Tailored Filler Solutions

Struktosil 45 AM

EPDM, sulfur cured

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Struktosil 45 AM

We will use our know-how of Neuburg Siliceous Earth and transfer it to new base materials, combined with innovative modifications for further improvement.

Formulation

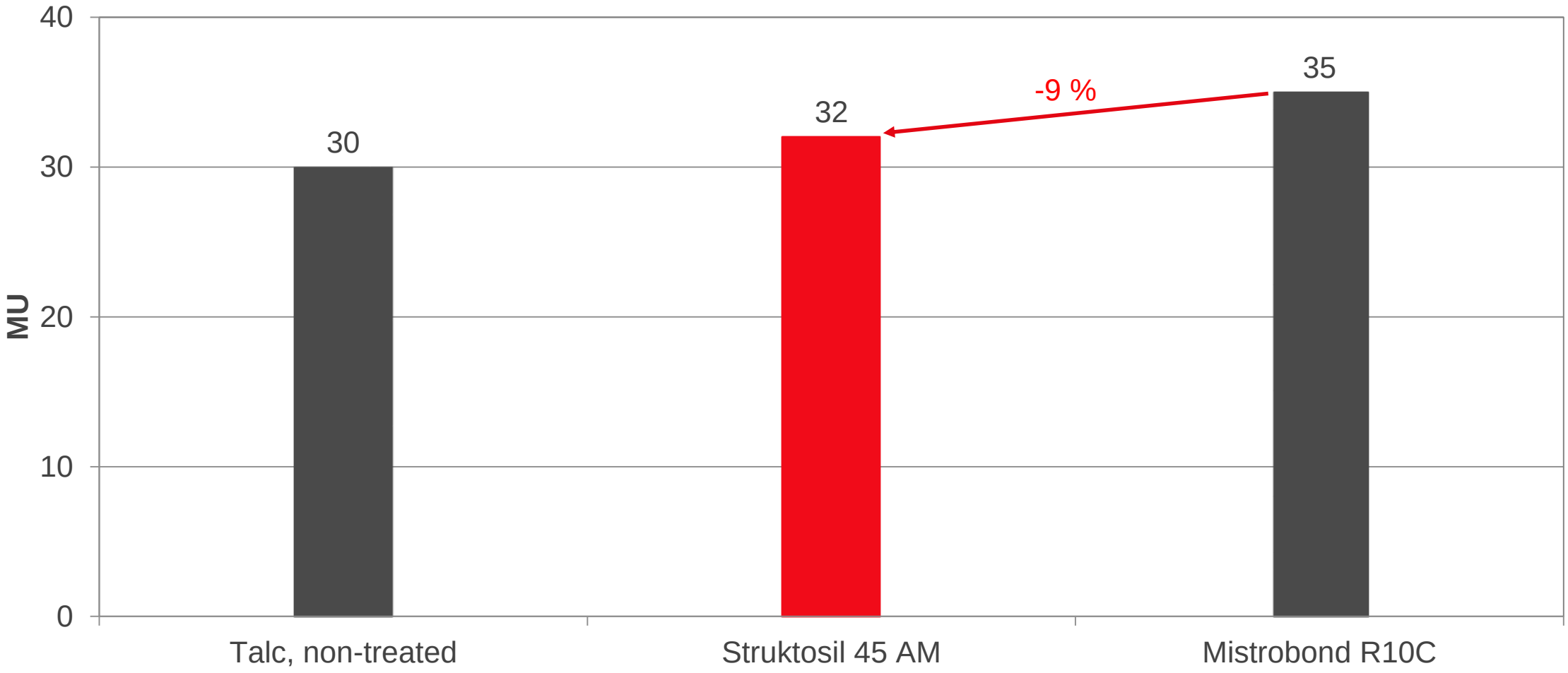
Material	Description	phr		
Keltan 2650	Ethylene propylene diene rubber, amorphous, ML 1+4 (125 °C): 25 MU	100		
Zinkoxyd aktiv	Zinc oxide active	3		
Edenor C18 98-100 GW	Stearic acid	0.5		
Talc, non-treated	Talc, non-treated	120		
Struktosil 45 AM	Talc, surface treated		120	
Mistrobond R10C	Talc, surface treated			120
Process Oil P460	Paraffinic mineral oil, plasticizer	5		
PEG 4000	Polyethylene glycol	1		
Rhenogran CBS-80	N-cyclohexylbenzothiazole-2-sulfenamide, 80 %, accelerator	0.5		
Rhenogran ZBEC-70	Zinc-dibenzyl-dithiocarbamate, 70 %, accelerator	2		
Rhenogran TP-50	Zinc-dithiophosphate, 50 %, accelerator	2		
Rhenogran CLD-80	Caprolactam disulfide, 80 %, sulfur donor	1		
Rhenogran S-80	Sulfur, 80 %, crosslinking agent	0.75		
Rhenogran MBTS-80	2-Mercaptobenzothiazole disulfide, 80 %, accelerator	1.3		
Total		**237.05**		

Fillers & characteristics

	Particle size		Oil absorption	Sieve residue > 40 µm	Density	Specific surface area BET	Color CIELAB scale Lightness L*	Surface treatment
	D_{50} [µm]	D_{97} [µm]	[g/100g]	[mg/kg]	[g/cm³]	[m²/g]		
Talc, non-treated	4.0	11.0	53	4	2.85	12	98	-
Struktosil 45 AM	4.0	11.0	55	5	2.85	9	98	Amino silane
Mistrobond R10C	4.6	16.3	46	28	2.85	9	94	Amino silane

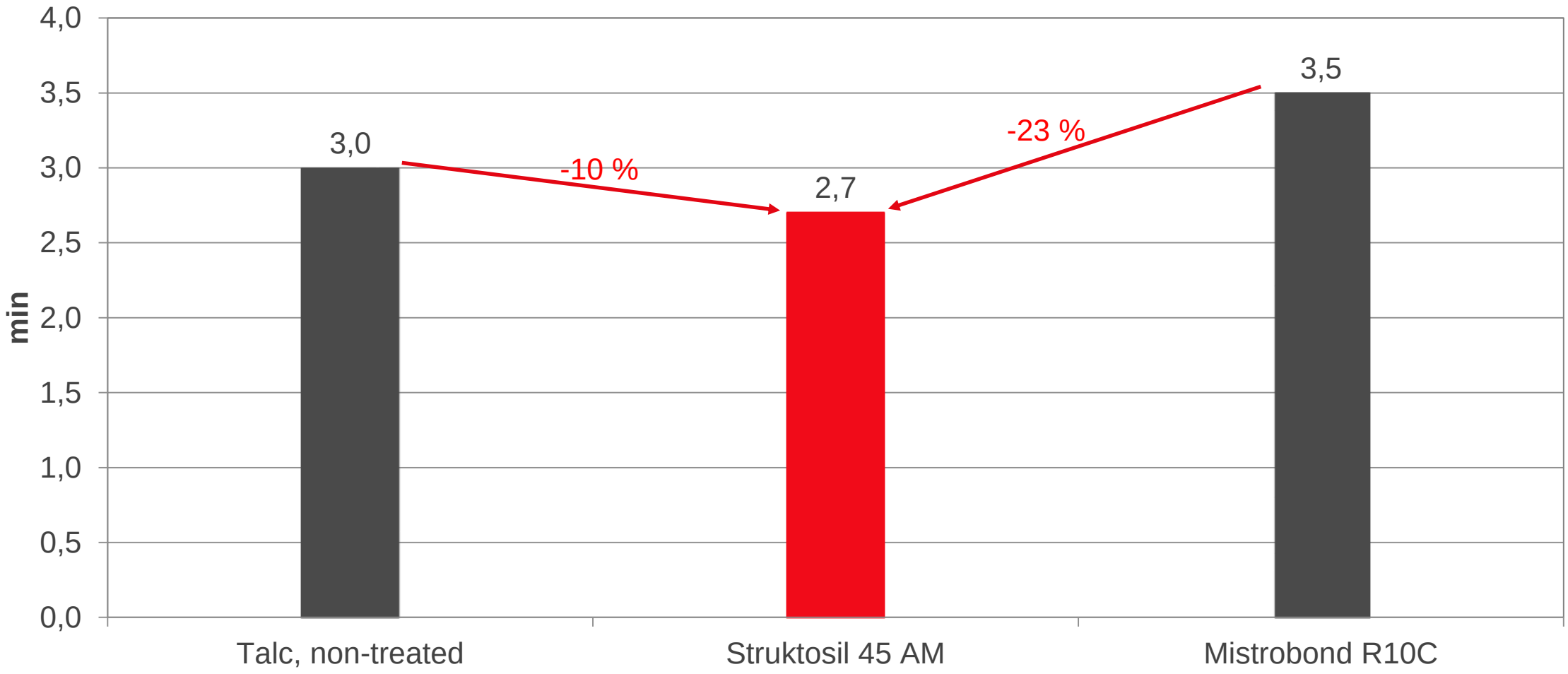
Mooney viscosity

DIN 53 523 Part 3, ML 1+4 120 °C



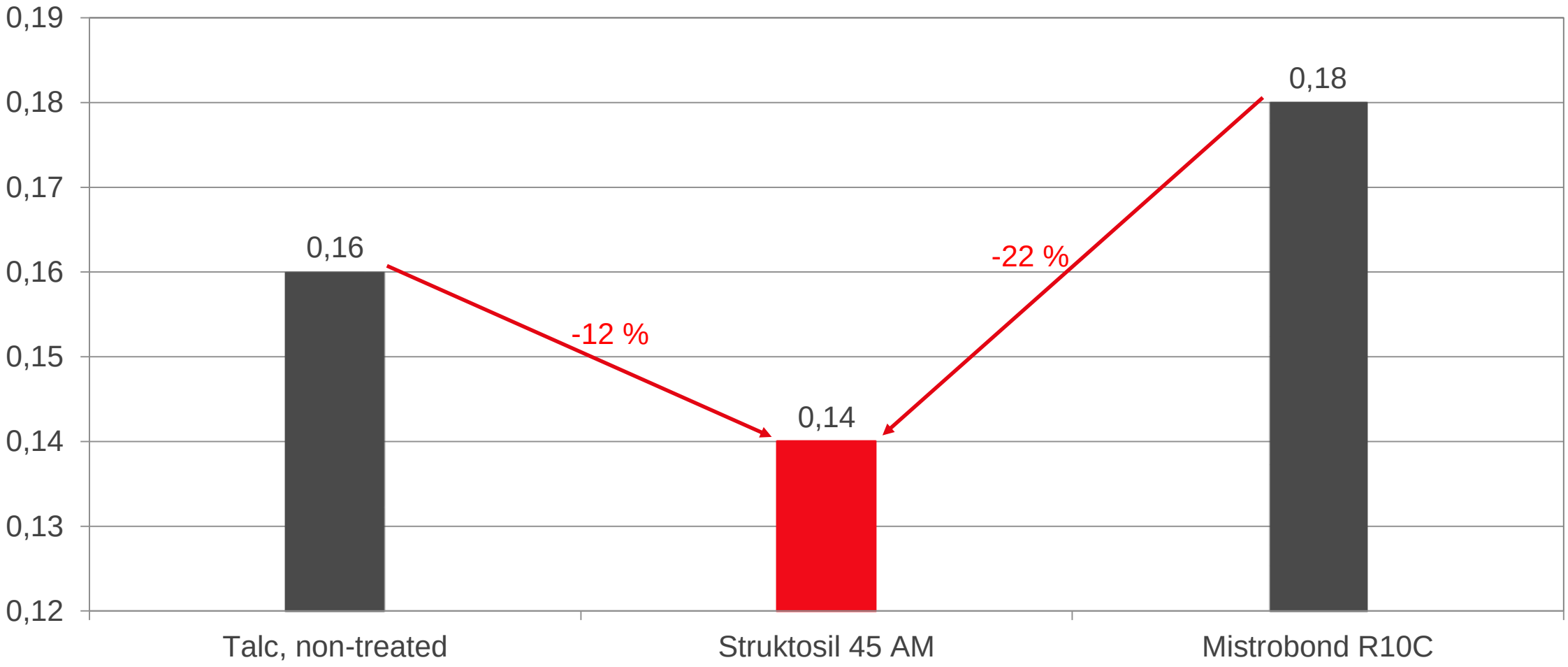
Rotorless curemeter
Conversion time $t_{90,}$ 180 °C

DIN 53 529-A3, 0.2° deflection – Göttfert Elastograph



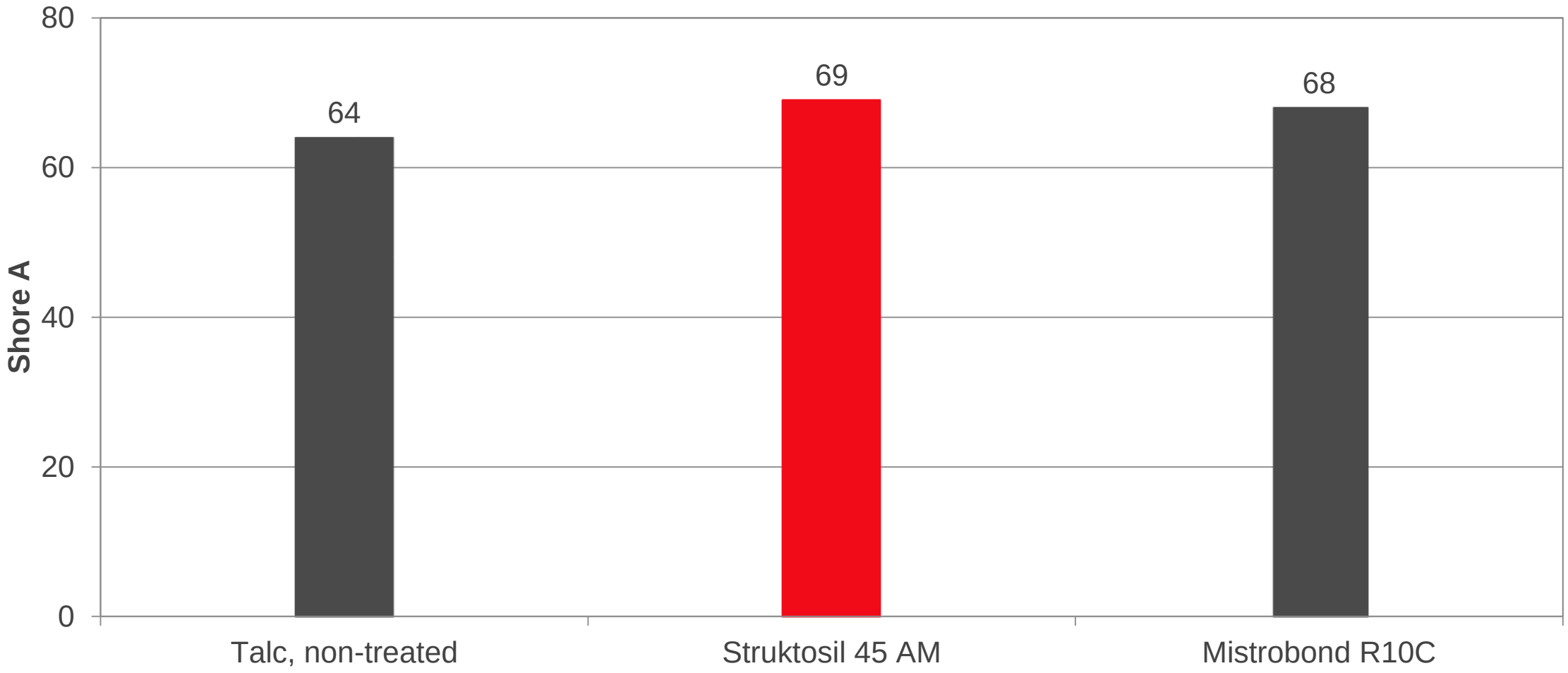
Rotorless curemeter
tan δ, 180 °C, end of test

DIN 53 529-A3, 0.2° deflection – Göttfert Elastograph



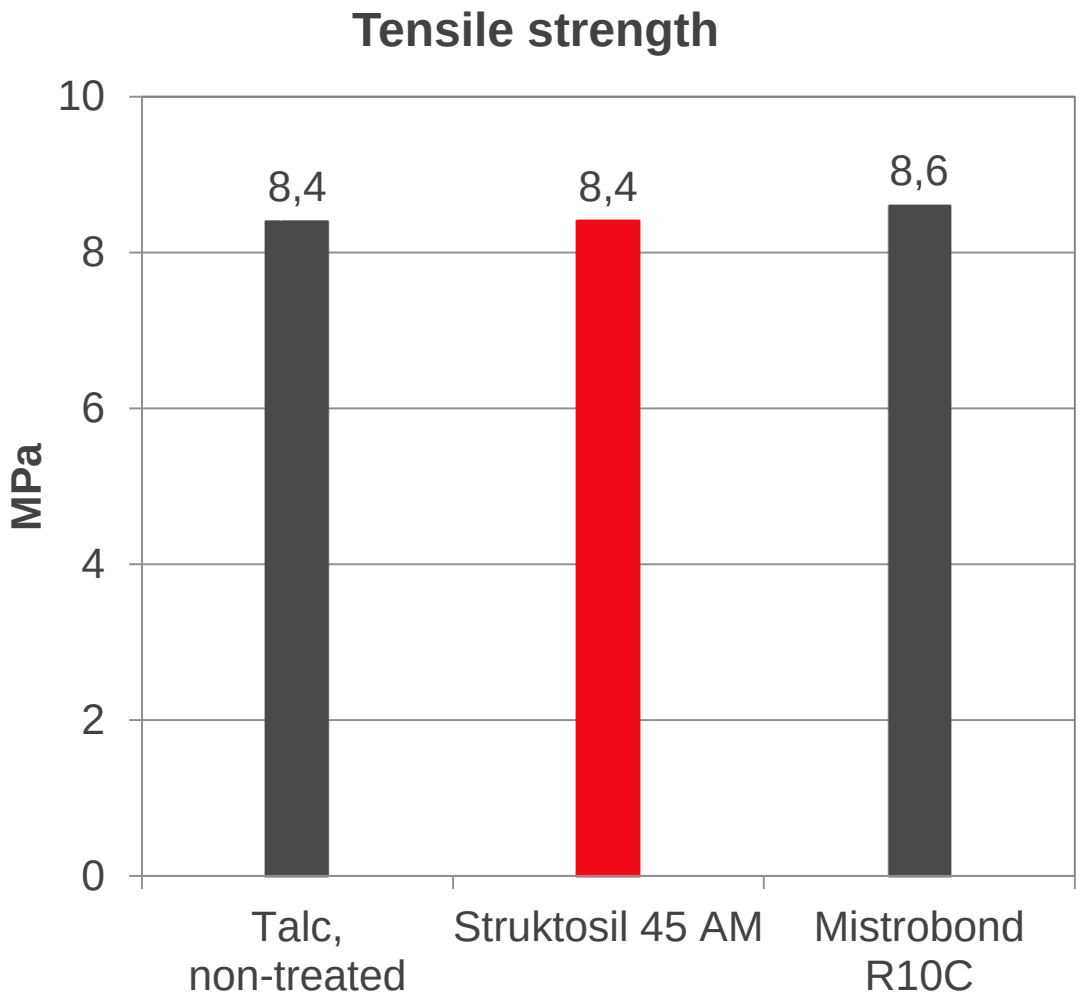
Hardness

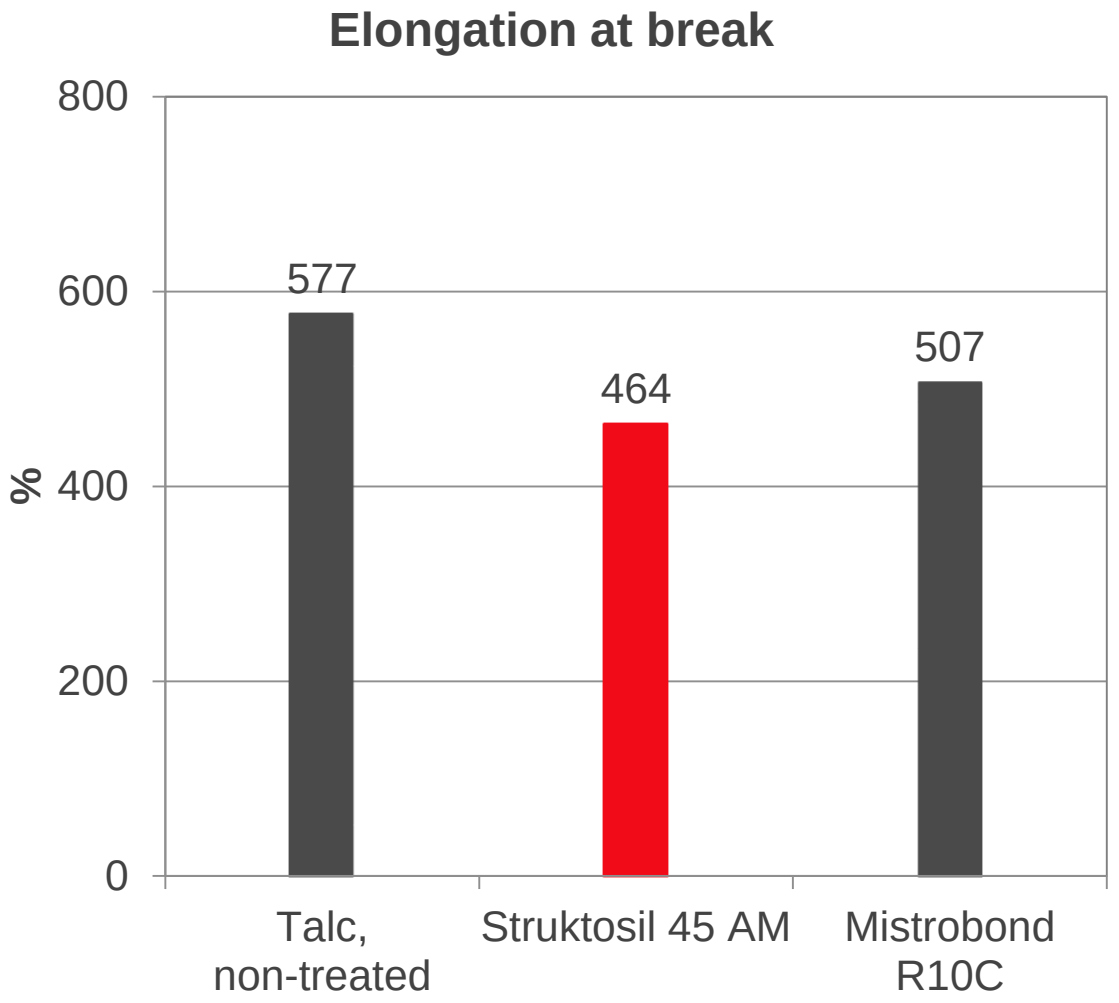
DIN 53 505-A, piled-up S2 dumbbells



Tensile test
Tensile strength & elongation at break

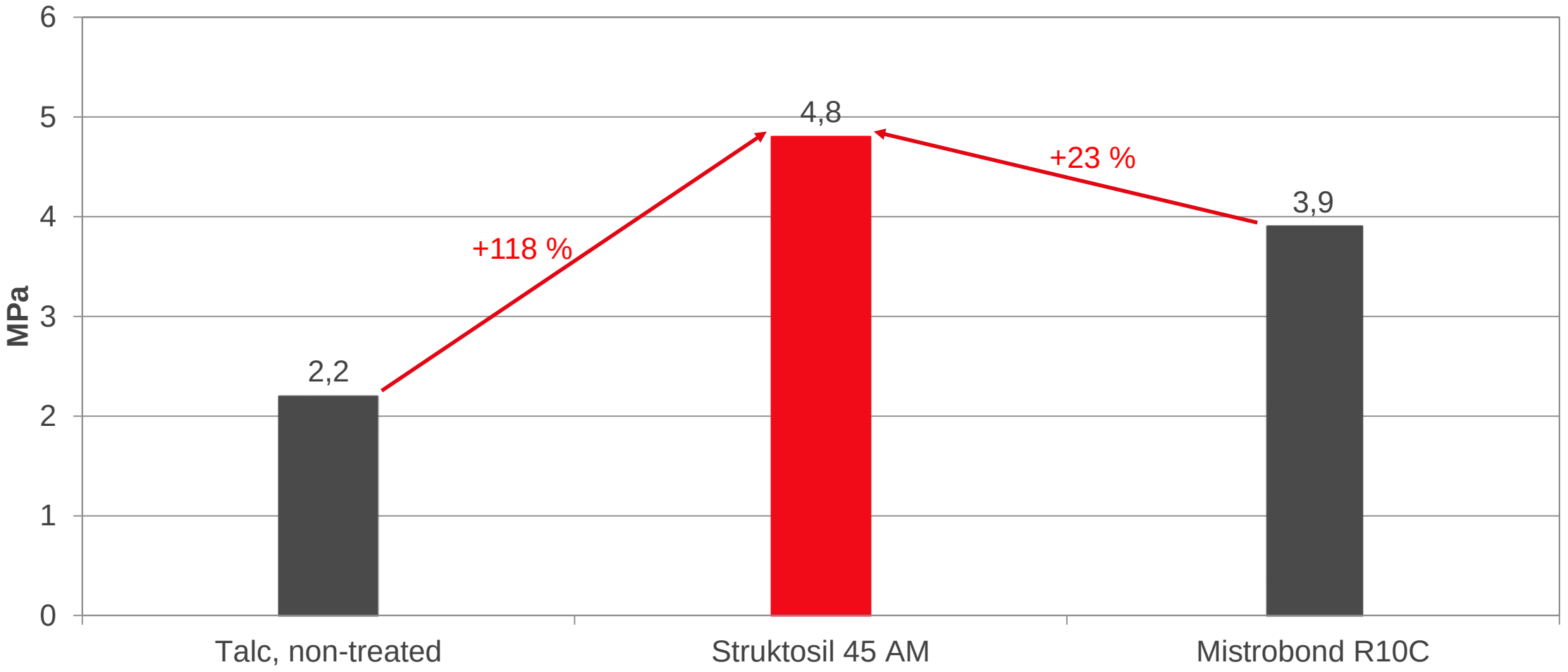
DIN 53 504, S2





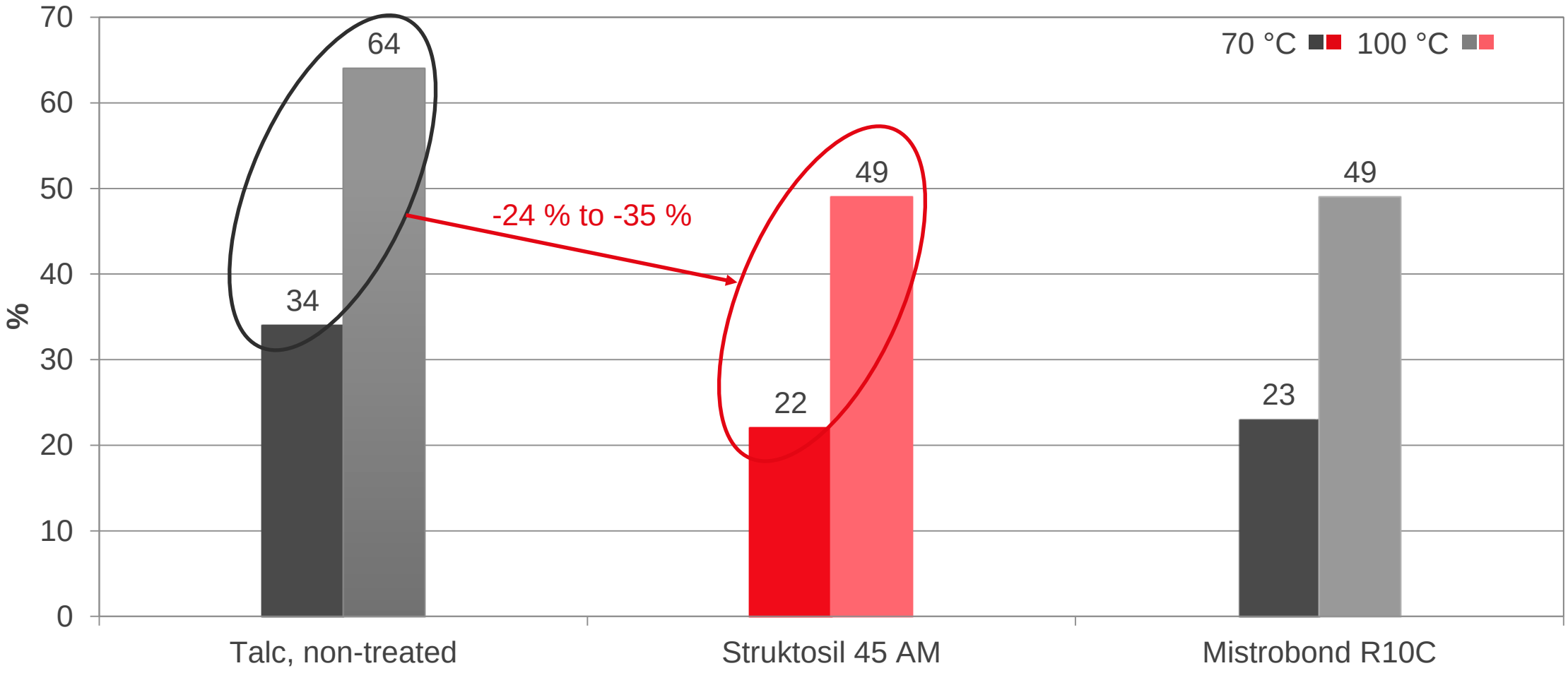
Tensile test
Modulus 100 %

DIN 53 504, S2



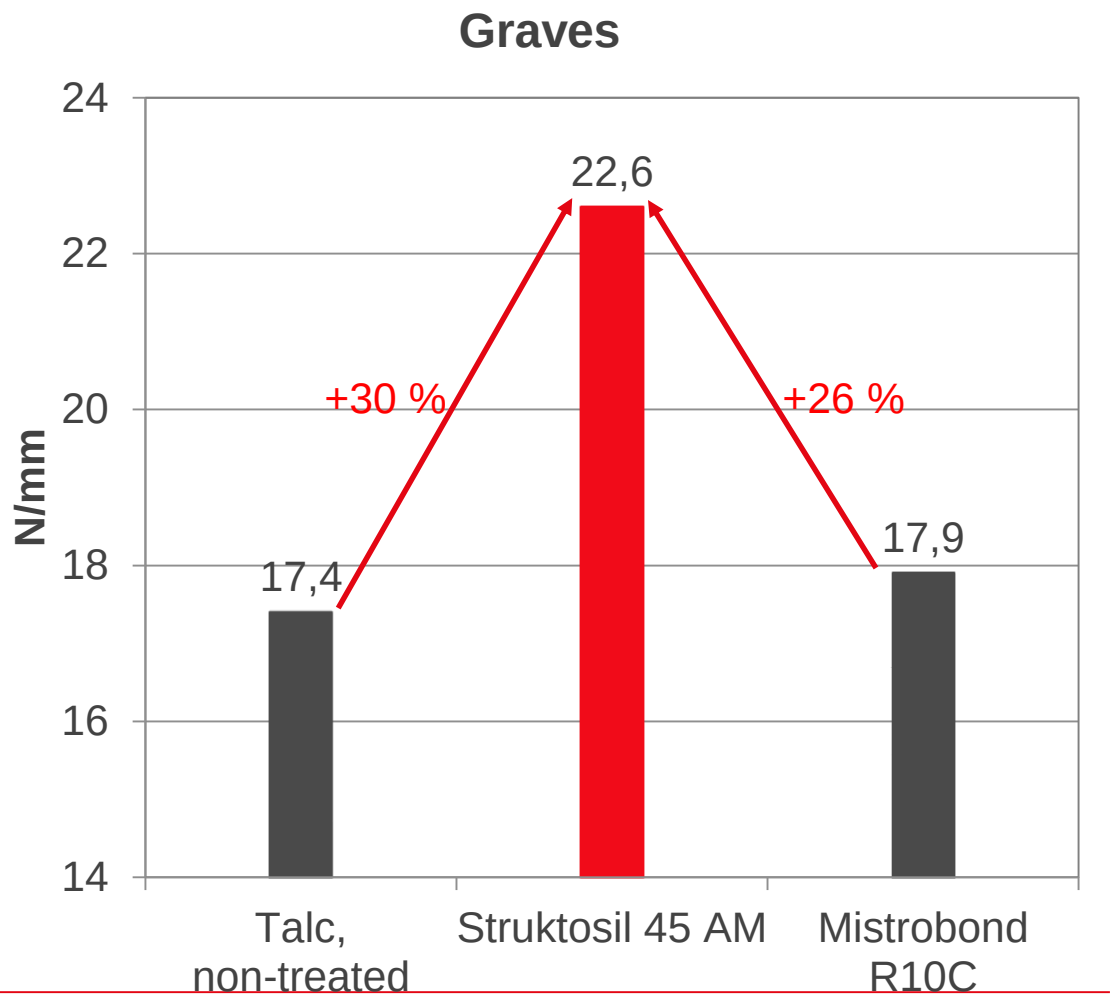
Compression set

DIN ISO 815-1 B, 24 h, 25 % defl.



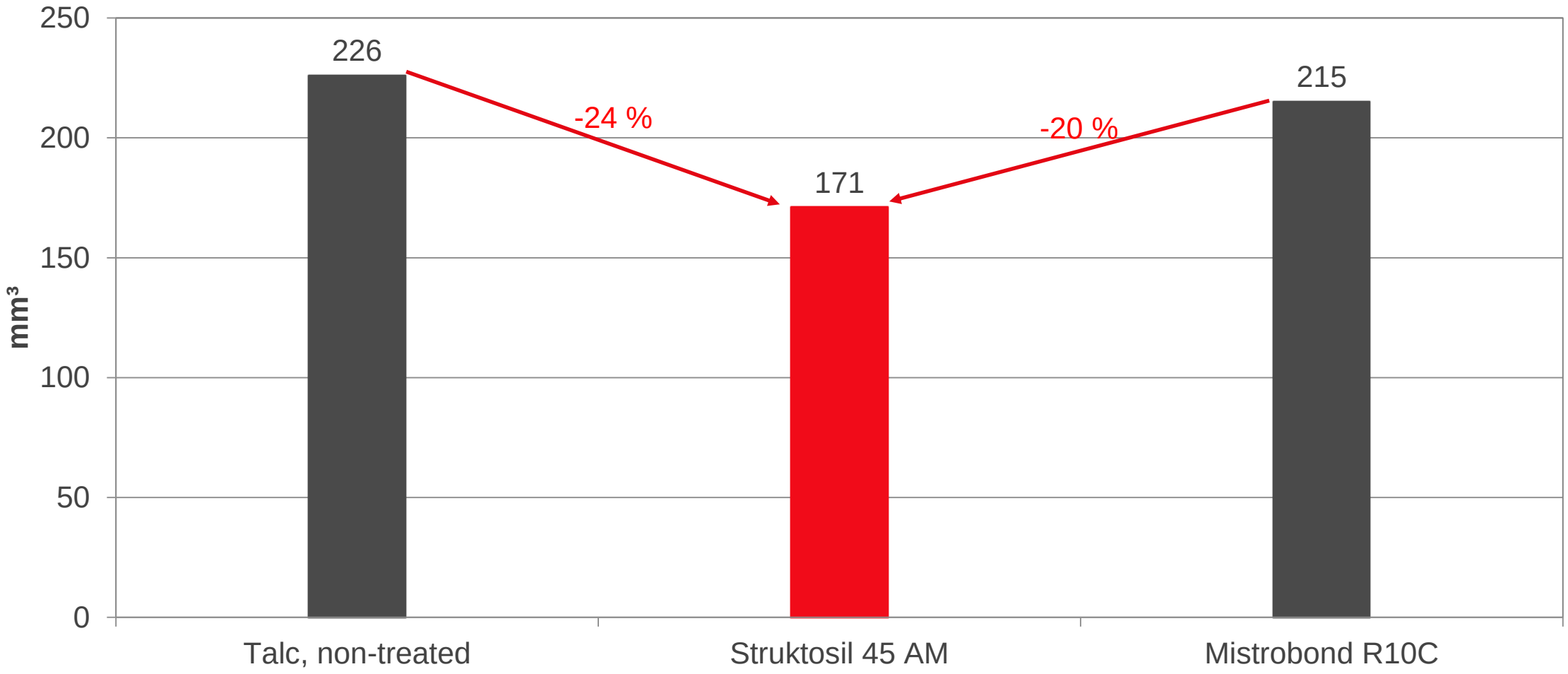
Tear resistance

DIN ISO 34-1A (Trousers specimen) & DIN ISO 34-1Bb (Graves specimen)



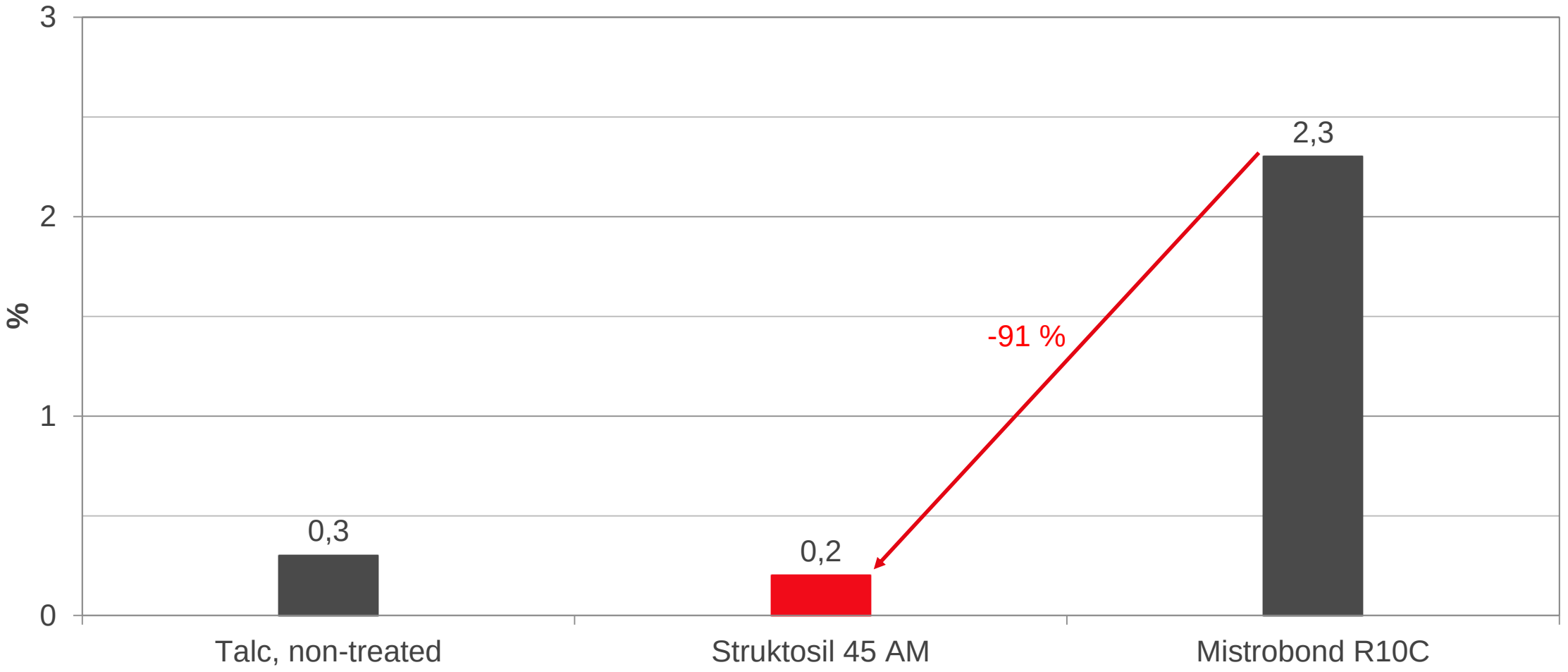
Abrasion loss

DIN ISO 4649, 10 N



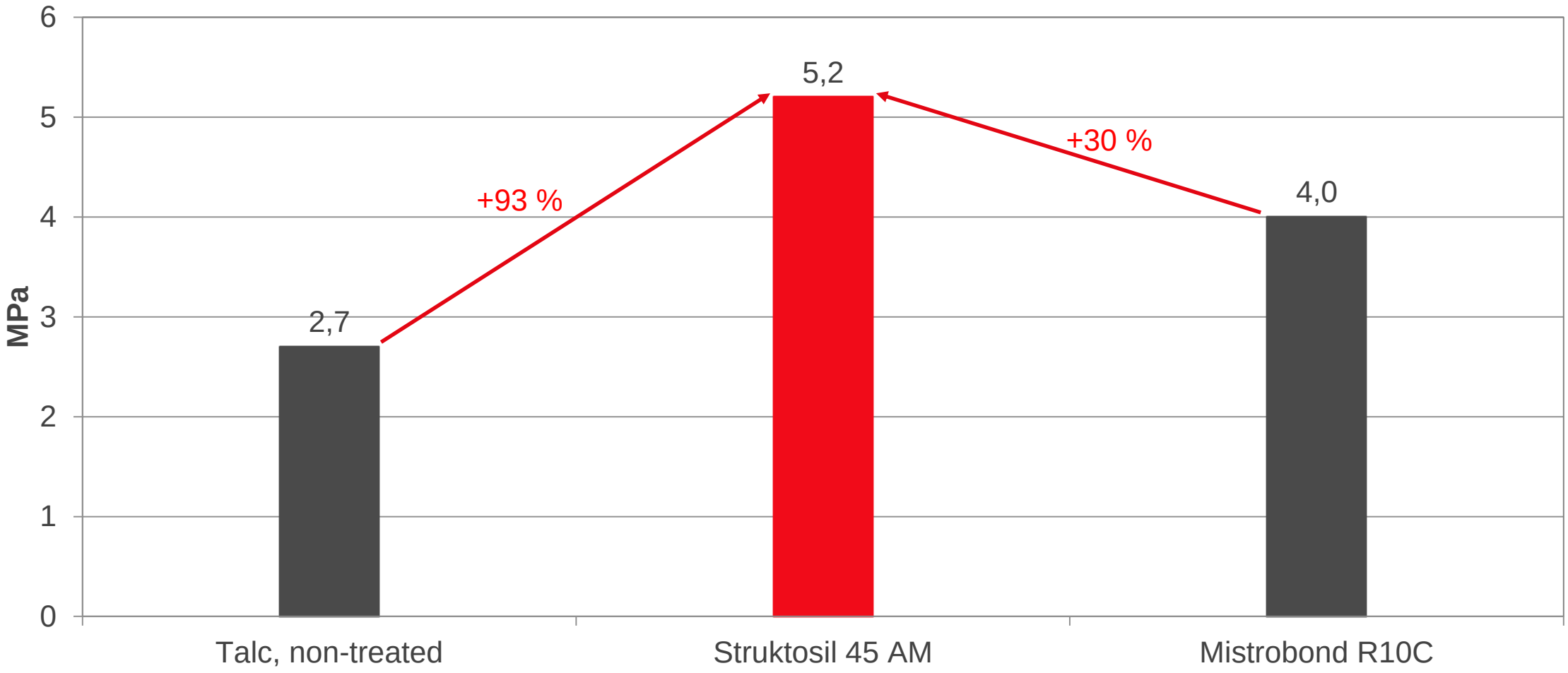
Storage in deionised water
Change of weight

168 h / 95 °C



Storage in deionised water
Modulus 100%

168 h / 95 °C



Conclusion

Advantages of Struktosil 45 AM compared to Mistrobond R10C:

- Lower Mooney viscosity
- Lower tangent delta at the end of vulcanization
- Shorter conversion time t_{90}
- Increased moduli
- Increased tear resistance
- Improved abrasion resistance
- Significantly lower absorption of water after storage in hot water

Advantages of Struktosil 45 AM compared to a non-treated talc:

- Lower tangent delta at the end of vulcanization
- Shorter conversion time t_{90}
- Highly increased moduli
- Increased tear resistance
- Better abrasion resistance
- Highly decreased compression set
- Lower absorption of water after storage in hot water

We supply material for good ideas!

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Preparation and curing of the compound

Mixing	
Open mill	Ø 150 x 300 mm
Batch amount	approx. 600 g
Temperature	50 °C
Mixing time	approx. 12 min

Curing	
Press temperature	180 °C
Curing time	5 min

Results in tabular form
Rheology

		Talc, non-treated	Struktosil 45 AM	Mistrobond R10C
Mooney viscosity, ML 1+4, 100 °C	MU	39	41	46
Mooney viscosity, ML 1+4, 120 °C	MU	30	32	35
Mooney scorch time, ML +5, 120 °C	min	12	9	10
Rotorless curemeter, M_{min}, 180 °C	Nm	0.05	0.05	0.06
Rotorless curemeter, M_{max}, 180 °C	Nm	0.67	0.64	0.72
Rotorless curemeter, $M_{max-min}$, 180 °C	Nm	0.63	0.59	0.67
Rotorless curemeter, V_{max}, 180 °C	Nm / min	0.7	0.89	0.95
Rotorless curemeter, t_5, 180 °C	min	0.79	0.53	0.53
Rotorless curemeter, t_{10}, 180 °C	min	0.94	0.60	0.61
Rotorless curemeter, t_{90}, 180 °C	min	3.01	2.65	3.54
Curing time	min	5.00	5.00	5.00
Rotorless curemeter, tan delta, 180 °C		0.16	0.14	0.18

Results in tabular form
Mechanical properties

		Talc, non-treated	Struktosil 45 AM	Mistrobond R10C
Hardness	Shore A	64	69	68
Tensile strength	MPa	8.4	8.4	8.6
Modulus 50 %	MPa	2.0	3.4	2.6
Modulus 100 %	MPa	2.2	4.8	3.9
Modulus 200 %	MPa	2.4	5.6	4.9
Modulus 300 %	MPa	2.8	6.1	5.4
Elongation at break	%	577	464	507
Tear resistance (Graves)	N / mm	17.4	22.6	17.9
Tear resistance (Trousers)	N / mm	9.8	10.2	7.8
Rebound elasticity	%	47	51	50
Abrasion loss	mm^3	226	171	215
Compression set, 24 h / 100 °C, 25 % defl.	%	34	22	23
Compression set, 24 h / 125 °C, 25 % defl.	%	64	49	49

Results in tabular form
Aging in hot air, 168 h / 70 °C

Absolute value					Relative change based on the mechanics before storage				
		Talc, non-treated	Struktosil 45 AM	Mistrobond R10C			Talc non-treated	Struktosil 45 AM	Mistrobond R10C
Hardness	Shore A	68	71	71	Δ	Shore A	4	2	3
Tensile strength	MPa	7.6	7.6	6.8	Δ	%	-9.6	-10.3	-20.4
Modulus 50 %	MPa	2.5	3.8	3.1	Δ	%	24.3	14.0	19.1
Modulus 100 %	MPa	2.8	5.3	4.4	Δ	%	25.2	10.9	14.3
Modulus 200 %	MPa	3.0	6.0	5.4	Δ	%	24.3	8.3	11.2
Modulus 300 %	MPa	3.5	6.6	6.1	Δ	%	24.4	7.7	11.7
Elongation at break	%	498	367	370	Δ	%	-13.5	-21.0	-26.9
Tear resistance (Graves)	N / mm	17.1	20.5	16.7	Δ	%	-1.7	-9.3	-6.7
Tear resistance (Trousers)	N / mm	8.6	8.6	6.2	Δ	%	-12.2	-15.5	-20.3
Rebound elasticity	%	50	53	54	Δ	%	6.4	3.9	8.0

Results in tabular form
Aging in hot air, 168 h / 100 °C

Absolute value					Relative change based on the mechanics before storage				
		Talc, non-treated	Struktosil 45 AM	Mistrobond R10C			Talc non-treated	Struktosil 45 AM	Mistrobond R10C
Hardness	Shore A	72	74	74	Δ	Shore A	8	5	6
Tensile strength	MPa	7.0	7.6	7.8	Δ	%	-16.3	-9.5	-9.1
Modulus 50 %	MPa	2.9	4.4	3.8	Δ	%	41.6	31.3	46.2
Modulus 100 %	MPa	3.1	6.0	5.5	Δ	%	38.7	25.8	41.2
Modulus 200 %	MPa	3.3	6.7	6.6	Δ	%	36.6	21.2	34.5
Modulus 300 %	MPa	3.9	n. d.	7.7	Δ	%	39.2	n. d.	42.4
Elongation at break	%	447	298	314	Δ	%	-22.5	-35.7	-38.0
Tear resistance (Graves)	N / mm	15.9	19.3	15.9	Δ	%	-8.7	-14.5	-11.1
Tear resistance (Trousers)	N / mm	8.5	6.6	5.6	Δ	%	-12.9	-34.9	-28.8
Rebound elasticity	%	53	55	55	Δ	%	12.8	7.8	10.0

Results in tabular form
Storage in deionised water, 168 h / 95 °C

Absolute value					Relative change based on the mechanics before storage				
		Talc, non-treated	Struktosil 45 AM	Mistrobond R10C			Talc non-treated	Struktosil 45 AM	Mistrobond R10C
Hardness	Shore A	67	72	68	Δ	Shore A	3	3	0
Tensile strength	MPa	8.3	8.0	7.8	Δ	%	-0.7	-5.2	-9.6
Modulus 50 %	MPa	2.5	3.7	2.8	Δ	%	22.8	10.1	7.3
Modulus 100 %	MPa	2.7	5.2	4.0	Δ	%	21.6	8.2	3.4
Modulus 200 %	MPa	3.0	6.2	5.1	Δ	%	22.2	11.3	4.7
Modulus 300 %	MPa	3.6	7.0	6.0	Δ	%	25.4	15.0	11.3
Elongation at break	%	500	387	431	Δ	%	-13.3	-16.6	-14.9
Weight					Δ	%	0.3	0.2	2.3
Volume					Δ	%	0.8	0.1	2.9