

# New reinforcing black and mineral fillers (CBpES) derived from scrap tyres

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CBpEX and CBpES are new grades of black reinforcing fillers in the quality range of the N700 series of Conventional Carbon Blacks, CBc. The CBp proprietary pyrolysis is performed in a sealed low vacuum reactor. The pyrolysed carbon is upgraded by the patented CBp method of fractionating the pyro-carbon agglomerates for a consistent smaller particle size and higher surface areas. The final particle size distribution is bimodal with two maxima at 25 nm and 50 nm. To ensure quality and consistency the homogenous particles are classified by specific gravity into performance and functional CBp grades. Investigations by the EU Recycle Tyre commissioned report [1] determined that the CBp functional fillers can be used in place of N700 series and can also partially replace other low structure N600 conventional carbon black grades.

Table 1: CBpES composition

Carbon	[%]	86,6
Hydrogen	[%]	0,6
Nitrogen	[%]	0,3
Sulfur	[%]	3,0
Minerals	[%]	8,1

Figures 2,3:

CBpES structure [1]

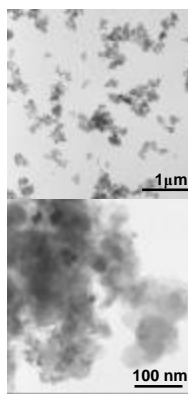
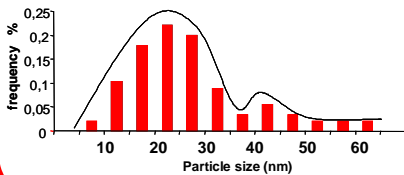


Table 1 shows a typical chemical composition of the CBpES black. By choosing the appropriate feedstock the carbon content can be above 90%.

Figure 1 shows the particle size distribution: The distribution is bimodal and the particle size is app. 20 to 50 nm.

Figures 2 and 3 show the particle and agglomerate structure.

Figure 1: Particle size distribution [1]



Figures 4 - 7 show the physical properties of an EPDM compound with a successive replacement of N765 carbon black by CBpES. The compound composition is given in Table 2.

Fig. 4: Curing properties

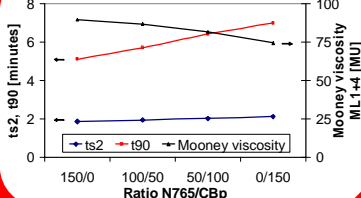


Fig. 5: Stress strain properties

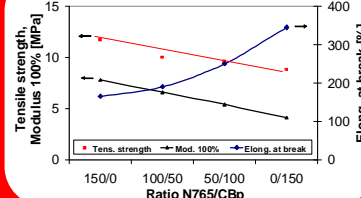


Table 2: Test compound (air duct)

EPDM Keltan 5531A	100	100	100	100
EPDM Buna EP T 4969	100	100	100	100
Carbon black FEF- N550	100	100	100	100
Carbon black SRF- N765	150	100	50	0
<b>Carbon black CBpES</b>	<b>50</b>	<b>100</b>	<b>150</b>	<b>0</b>
Triocetyl trimellitate TOTM	25	25	25	25
Par. oil Sunpar 2280	20	20	20	20
Stearic acid	1	1	1	1
Zinc oxide	10	10	10	10
Antioxidant Naugard 445	2	2	2	2
Rhenogran ZMMBI-50	1	1	1	1
Antiox. Flectol TMQ	2	2	2	2
Acc. Perkacit MBTS	2	2	2	2
Acc. Butyl Tuads	4	4	4	4
Sulphur	2	2	2	2

Fig. 6: Hardness, comp. set

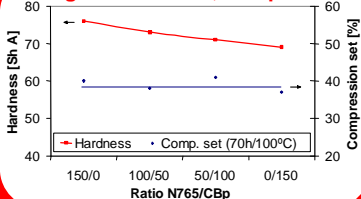
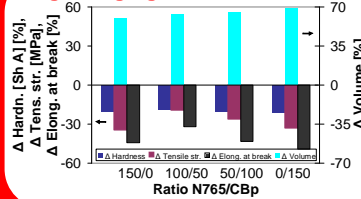


Fig. 7: Aging (fuel C, 2 days, 23°C)



Replacing of N765 by CBpES results in a slight increase in curing time. This effect can be corrected by an adjustment of the curing system. The scorch time is not significantly influenced. The viscosity of the compound decreases with increasing CBpES loadings. Hardness and tensile strength decrease and elongation at break increases. Compression set is not influenced.

In this example of an air duct recipe about 100 phr of the 150 phr in total of N765 can be replaced by CBpES. There are some changes in the property profile but the overall properties of the compound remain good.

[1] J.B. Donnet, A. Santini, R. Schuster, A. Geissler: Assessment of carbon black obtained by pyrolysis from scrap tyres for use in rubber and plastic compounding; paper presented at the International Rubber Conference, May 16-18, 2006; Lyon (France)



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Vacuum Pyrolysis reactor



Oil condensing towers



Moving bed reactor



Vacuum system



Oil recovery system



CBpES recovery system



Heating system