

# Non-black fillers in CR

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# Non-black Fillers in CR

### **Test Compound**

CR, mercaptan type, medium tendency to crystallize, ML (1+4) 100 °C 48¹	100
Stearic acid	1
Filler	100/50/35
Diethylene glycol (DEG), see below	2
Adipate plasticizer <sup>2</sup>	10
Magnesium oxide <sup>3</sup>	4
Zinc oxide <sup>4</sup>	5
Ethylene thiourea, 80 %	1.2

Regarding precipitated silica and the different types of precipitated silicate additional compounds with 2 phr DEG were examined.

Curing was carried out in a press at 180 °C. The curing time was  $t_{90}$  + 10 %.

<u>Please mind!</u> The following figures show trend analysis, which only can be the basis for specific problem solvings.

Filler: Precipitated Silica Precipitated Silicates Carbon Black All others	Loading: 35 phr 50 phr 50 phr 100 phr
Open mill Batch Temperature Time of mixing	150 x 300 mm 400 cm³ 50 °C 20 to 25 min
Extruder  Temperature of barrel Temperature of head	d = 30 mm L/D = 15 70 °C 110 °C

#### Applied in this test compound:

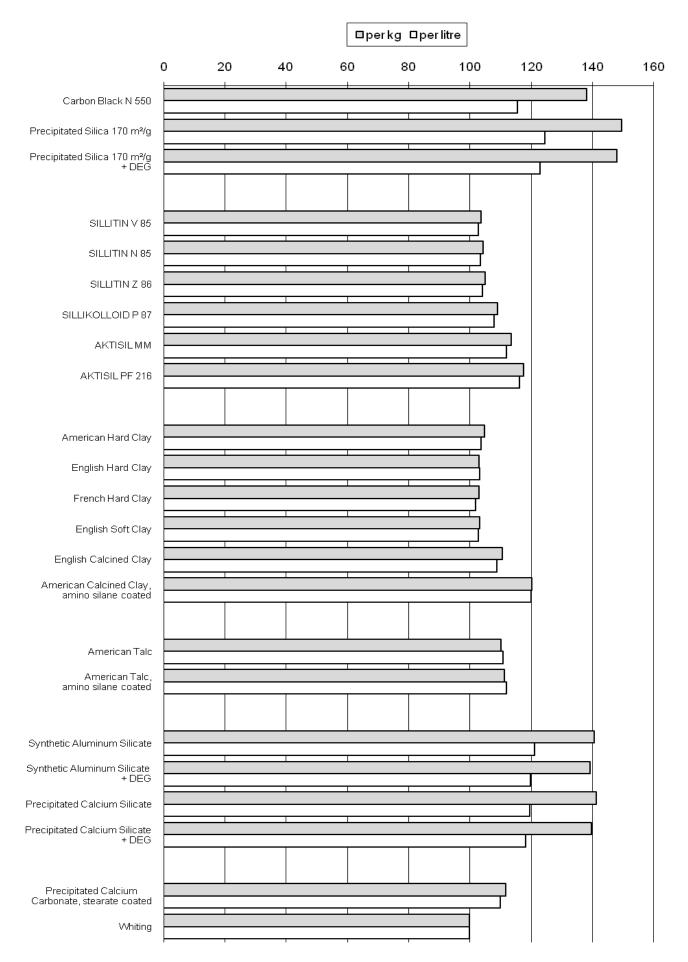
- (1) Baypren 210<sup>®</sup>, Bayer
- (2) Mediaplast NB-4, Kettlitz
- (3) Maglite DE®, Marine Magnesium Company/C.P. Hall Company
- (4) Zinkoxyd aktiv<sup>®</sup>, Bayer

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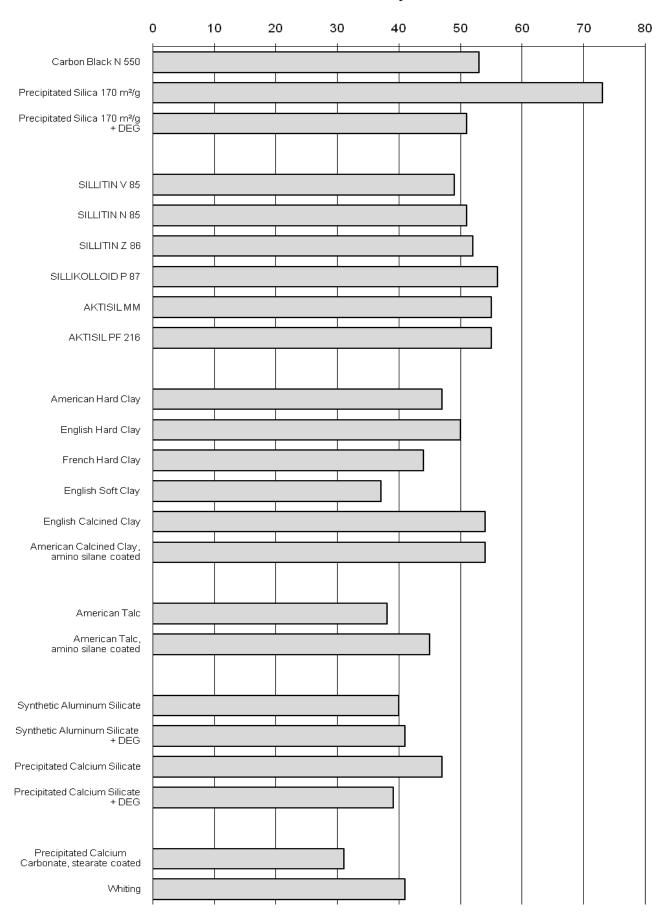
Our technical service suggestions and the information contained in this report are based on experience and are made to the best of our knowledge and belief, but must nevertheless be regarded as non-binding advice subject to no guarantee. Working and employment conditions over which we have no control exclude any damage claims arising from the use of our data and recommendations. Furthermore, we cannot assume any responsibility for any patent infringements which might result from the use of our information.

# INDEX OF COMPOUND COSTS Base: Whiting = 100 (Germany, 1993)



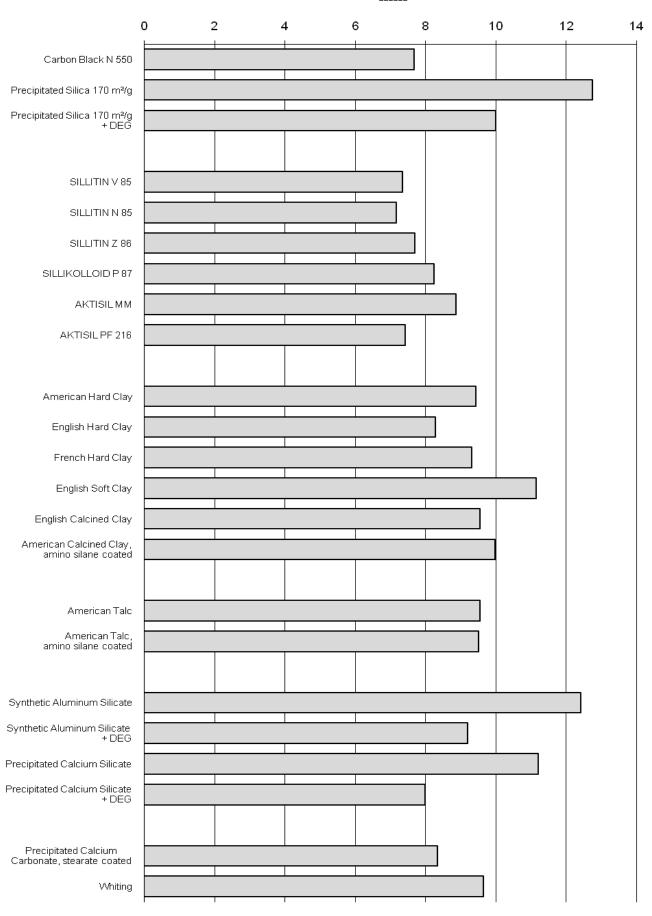
# MOONEY VISCOSITY ML (1+4) at 120 °C, DIN 53 523, Part 3

#### Mooney units



# MOONEY SCORCH t<sub>5</sub> (ML) at 120 °C, DIN 53 523 Part 4

#### min

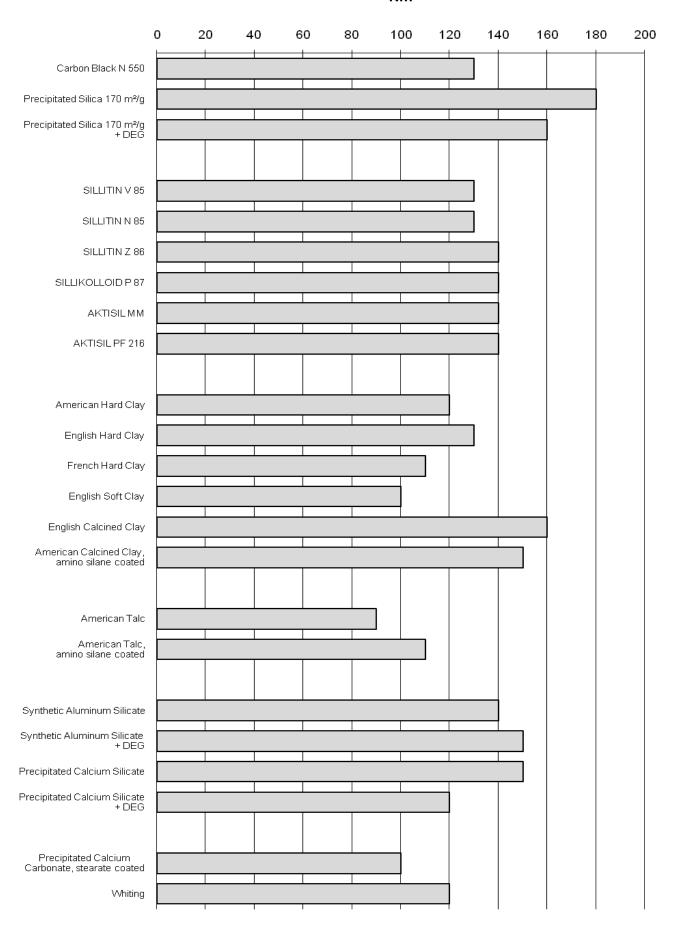


# EXTRUDABILITY based on ASTM D 2230-90 Method A, Evaluation of Garvey-Profile at 1 m/min Speed

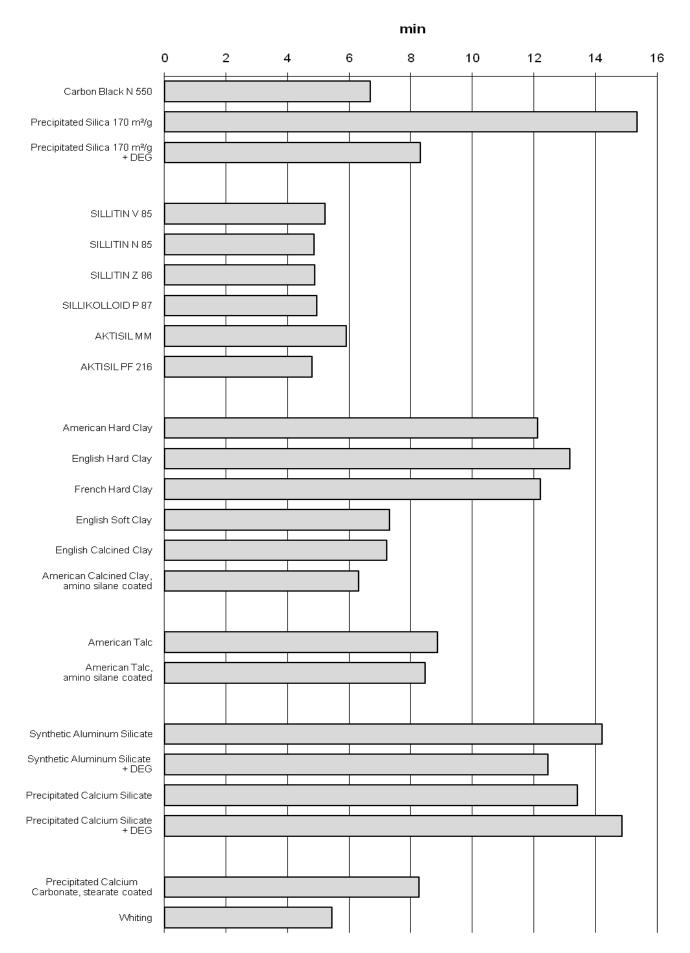
	swelling	edge of 30°	surface	corners
	0 1 2 3 4		1 2 3 4	
Carbon Black N 550	0	1 2 3 4	· 	1 2 3 4
Precipitated Silica 170 m²/g				
Precipitated Silica 170 m²/g + DEG				
SILLITIN V 85				
SILLITIN N 85				
SILLITIN Z 86				
SILLIKOLLOID P 87				
AKTISILMM				
AKTISIL PF 216				
A manufactural Class				
American Hard Clay				
English Hard Clay				
French Hard Clay				
English Soft Clay				
English Calcined Clay				
American Calcined Clay, amino silane coated				
American Talc				
American Talc, amino silane coated				
arriirio silarie coateu				
Synthetic Aluminum Silicate				
Synthetic Aluminum Silicate + DEG				
Precipitated Calcium Silicate				
Precipitated Calcium Silicate + DEG				
Precipitated Calcium Carbonate, stearate coated				
Whiting				

# TORQUE OF EXTRUDER 1m/min Speed

#### Nm

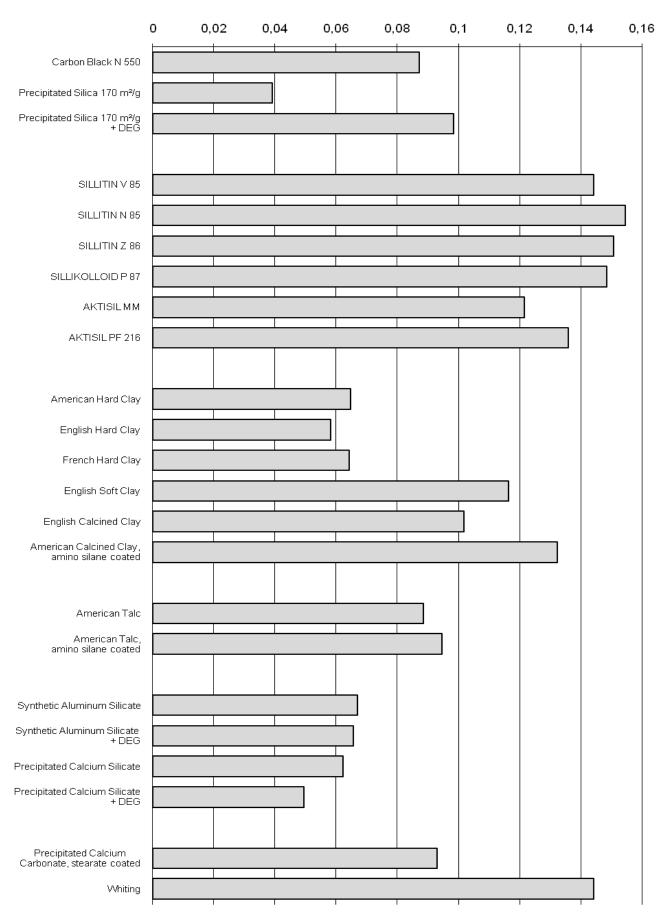


# Rotorless Cure Meter, Göttfert Elastograph t<sub>90</sub> at 180 °C DIN 53 529-A3

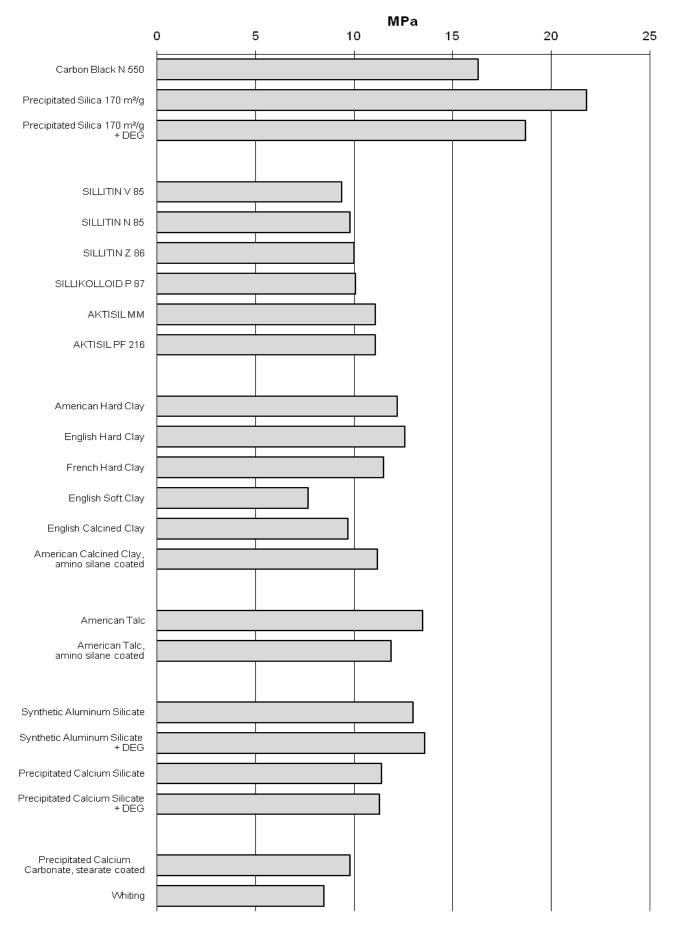


# Rotorless Cure Meter, Göttfert Elastograph ratio $t_5/t_{90}$

#### nondimensional



## TENSILE STRENGTH DIN 53 504-S2



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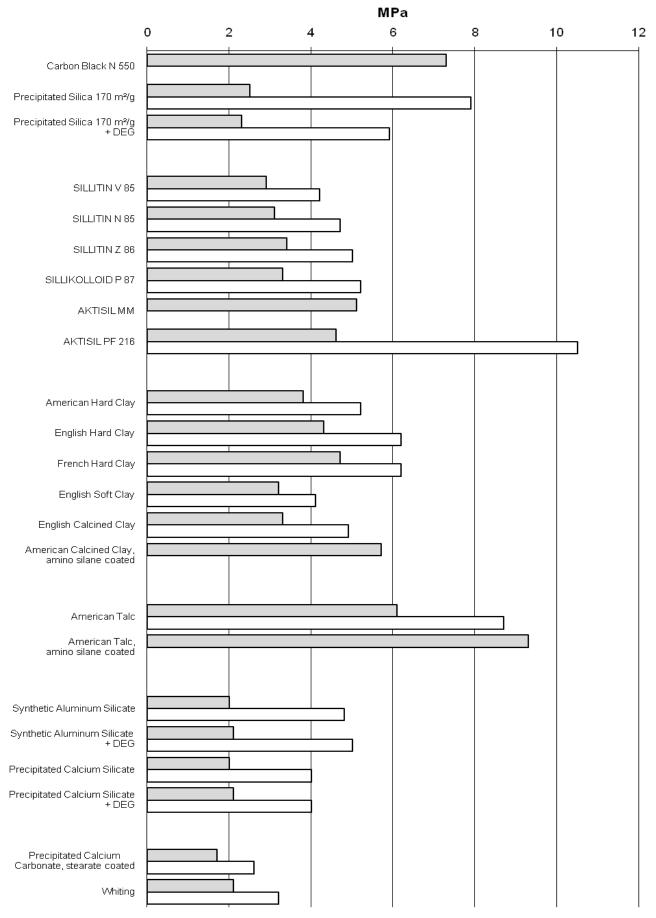
## ELONGATION AT BREAK DIN 53 504-S2

% 0 100 200 300 400 500 600 700 Carbon Black N 550 Precipitated Silica 170 m²/g Precipitated Silica 170 m²/g + DEG SILLITIN V 85 SILLITIN N 85 SILLITIN Z 86 SILLIKOLLOID P87 AKTISILMM AKTISIL PF 216 American Hard Clay English Hard Clay French Hard Clay English Soft Clay English Calcined Clay American Calcined Clay, amino silane coated American Talc American Talc, amino silane coated Synthetic Aluminum Silicate Synthetic Aluminum Silicate + DEG Precipitated Calcium Silicate Precipitated Calcium Silicate + DEG Precipitated Calcium Carbonate, stearate coated

Whiting

### MODULUS DIN 53 504-S2

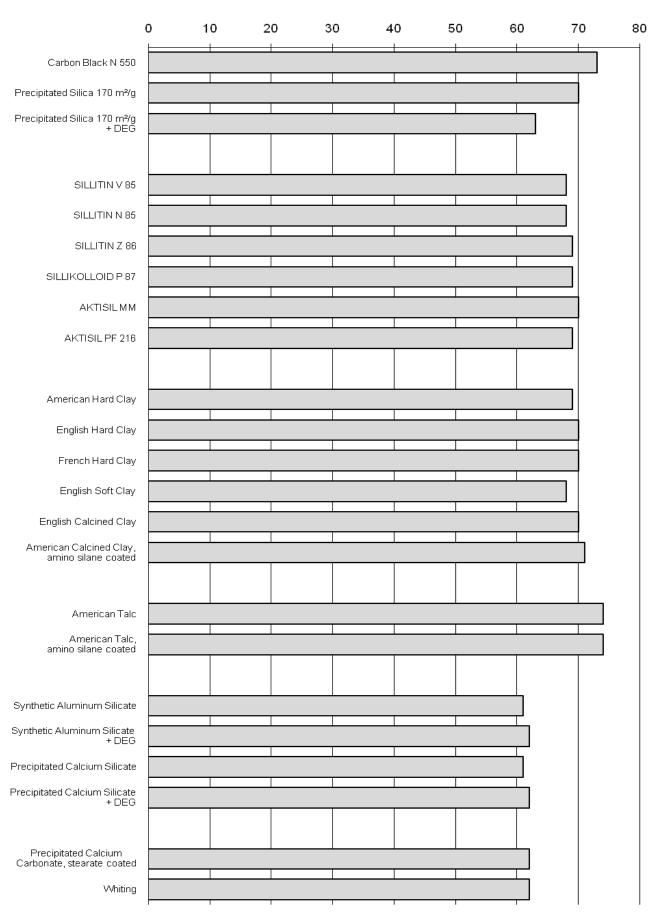
■Modulus 100 % ■Modulus 300 %



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## HARDNESS DIN 53 505-A

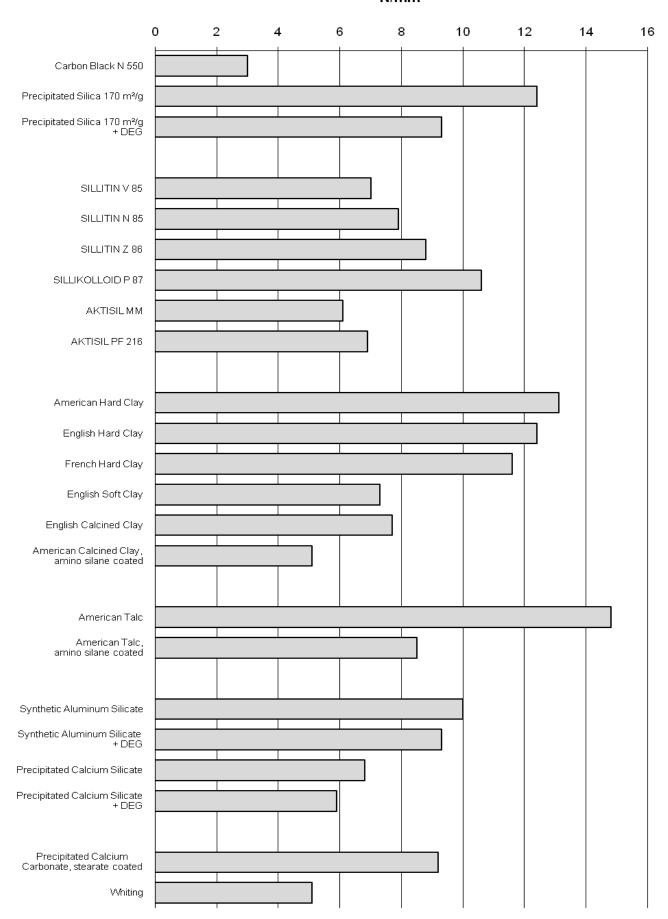
#### Shore A



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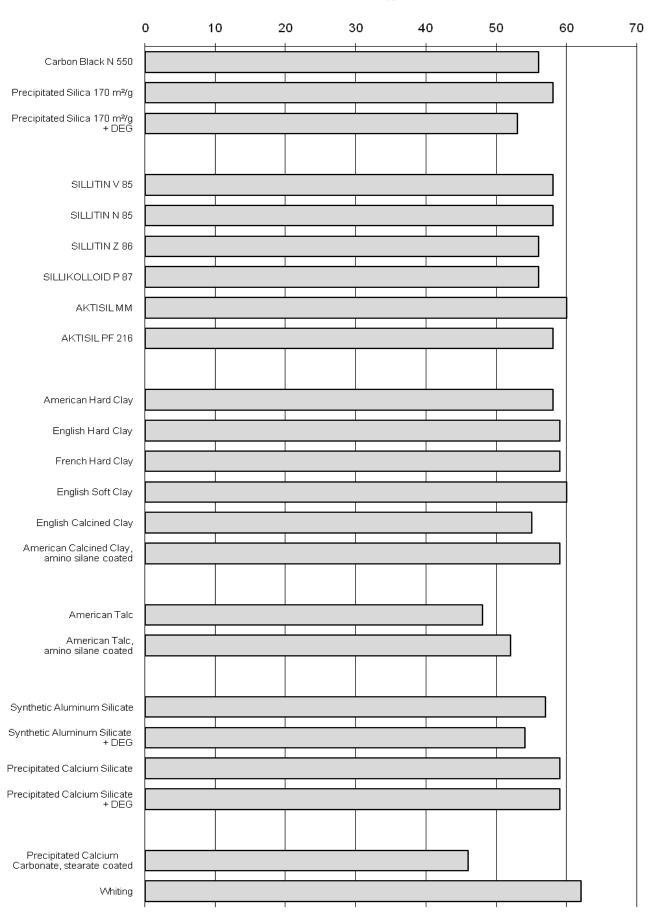
# TEAR RESISTANCE DIN 53 507-A, 500 mm/min

#### N/mm



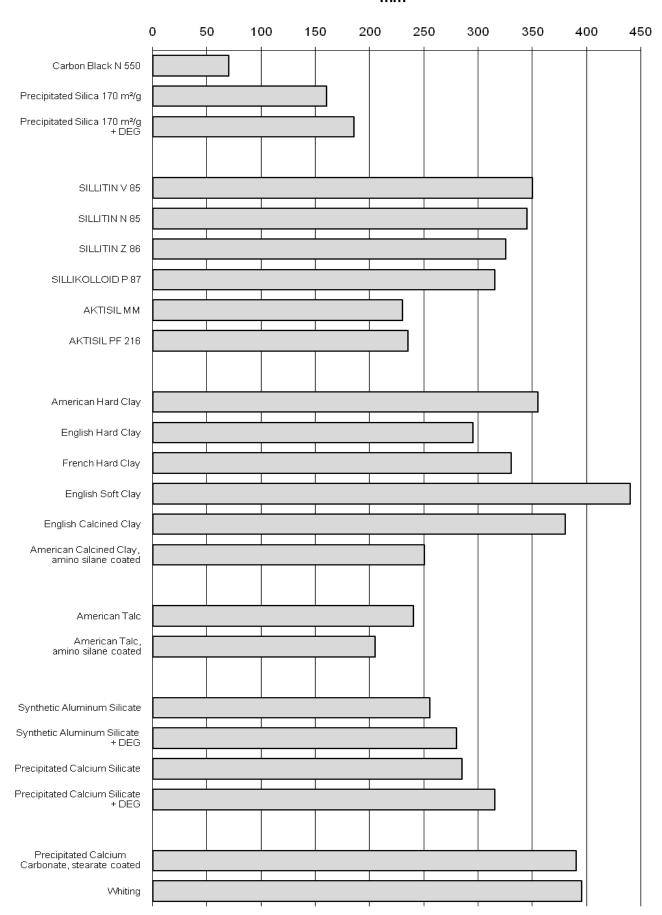
## REBOUND ELASTICITY DIN 53 512

%



## ABRASION DIN 53 516

#### mm³



# COMPRESSION SET DIN 53 517-I

□24 h/70 °C □72 h/70 °C □24 h/100 °C

% 0 5 10 15 20 25 30 35 45 50 40 Carbon Black N 550 Precipitated Silica 170 m²/g Precipitated Silica 170 m²/g + DEG SILLITIN V 85 SILLITIN N 85 SILLITIN Z 86 SILLIKOLLOID P 87 AKTISILMM AKTISIL PF 216 American Hard Clay English Hard Clay French Hard Clay English Soft Clay English Calcined Clay American Calcined Clay, amino silane coated American Talc American Talc, amino silane coated Synthetic Aluminum Silicate Synthetic Aluminum Silicate + DEG Precipitated Calcium Silicate Precipitated Calcium Silicate + DEG Precipitated Calcium Carbonate, stearate coated Whiting

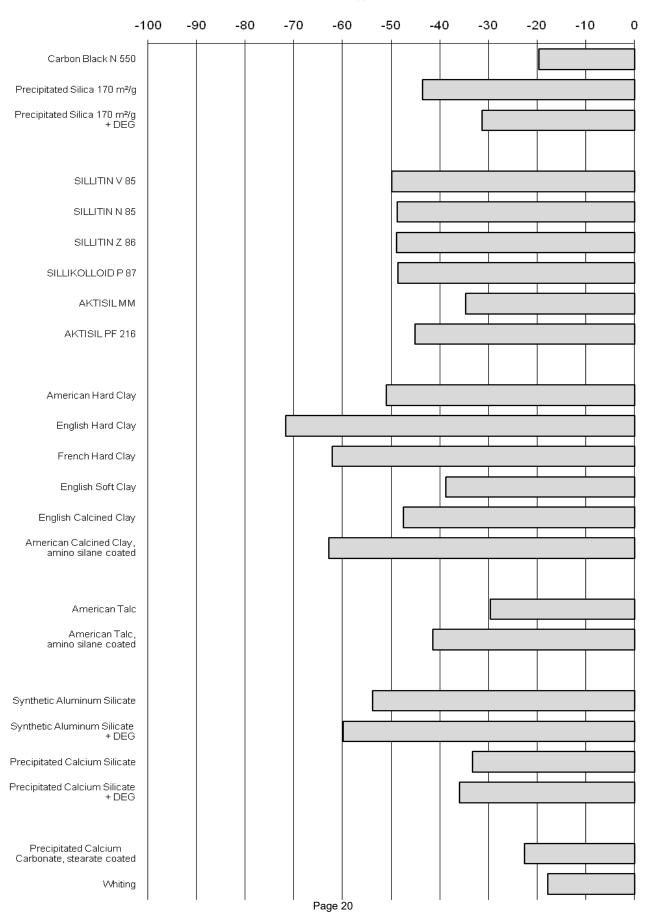
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# AIR AGEING, 7 d/100 °C DIN 53 508, 5.3 Change of Tensile Strength



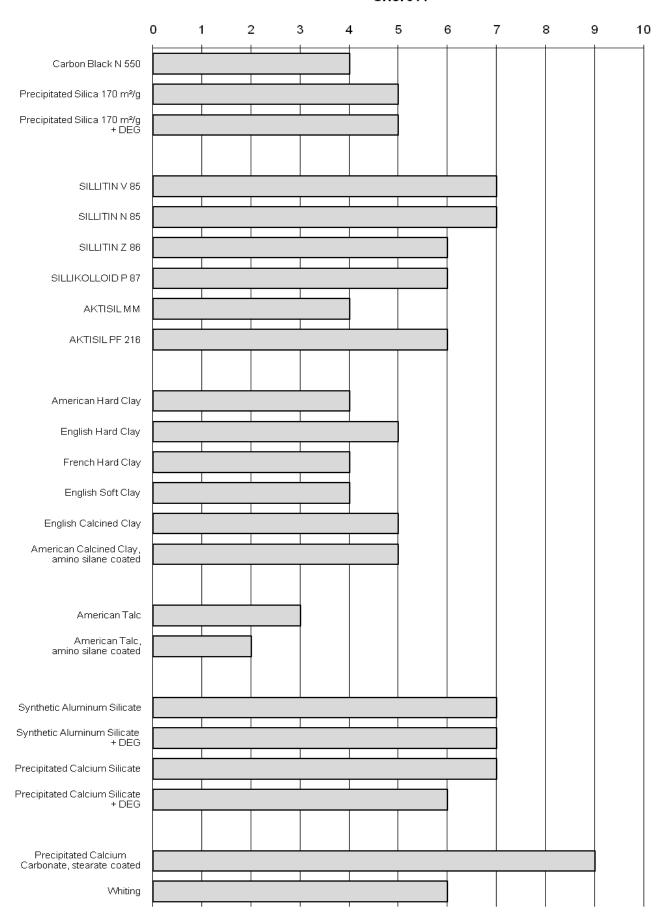
# AIR AGEING, 7 d/100 °C DIN 53 508, 5.3 Change of Elongation at Break

#### % relative

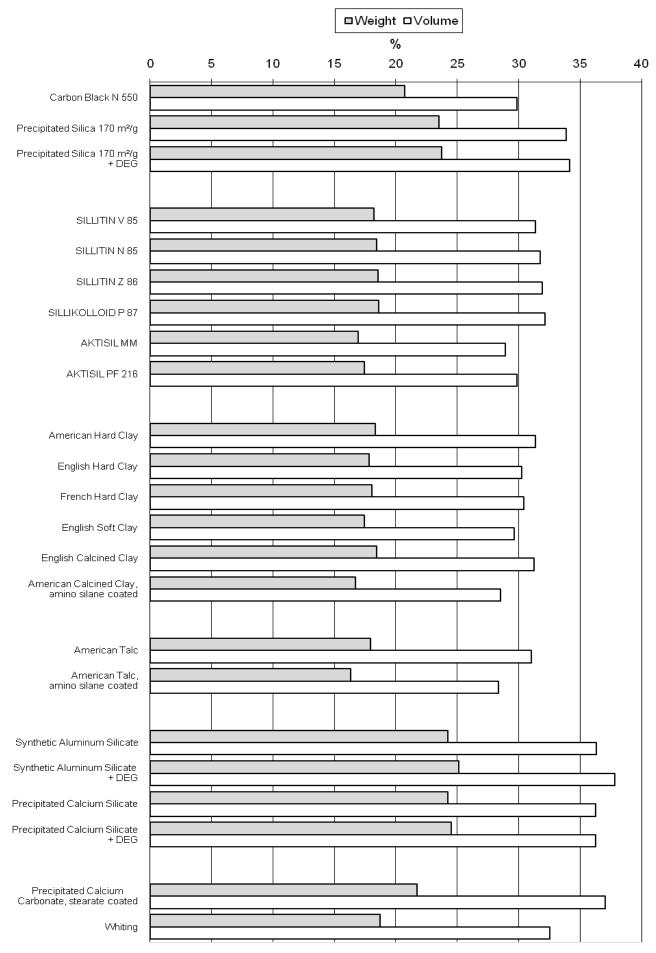


# AIR AGEING, 7 d/100 °C DIN 53 508, 5.3 Change of Hardness

#### Shore A

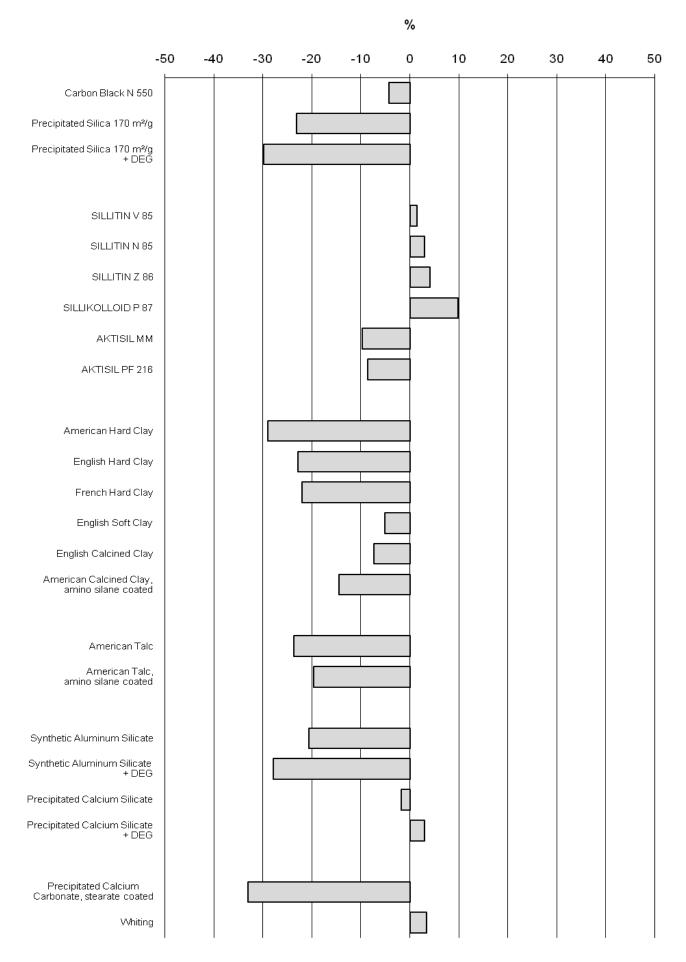


# RESISTANCE TO ASTM OIL 2, 7 d/100 °C DIN 53 521-A, S2 Change of Weight and Volume



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# RESISTANCE TO ASTM OIL 2, 7 d/100 °C DIN 53 521-A, S2 Change of Tensile Strength



# RESISTANCE TO ASTM OIL 2, 7 d/100 °C DIN 53 521-A, S2 Change of Elongation at Break

#### % relative



# RESISTANCE TO ASTM OIL 2, 7 d/100 °C DIN 53 521-A, S2 Change of Hardness

#### Shore A

