

Tailored Filler Solutions

Struktosil 45 AM

EPDM, sulfur cured



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Struktosil 45 AM



We think in extremes. And in extremely small minerals.

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		



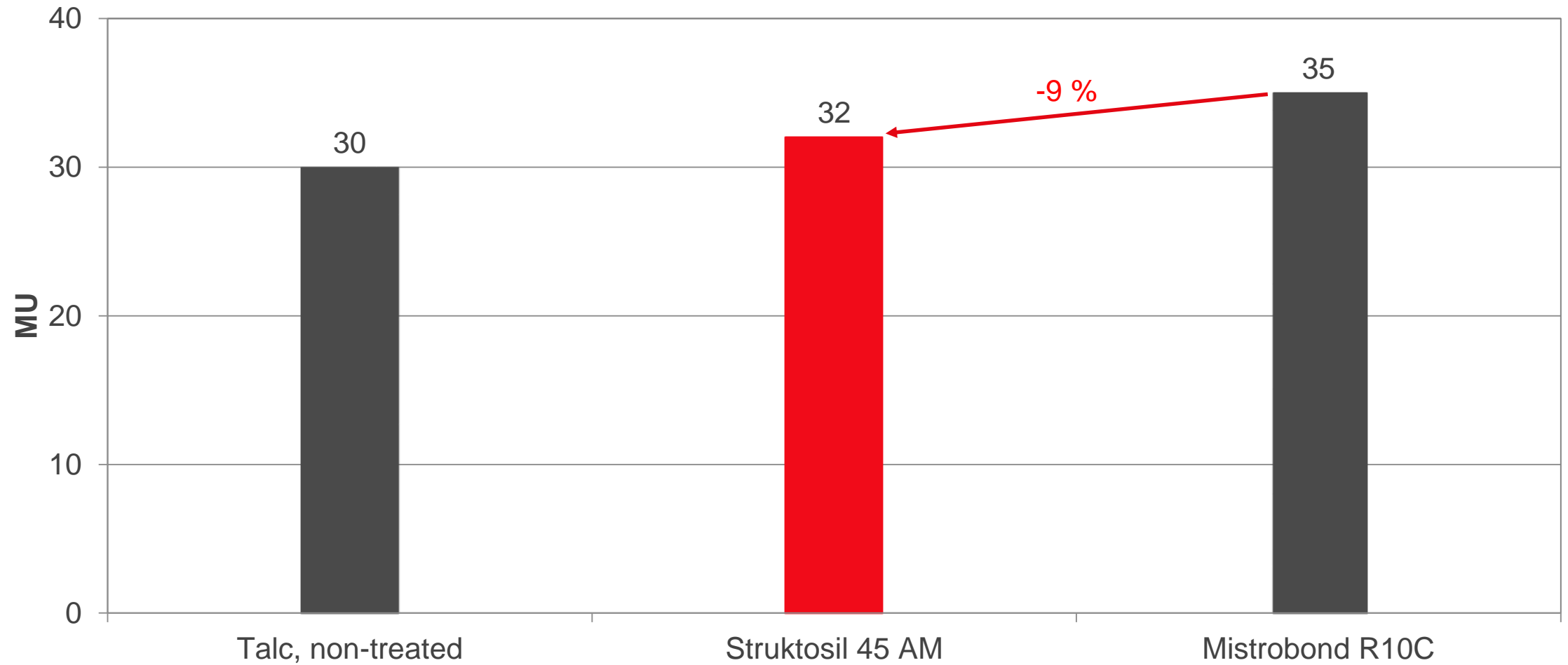
Fillers & characteristics

	Particle size		Oil absorption [g/100g]	Sieve residue > 40 µm [mg/kg]	Density [g/cm³]	Specific surface area BET [m²/g]	Color CIELAB scale Lightness L*	Surface treatment
	D ₅₀ [µm]	D ₉₇ [µm]						
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

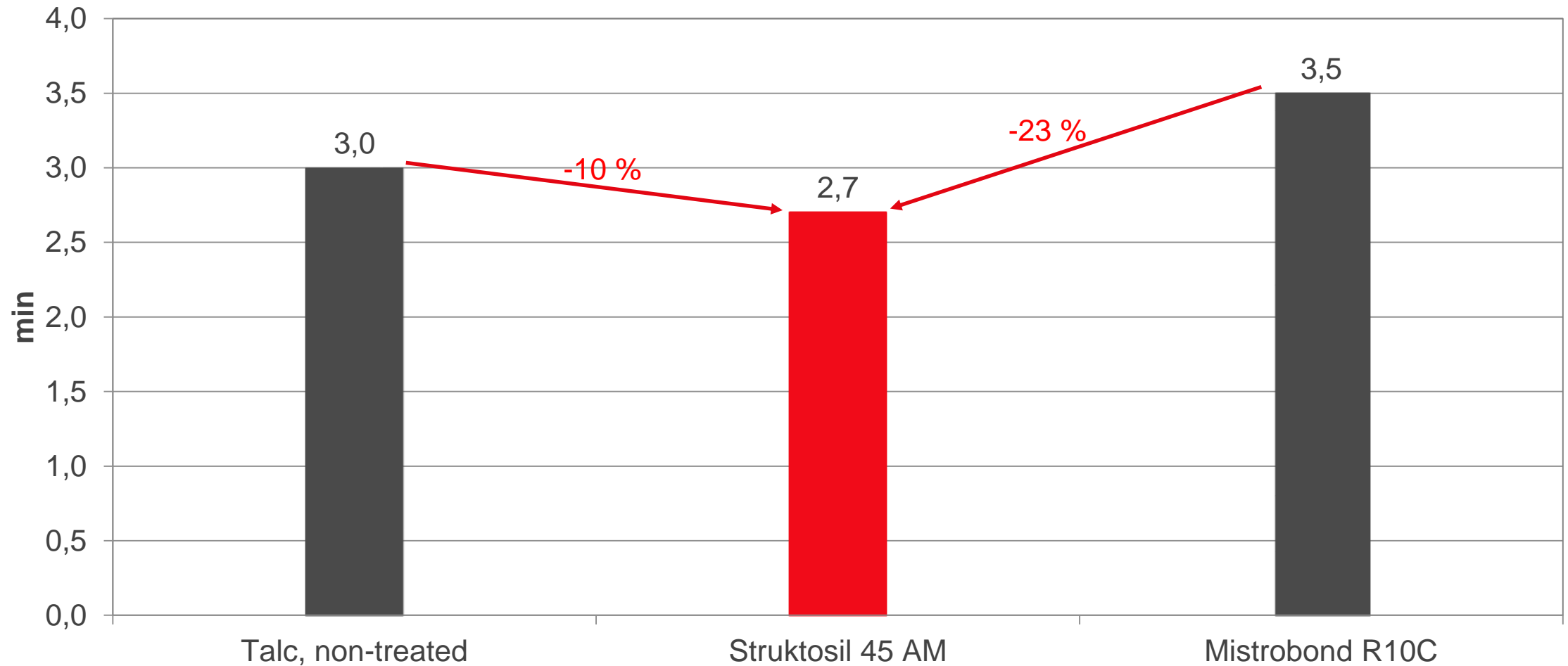


Rotorless curemeter

Conversion time t_{90} , 180 °C



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

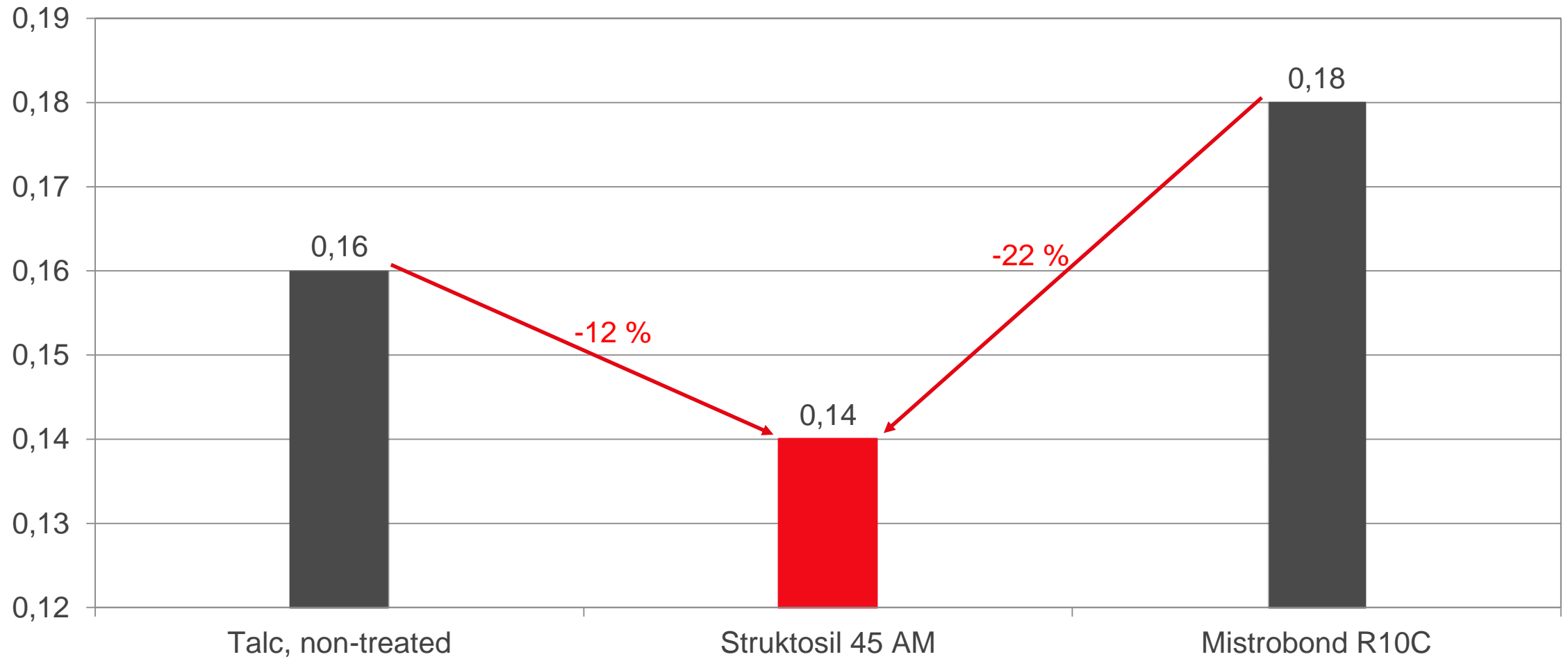


Rotorless curemeter

$\tan \delta$, 180 °C, end of test



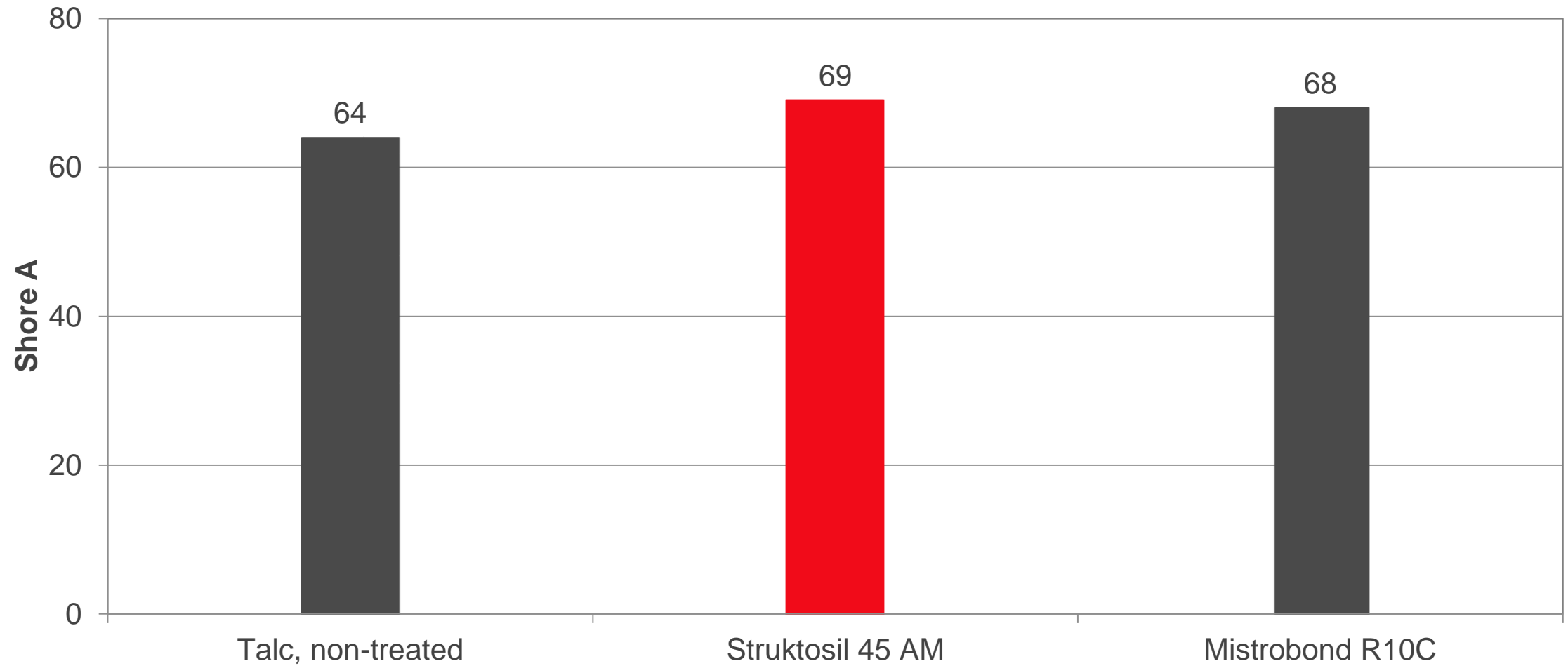
DIN 53 529-A3, 0.2° deflection – Göttfert Elastograph





Hardness

DIN 53 505-A, piled-up S2 dumbbells



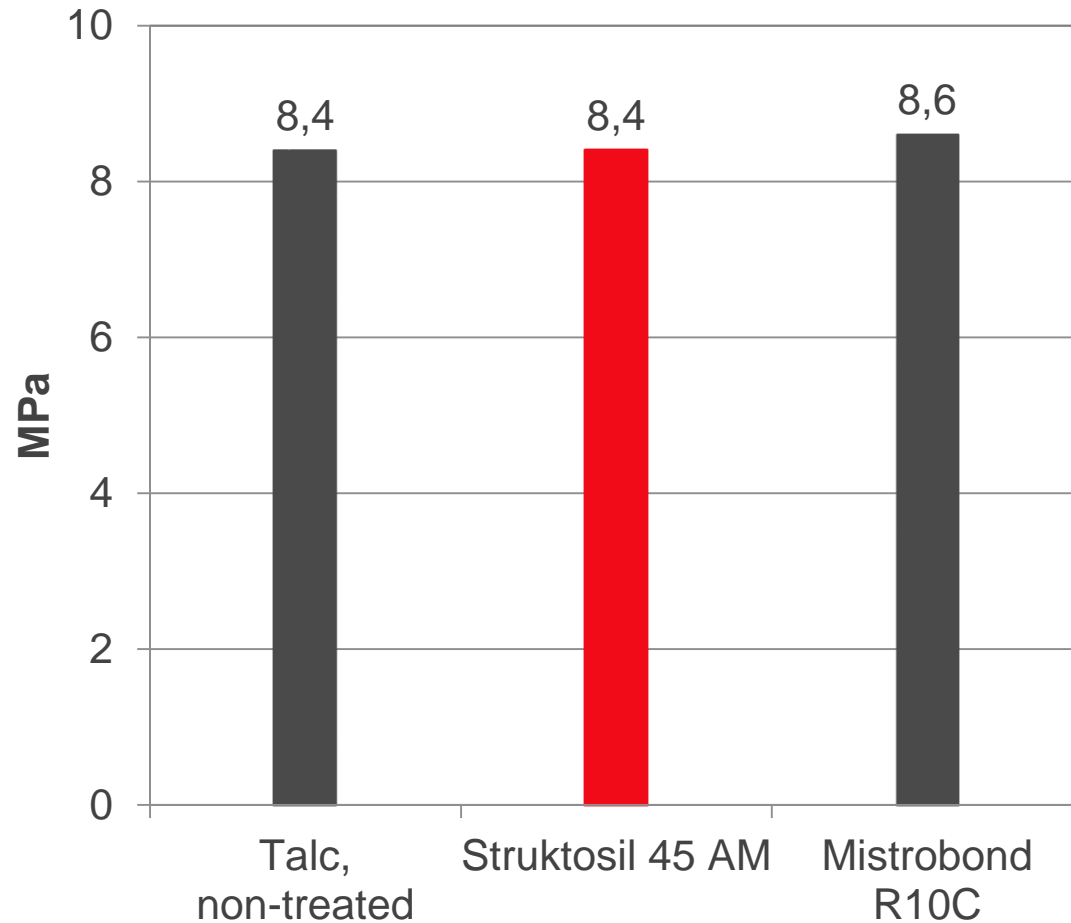


Tensile test

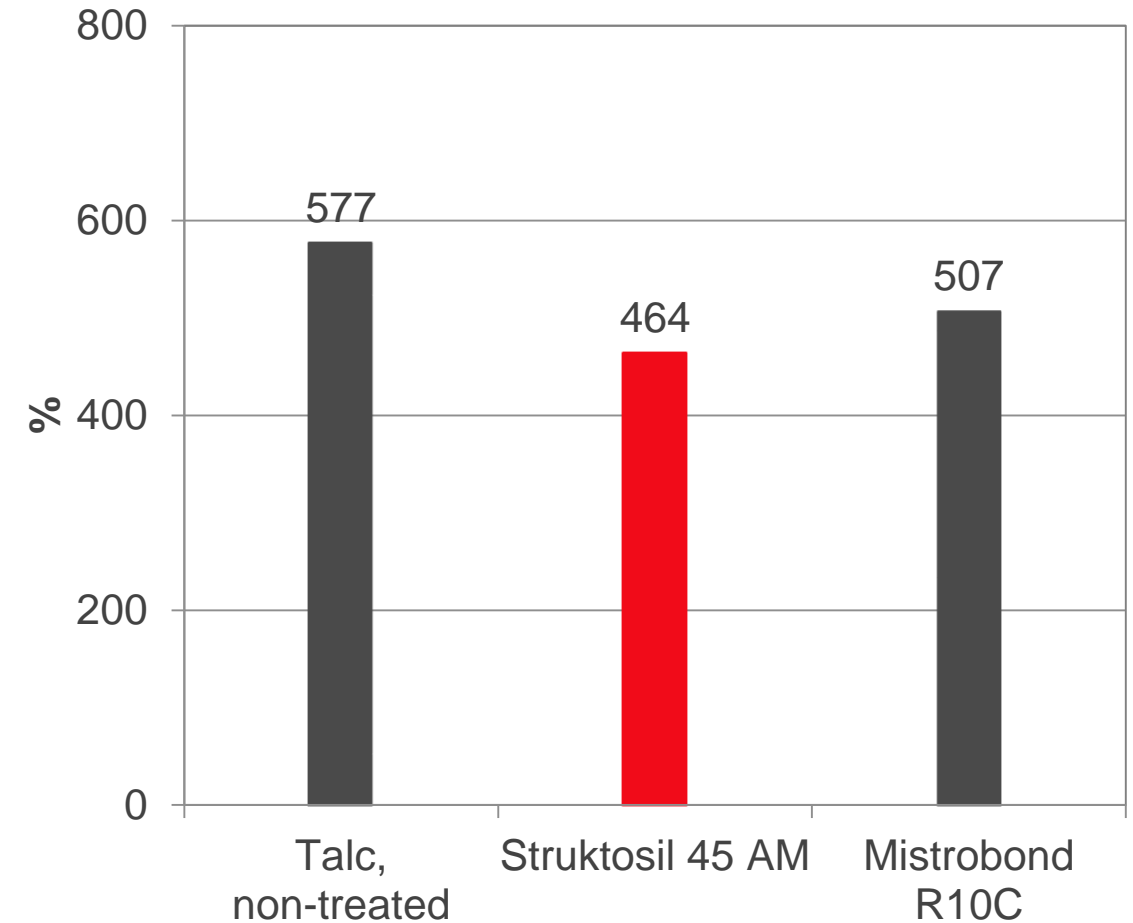
Tensile strength & elongation at break

DIN 53 504, S2

Tensile strength



Elongation at break

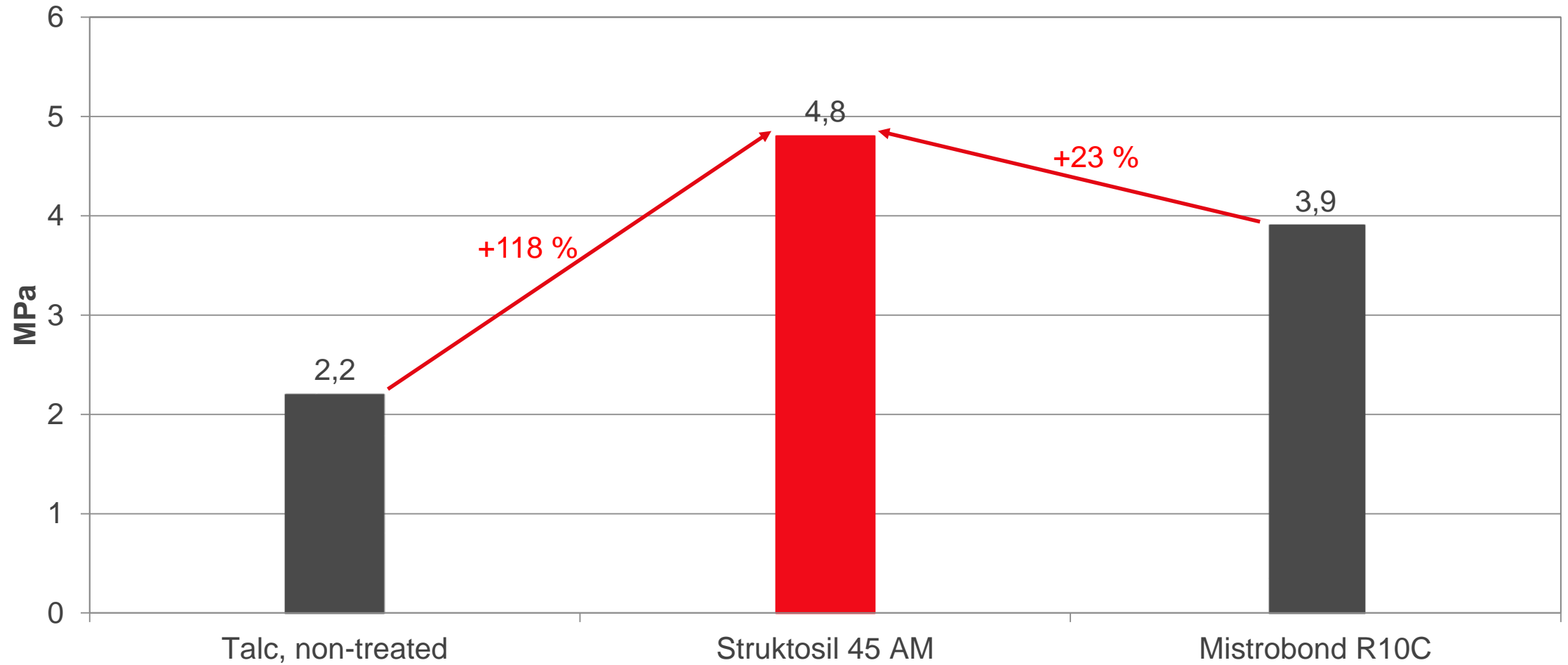


Tensile test

Modulus 100 %



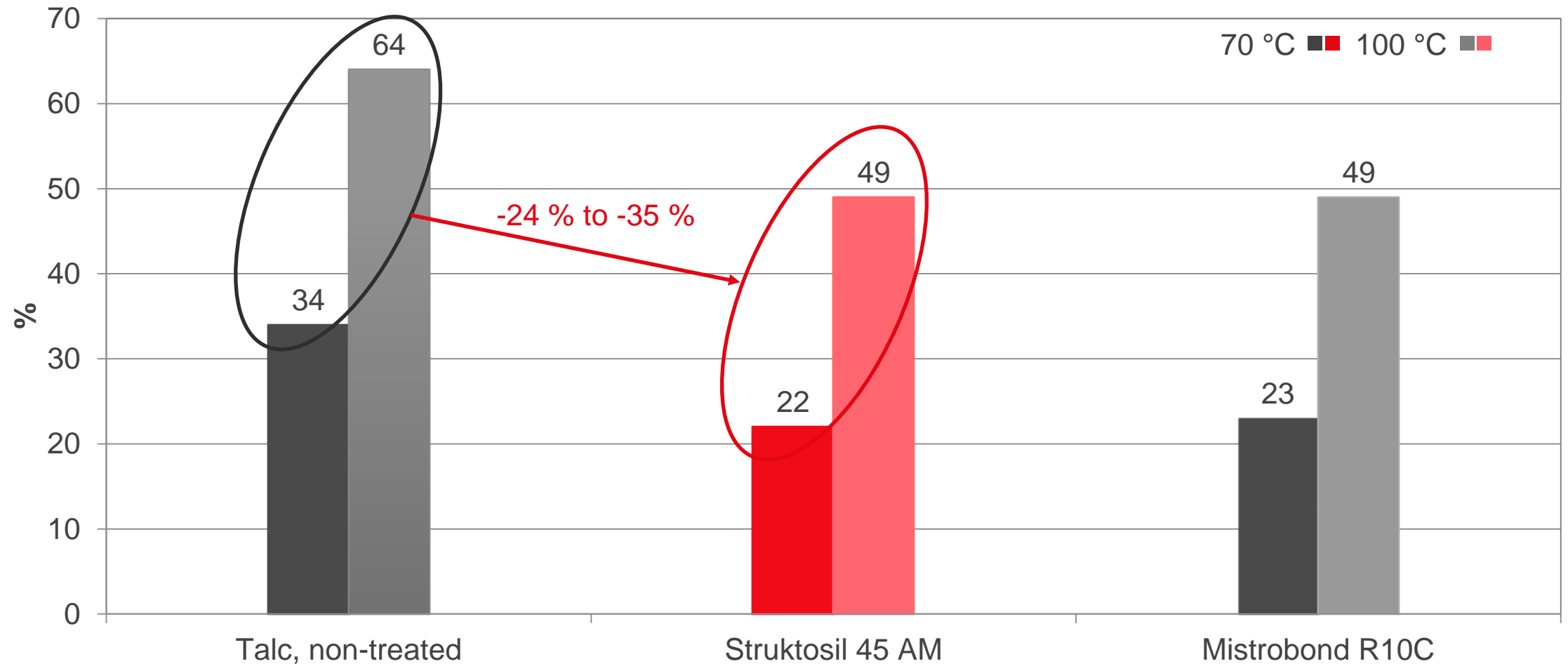
DIN 53 504, S2





Compression set

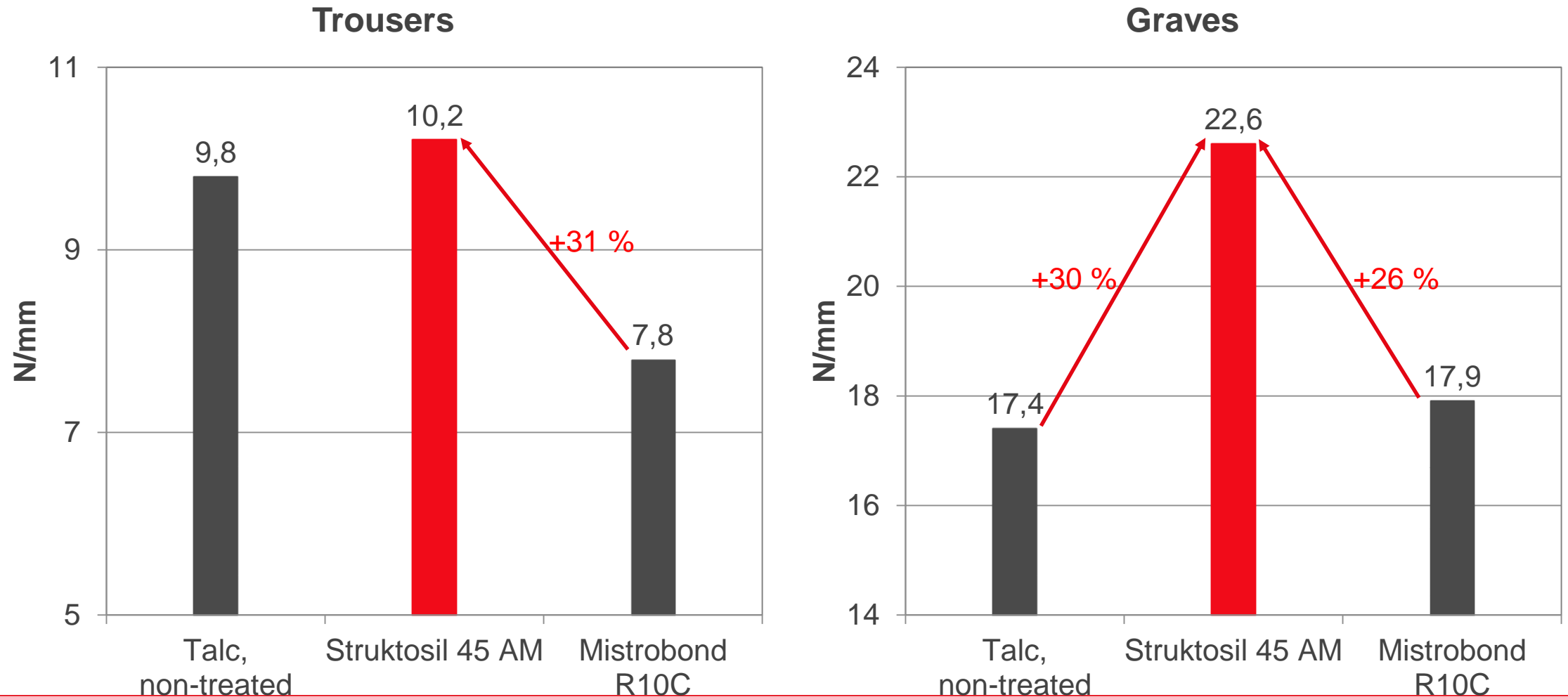
DIN ISO 815-1 B, 24 h, 25 % defl.





Tear resistance

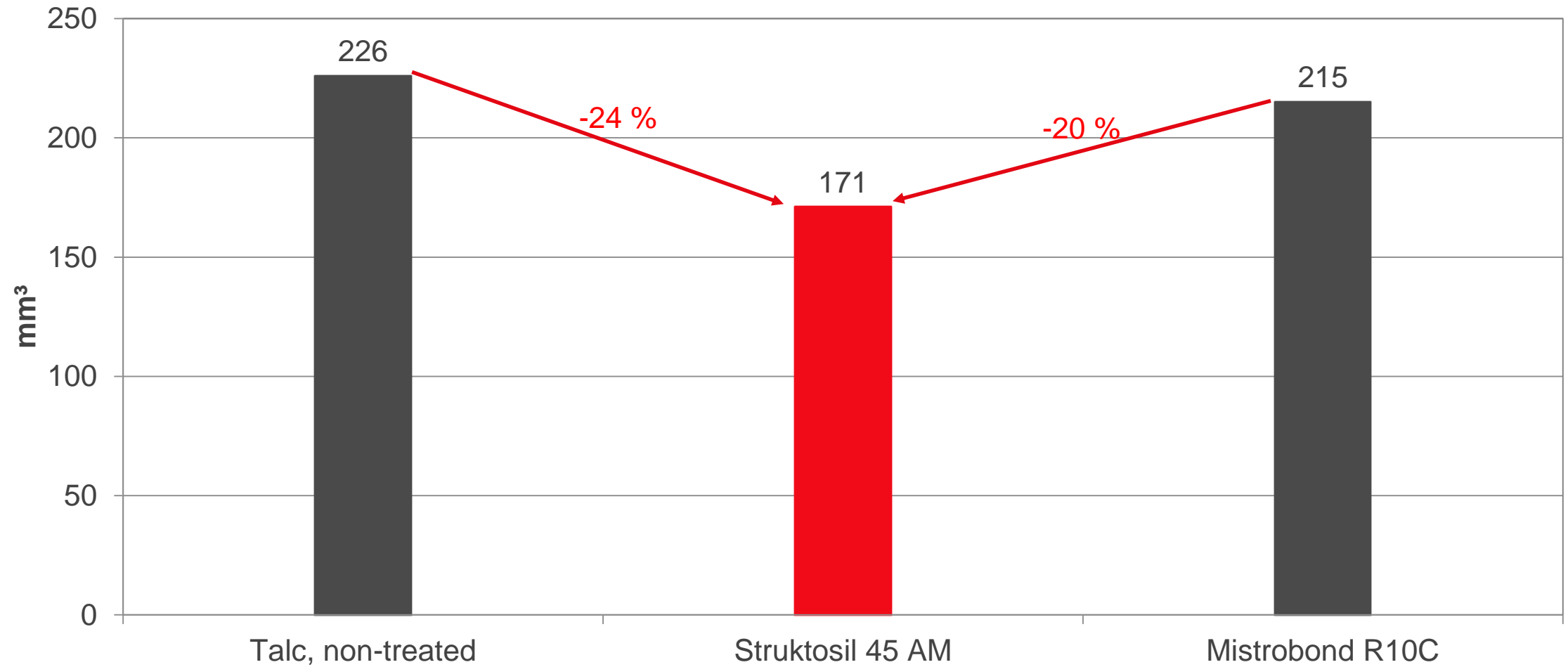
DIN ISO 34-1A (Trousers specimen) & DIN ISO 34-1Bb (Graves specimen)





Abrasion loss

DIN ISO 4649, 10 N

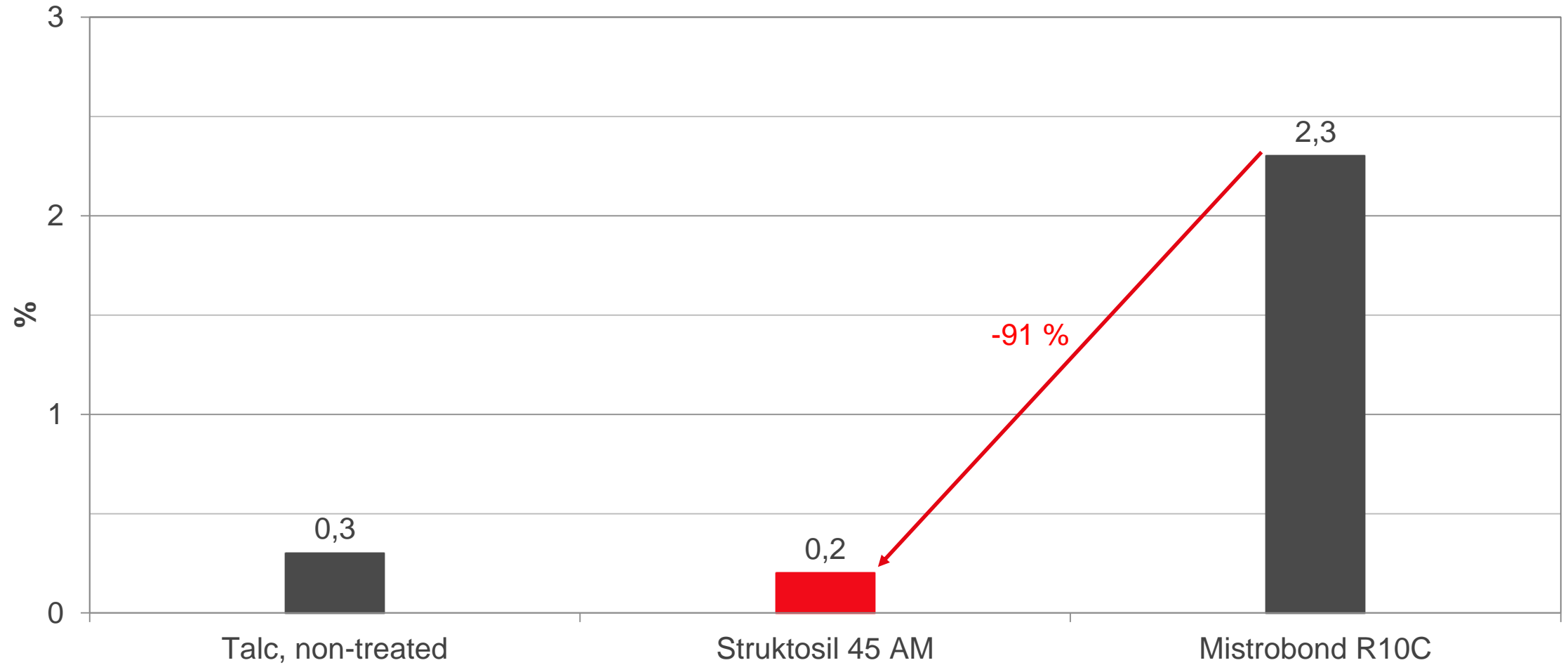


Storage in deionised water

Change of weight



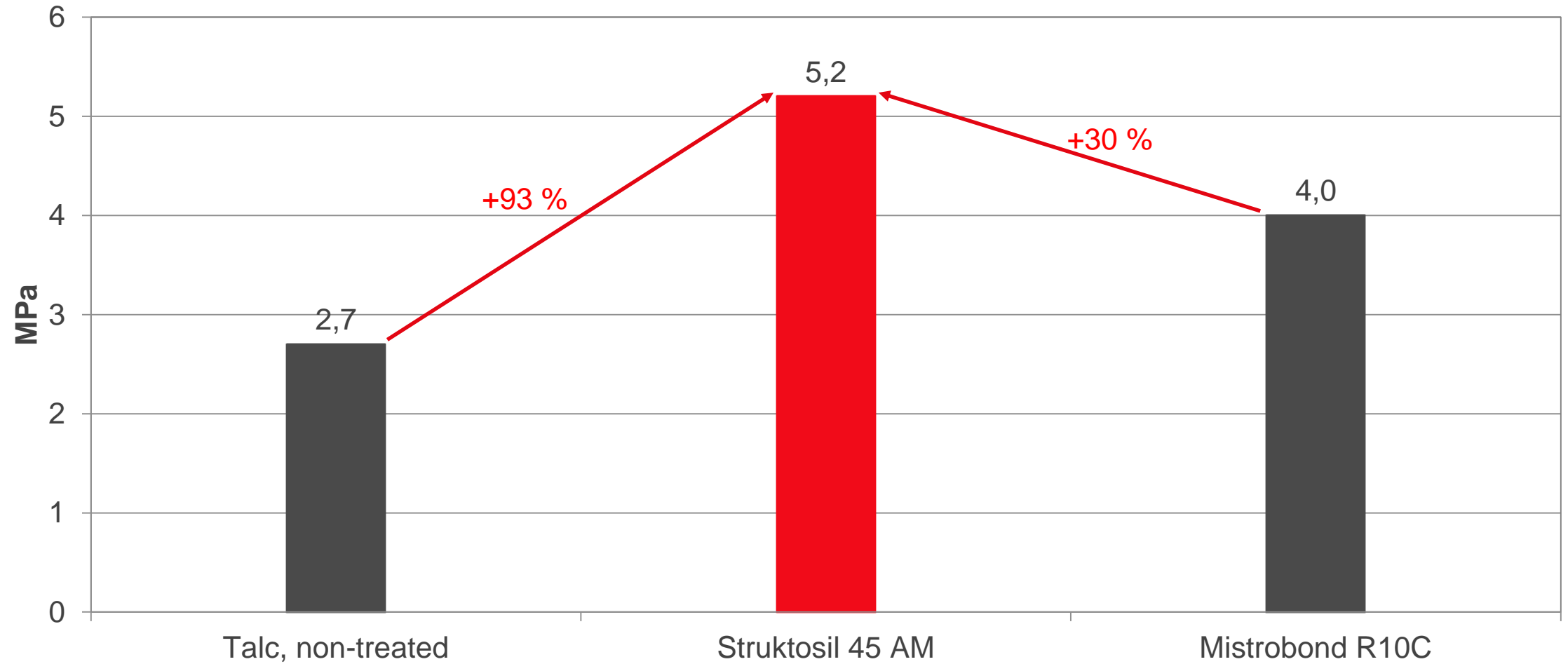
168 h / 95 °C



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