

Progress beyond

High Performances Silica combination

to afford low CO₂ emission and extended lifetime for the **Hybrid and Electrical Vehicles**

Tire Tech 2022 - May 18th-20th, Hannover Dr. Thomas Chaussée, Global Application Lab Manager







+20% wear: More severe on tread due to local load Enhanced handling performance: More load on internal parts

More Torque at acceleration

Better Tear Resistance: More strain/stress applied on tread More Grip: faster acceleration

This leads to **new tire construction** with additional compound to increase bead/sidewall stiffness

page 2

What does it mean in terms of compound properties ?

Tire part	Tire property	Lab descriptor	
Sidewall	Higher stiffness	E'	
Belt / Carcass	Higher stiffness	E'	
Tread	Higher stiffness	E'	
Tread	More severe wear	TSxEB, DIN	
Tread	More tear	Tear strength	
Tread	Better Grip	$tan(\delta)/E'$	

ر لر کے

In the same time Rolling Resistance remains a must have since it support better autonomy to eV

Stiffness, tear and mechanical performance enhancement are usually a tradeoff when changing raw materials

Can we define some alternatives

Ways to globally improve wear & Rolling resistance by using modified compounds ?

How to improve wear & Rolling Resistance together ?

Solvay

RRC CONTRIBUTION OF TIRE PARTS (%)

Reducing RRC indicators in internal parts by over 30% is similar to a 15% improvement in tread and easily available using existing silica replacing partially CB

	GR/C		impro	ves r	
	ъ <u>г</u>				
	REF N550	Z1085GR 30phr	Z1085GR 35phr	Z1085GR 40phr	
NR		5	0		
BR CB 24		50			
N550	60	20	20	20	
Zeosil 1085GR		30	35	40	
TESPT		2	2,3	2,7	
Oil Nytex 4700	13				
ZnO	3				
Stearic Acid	1,5				
6PPD	3				
Tack resin SP1068	5				
Sulfur	2				
TBBS	1,05	1,6-2	1,8	1,6-2	
DPG	0.3		0.8		

Silica for PCT Sidewall Zeosil 1085GR/CB mix improves RRC & dynamic stiffness

Better RRc by 6-7%, ~ 0,5 in RRc

SOLVAY

Silica for PCT Belt Premium 200MP/CB mix improves RRC & dynamic stiffness

	REF	200MP 10phr	200MP 45phr
NR	100	100	100
N220	60	50	15
Premium 200MP		10	45
NYTEX 4700	2	2	2
TMQ	1	1	1
6PPD	1	1	1
TESPT	0	1,4	6,3
Cobalt	0,3	0,3	0,3
Adhesion system	Adhesion system Adjusted		
Vulcanization Package Adjusted			

- Slightly higher Adhesion to metal
- Lower viscosity (extrusion)
- Equal or higher mechanical properties

SOLVAY

Tire tread compounds optimisation Formulation design & mixing process

Ingredients	Zeosil 1165MP	Premium 200MP	Zeosil HRS1200MP	Zeosil HRS1200MP	Premium SW		
FsSBR	80						
BR	20						
Silica	80	80 80 69 75 70					
Silane TESPT	6.4	9.6	6.9	7.5	10.5		
TDAE	25	30	30	35	38		
Stearic Acid	2						
N330	3						
ZnO	1,2						
6PPD	2,5						
Sulfur	1						
CBS	1.5						
DPG	2	2.5	2.3	2.3	2.7		

PROCESS

NP1 : 3'30 total cycle time 2' silanization plateau Dump temperature: 155 °C

NP2 : 4' total cycle time Dump Temperature: 155 °C

NP3 : Acceleration: Open mill

Tire tread compounds optimisation Mechanical properties: Tread wear

H

HRS1200MP Best in class tear strength & TSxEB showing potential in tread wear

뜈

Premium SW

Improved tear strength & TSxEB versus Zeosil 1165MP

Potential in wear/Tear

HRS1200MP: +20% / +10% Premium SW: +10 / +5%

Tire tread compounds optimisation Dynamic properties: Rolling resistance – shear, 10Hz, 40°C

Tire tread compounds optimisation Dynamic properties: Wet braking

Silica	Zeosil 1165MP	Premium 200	Zeosil HRS 1200MP		Premium SW
Hardness	64	63	65	67	63
G*12%, 0°C, shear, 10Hz (MPa)	3.2	3.1	3.4	3.7	3.2
Tan δ 10% 0°C, shear, 10Hz	0.59	0.55	0.60	0.61	0.57
Tan δ max 0°C, shear, 10Hz	0.62	0.56	0.64	0.67	0.57
Tan δ 0°C, tensile, 5% +/-0.5%, 50Hz	0.6	0.63	0.56	0.47	0.58

HRS1200MP Better tan δ shear Worst tan δ tensile

Ŕ

Potential in Wet braking HRS1200MP: 0% Premium SW: 0%

Choosing the right Silica for the right use

All Solvay DMA tests have been performed with Metravib DMA instruments

Progress beyond

Come and see us at booth 3008

ACKNOWLEDGEMENT

Alain Monton, Olivier Badie, Yannick Vaudey, Romain Laplaize, Laurent Guy, Dong-Jim Kim, Natalia Gajos, Cédric Boivin, Jérémy Berthomé, Marie Gaube

solvay.com