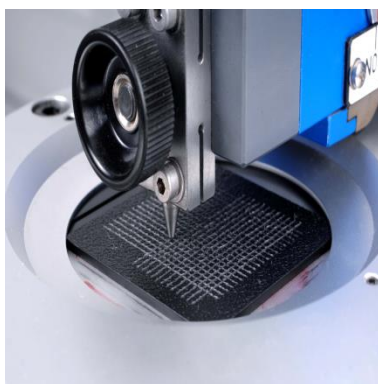
Temperatures in summer in a (closed) car after 1 hour in the sun

To simulate the conditions in a car we do the following testing:

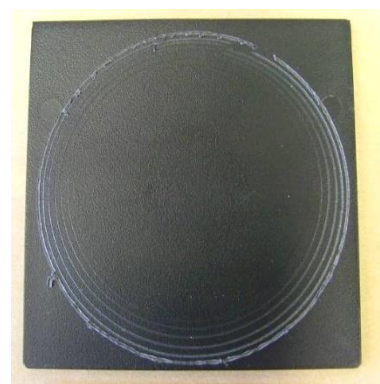
- Scratch resistance test of sample with additives direct after molding
- Same test with sample that was aged for 7 days at 80 °C or QUV test

Scratch Methods available at EVONIK for Scratch Evaluation

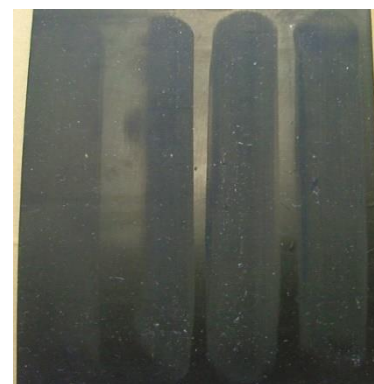
Erichsen
Scratch
Tester 430 P



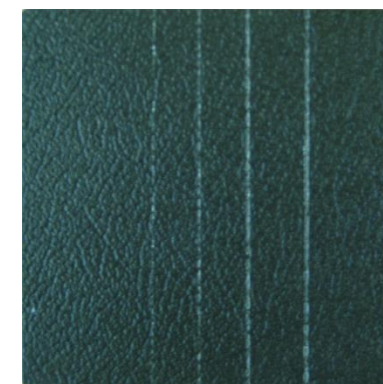
Erichsen
Abraser
Model 413



Crockmaster
Crockmeter
CM-5



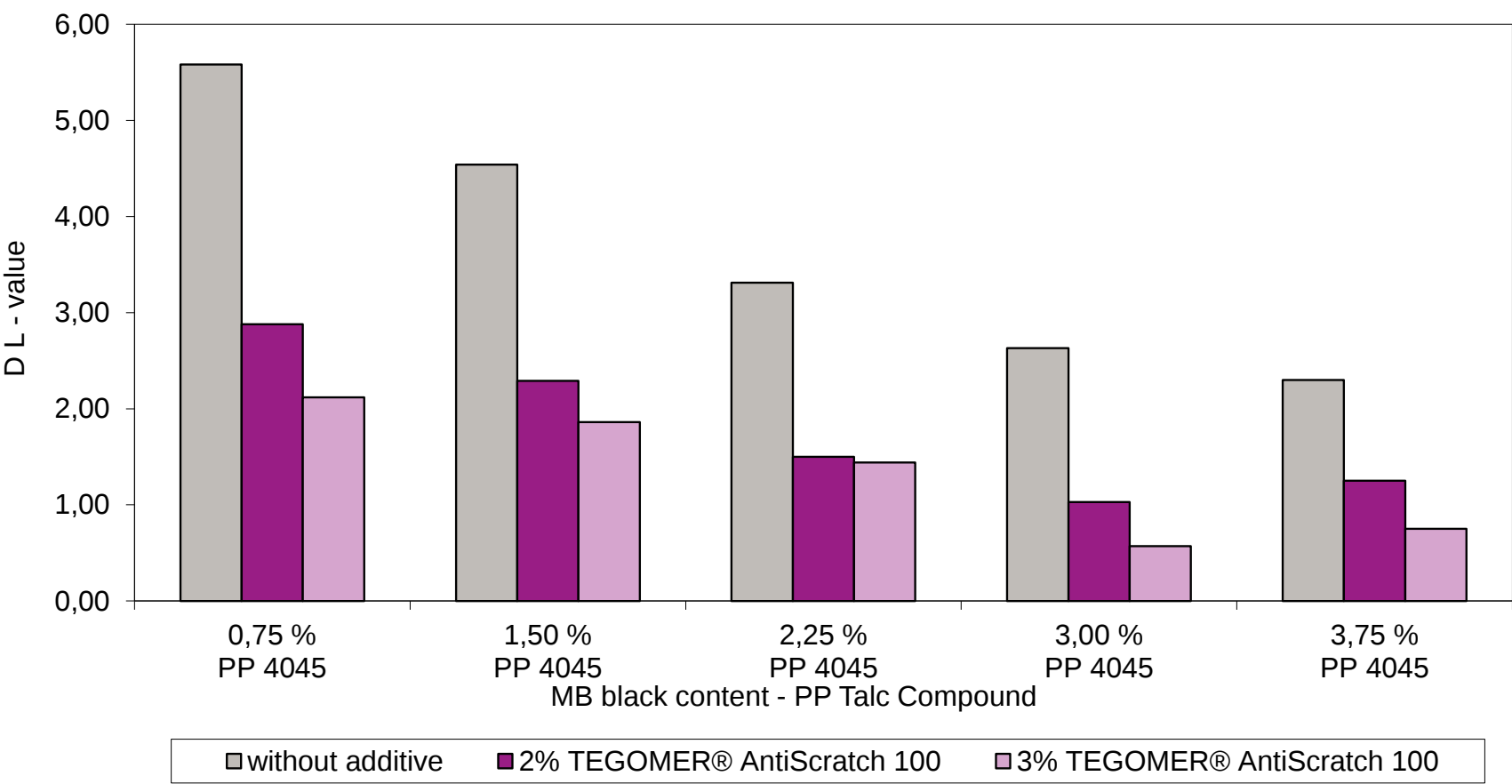
Multifinger
Scratch/Mar
Model 710



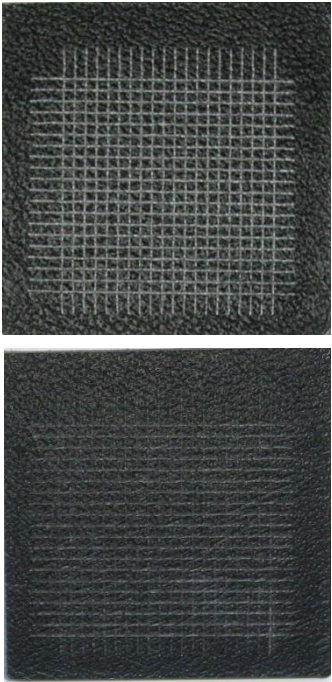
Improvement of AntiScratch

TEGOMER® AntiScratch 100 in TPO/talc

Influence of **OMS** and **CB** content on Scratch Resistance



No additive

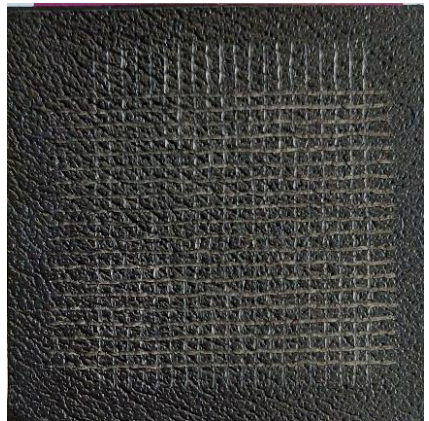


+ 3 % TAS 100

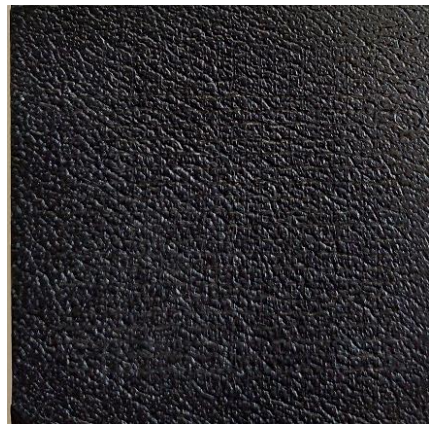
Grained surface K09

Improved Scratch Resistance with TEGOMER® AntiScratch 100

PP/TPO with 20% talc



without Additive



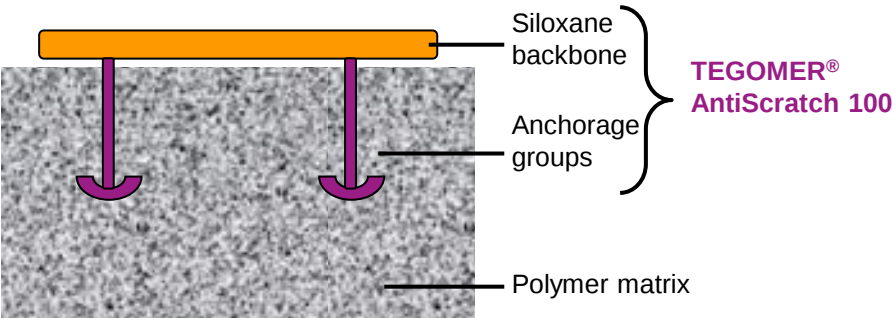
+ 3% TEGOMER®
AntiScratch 100



According
GM 10640
10N Force

Outstanding Properties in Performance with TEGOMER® AntiScratch 100

	AntiScratch 100	Amides	Silicone oil Masterbatch	MAA grafted Polyolefine
Scratch 1d / RT	++	++	++	(+)
Scratch 7d / 70°C	++	0	(+)	(+)
Migration	No	Yes	Yes	partly
Odor	No	Yes	No	partly
Notched Impact	+	0	0	0
Coloration	+	+	0 or -	+
Use in moulding operation	++	0	-	0 or -
Addition in %	2-4	0.5.-2.0	2-4	>3



The anchorage groups of TEGOMER® AntiScratch 100 ensure a permanent and long lasting antiscratch effect.

Additive with Long Lasting Effect – No Tackiness after UV Irradiation

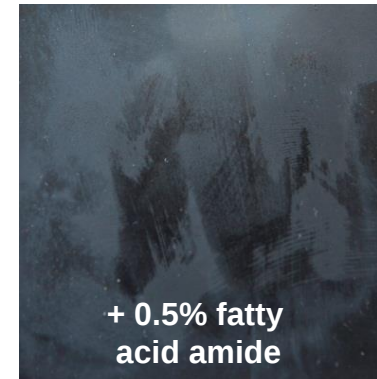
The PV 1306 test method of VW/Germany is used to analyze interior automotive parts based on PP and PP/Talc compounds regarding their tackiness and migration after UV irradiation (5 x 96 h).



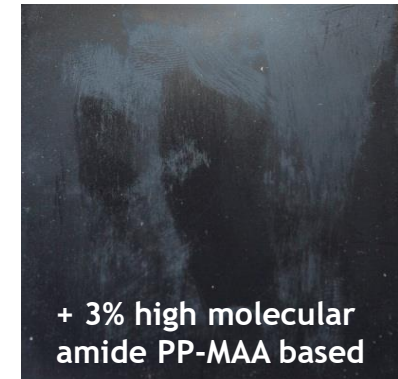
without Additive



+ 3% TEGOMER®
AntiScratch 100



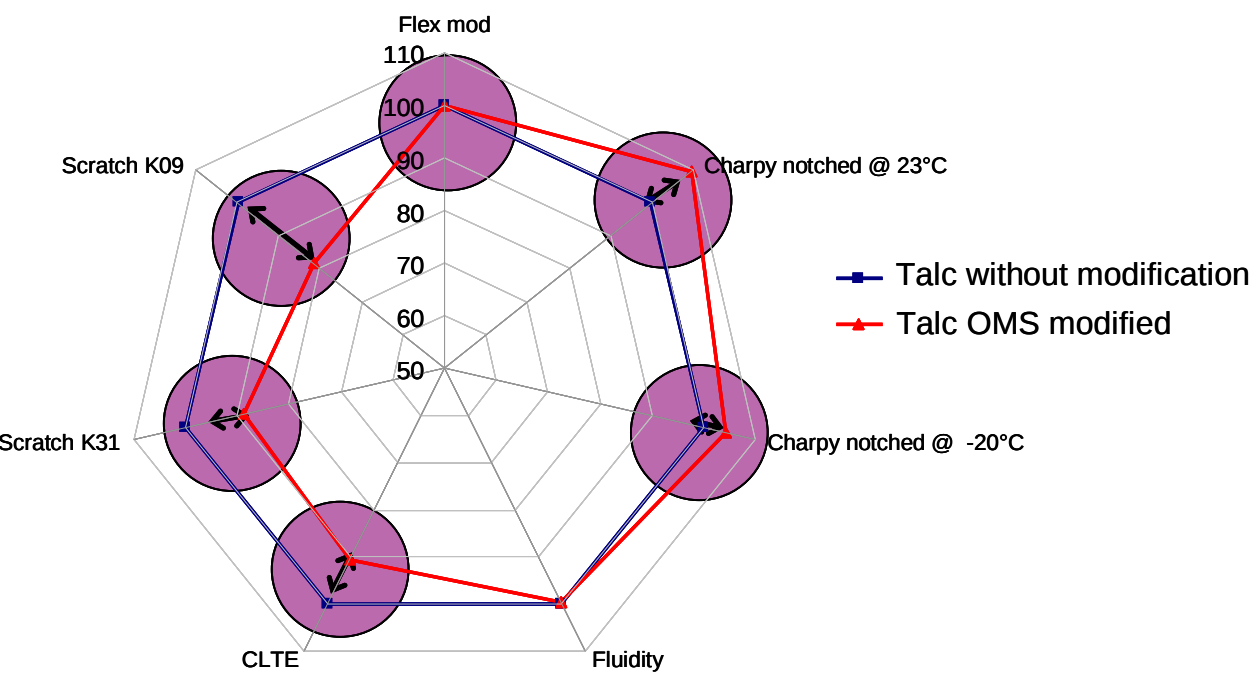
+ 0.5% fatty
acid amide



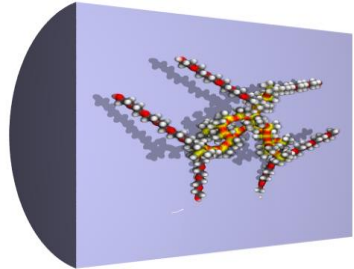
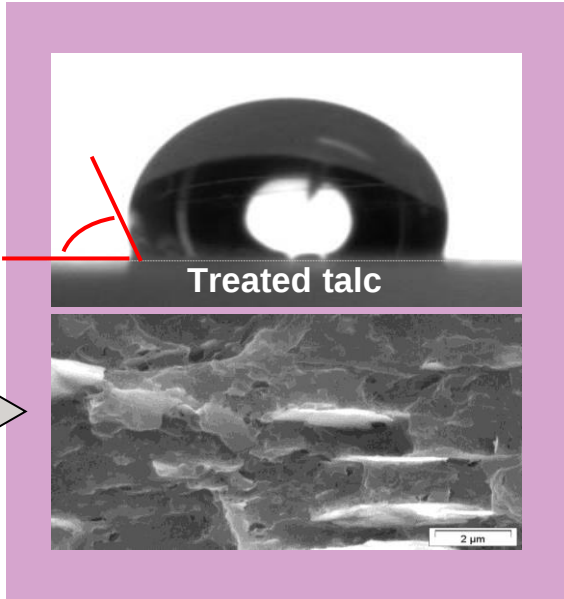
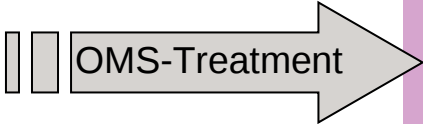
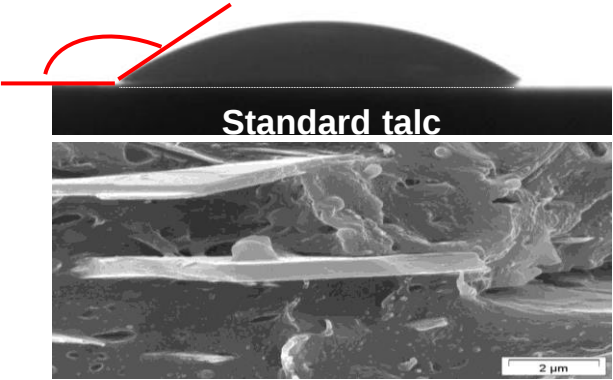
+ 3% high molecular
amide PP-MAA based

TEGOMER® AntiScratch 100 does not show any migration and tackiness in the PV 1306 test. It stays in the bulk phase of plastics compounds and provides a long-lasting scratch resistance.

Benefits of using Treated Talc in TPO Applications



- Improved
- Scratch Resistance
 - Mechanical properties
 - Surface Hydrophobicity



*CLTE = coefficient of linear thermal expansion

Unfilled black PP – Hoover application

- **Unfilled black PP** with **high gloss** is used for a certain part of a Hoover
- PP is cheaper than ABS which is usually the preferred polymer for a number of appliances such as coffee machines, toasters or hoovers where gloss is an issue



Using **2-3 % TEGOMER® AntiScratch 100** guarantees glossy, non-scratched surfaces

CaCO₃ Filled PP Arm Rest of Chairs

- Furniture such as parts of office chairs are just one example where **filled PP** is used
- scratches appear especially if **grained higher value surfaces** are used
- Those parts are made from **CaCO₃ or talc filled PP** where white scratches appear and make it look old even after short period of use

2 % TEGOMER® AntiScratch 100 gives a long-lasting scratch resistance



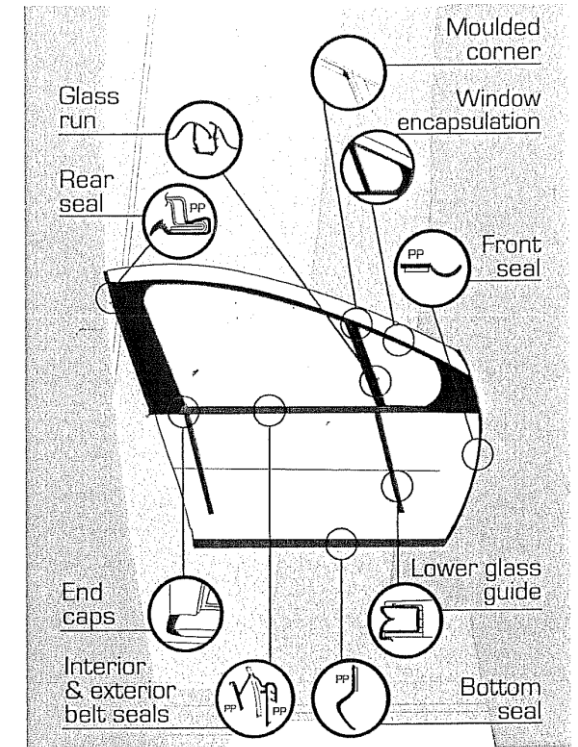
SEBS based Glassing Application

- SEBS is used as a price competitive TPE material in a number of application, e.g. automotive
- SEBS has **very good haptic properties** and is much less expensive than TPU and TPE-E, even than TPE-V
- Automotive frames are just one application where **scratch resistance in combination with good slip** is required

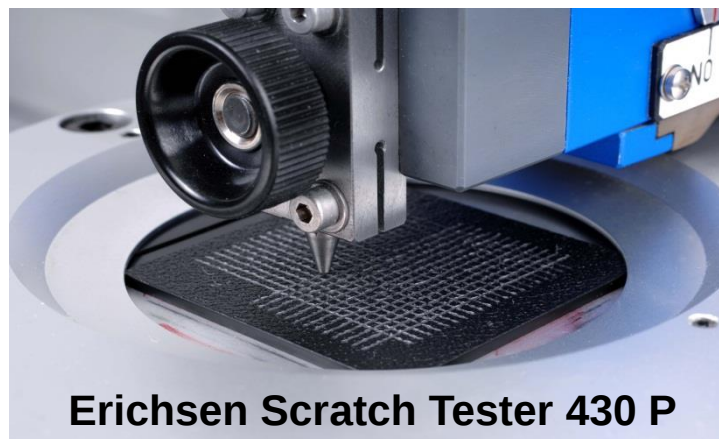
OMS additives used are

- **TEGOMER® AntiScratch L**
- **TEGOMER® M-Si 2650**
- **TEGOMER® H-Si 6441 P**

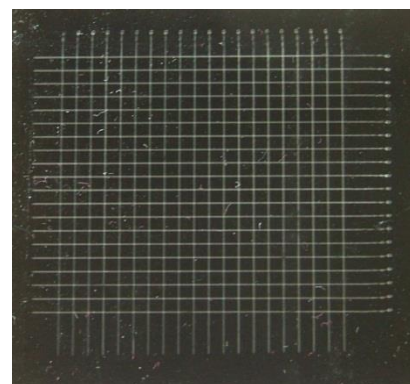
depending on the overall formulation



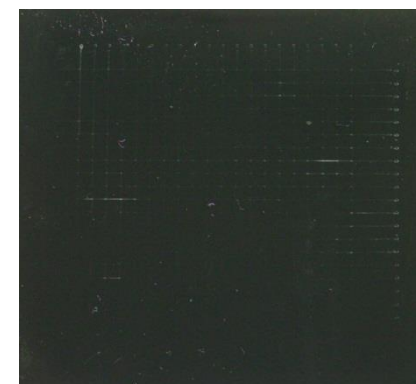
PA and PA/GF Compounds - TEGOMER® H-Si 6441 P



30 N Force
PA, PA/GF



without Additive



with 2% OMS



without Additive



with 2% OMS

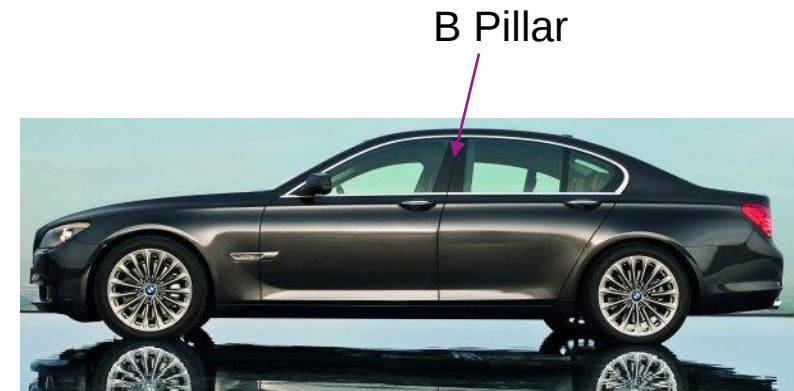
1000 stokes for PA
9 N Force



Crockmaster
Model CM-5

PMMA – Automotive B Pillar

- B pillars of cars are either made from coated metal or PC or can be created as **black PMMA** which has a suitable durability and high gloss but should be improved regarding scratch appearance
- **2-3 % TEGOMER® H-Si 6441 P** can be applied in PMMA without reducing even high jetness black appearance and it is improving **scratch and mar resistance** significantly
- Further Applications:
 - Automotive interiors
 - Electronics (**PMMA, PC/ABS or PMMA/ABS**)
no additional coating / transparent top layer necessary

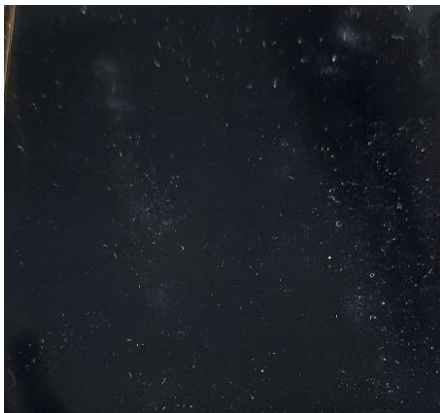


Improved Scratch Resistance with OMS Additives in Different Polymers

PMMA



without Additive



+ 3% TEGOMER®
H-Si 6441



Multi Finger Test
2,3,5,7,10 N

Recommendation of OMS additives for enhanced scratch resistance

	TEGOMER® AntiScratch 100	TEGOMER® AntiScratch L	TEGOMER® H-Si 6441 P	TEGOMER® M-Si 2650	TEGOMER® 6264
PP/Talc	++	+	+		
PP/TPO/Talc	++	+	+		
TPE/TPE-V/SEBS	+		+	++	++
TPU			++		
PA		+	++		
PA/GF		+	++		
PMMA/ABS			++	+	
PC/ABS			++	++	



Summary – Organomodified Siloxanes for Scratch Resistance

- OMS give scratch and abrasion resistance
 - No negative side effects such as malodor, fogging, tackiness
-
- | | | |
|-----------------------------------|----------|----------------------------|
| ▪ TEGOMER® Antiscratch 100 | (solid) | PP, PP/TPO |
| ▪ TEGOMER® Antiscratch L | (liquid) | PC, TPE |
| ▪ TEGOMER® H-Si 6441 P | (solid) | PA, PC, PMMA, PS, PET, TPE |
| ▪ TEGOMER® M-Si 2650 | (liquid) | PA, PC, PMMA, PS, PET, TPE |
| ▪ TEGOPREN® 6846 | (solid) | PS, PMMA |

Evonik supports customers with evaluation of scratch and abrasion resistance

Details about the formulation help us (kind and amount of filler, pigment, polymer,...)





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Leading Beyond Chemistry