

Elastomers

DUTRAL® EP(D)M

EXPERIMENTAL GRADES FOR AUTOMOTIVE INDUSTRY

APPLICATION

The elasticity
you need



versalis

Dutral® EP(D)M experimental grades for automotive industry



Background

The first synthesis ever of an Ethylene Propylene elastomer copolymer was performed in the late '50s by Prof. Natta and his team based in Ferrara. In 1963, the trademarked product Dutral® was scaled-up to a production of 5 KTPY and eventually the capacity increased to 130 KTPY of NPC in order to support market demand.

Process

The Dutral® EPR is produced by slurry polymerisation process, which allows the production of a wide variety of grades. The process does not require solvent and solvent recovery equipment and, in addition, the low viscosity of the suspension helps temperature control and product handling. Moreover monomers are highly soluble in the reaction bulk, therefore high molecular weight polymers can be produced advantageously.

The polymerisation is carried out by proprietary Ziegler-Natta catalyst and the unreacted monomers are recovered in the stripping section. Eventually, the crumbs are stabilised by means of a proper antioxidant and then washed, dried, baled and packaged.



Dutral®: development of a new catalyst system

After years of internal development Versalis is ready to scale up an improved Z-N catalyst. Traditional Catalyst System is very versatile, able to produce from very low to very high Molecular Weight, from low to high Ethylene and ENB content.

The New Catalyst System keeps the versatility of the traditional one, significantly increases the polymerization yield, improves comonomers addition to obtain better distribution inside the polymer chain, reduces undesired side reactions.

Thanks to the new catalyst system Versalis is now in the position to offer a new Branched Terpolymer family characterized by a new polymer structure to improve processability and increase fillerability.

Dutral®: new Catalyst System benefits

Higher polymerization yield	Cleaner products
Better monomer distribution and side reactions control	Better consistency
	Better curing efficiency
	Gel content: low to none
Widening the polymer design	New polymer structures
	Improved processability

Grade list

Grades	Propylene content %wt	Mooney Viscosity ML (1+4) 125 °C	Unsaturation Level %wt	Oil content %wt	Physical form	Pack. N°	Main Applications
Dutral® TX 1502 (BTR 4049)	40	76	4.5	-	B	1	Automotive compact profiles, building, mechanical goods
Dutral® BTX 6049 (BTR 6049)	40	85	6	-	B	1	Automotive compact profiles, building, mechanical goods
Dutral® BTX 8148 WO (BTR 8148 WO)	39	75	8.5	17	B	1 2	Automotive sponge and solid profiles, building, mechanical goods
Dutral® BTX 9049 (BTR 9049)	39	90	9.5	-	B	3	Automotive sponge and solid profiles, building, mechanical goods

Storage and packaging

Pack. n°	Packaging description	Crate dimension (mm)	Nominal net weight	Bale (bag) weight (kg)	Bale (bag) dimension (mm)	Bales (bags) total	Bales (bags) x layers
1	Cardboard box	1050x1250x1050	625	25	550x350x170	25	5x5
2	Cardboard box	1130x1210x1050	600	25	550x350x220	24	6x4
3	Cardboard box	1000x1200x1850	875	25	550x350x250	35	5x7

Dutral® grades have to be stored in vented, dry areas at temperature between 20 °C and 30 °C, avoiding direct sunlight.

Dutral®TX 1502 and Dutral®BTX 6049: the right choice for compact profiles

Key features

Dutral® TX 1502 and Dutral® BTX 6049 are high molecular weight terpolymers, characterized by tailored molecular structure to improve mixing ability and to obtain high loading capacity, good mechanical properties

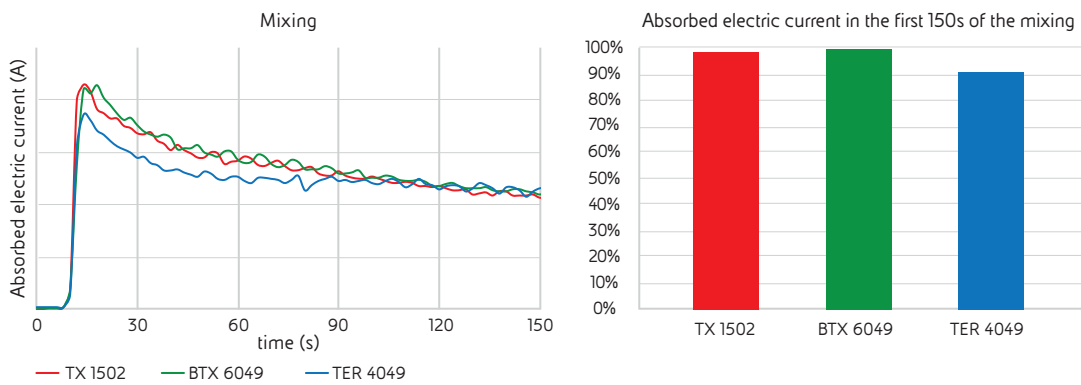
and good collapse resistance.

Dutral® TX 1502 and Dutral® BTX 6049 based compounds exhibit fast extrusion speed, fast curing and high cure state. In particular, Dutral® BTX 6049 vulcanization is boosted by a medium-high diene content.



Compact profile formulation

Ingredient (phr)			
Dutral® TER 4049	100		
Dutral® TX 1502		100	
Dutral® BTX 6049			100
ZnO		5	
Stearic Acid		1	
PEG 4000		5	
CaO		5	
Whiting		25	
FEF N 550		140	
Paraffinic oil		90	
Peroximon F/40		8	
TRIM S		2	
Mooney viscosity			
Polymer ML (1+4) a 125 °C	73	71	85
ML CV (1+4) @ 100 °C	57	50	51
Hardness			
Shore A 3"	55	55	59
Mechanical properties ASTM D412			
M100%	1.2	1.6	2.0
M200%	2.6	3.9	4.8
M300%	4.3	5.9	7.2
T.S. (MPa)	5.9	7.2	9.1
E.B. (%)	460	400	360
Compression set ASTM D395			
24 h 100 °C (%)	13	11	8



The tailor made molecular structure of Dutral® TX 1502 and Dutral® BTX 6049 guarantees a better filler incorporation compared to the linear structure of Dutral® TER 4049.

Dutral® BTX 8148 WO and Dutral® BTX 9049: the best for sponge profiles

Sponge profile is probably the most demanding automotive body sealing application. It requires low Mooney compound and good collapse resistance to allow proper expansion, high cure rate to obtain a perfect skin.

In order to achieve the above-mentioned compound properties, Dutral® BTX 8148 WO and Dutral® BTX 9049 design has been appropriately tuned.

Key features

Dutral® BTX 8148 WO and Dutral® BTX 9049 are tailored molecular structure terpolymers of high diene content. They are characterized by high

loading capacity, easier dispersion of ingredients during mixing, good dimensional stability and low temperature elasticity; the high ENB content ensures a fast curing.

They can be advantageously used in automotive sponge applications.

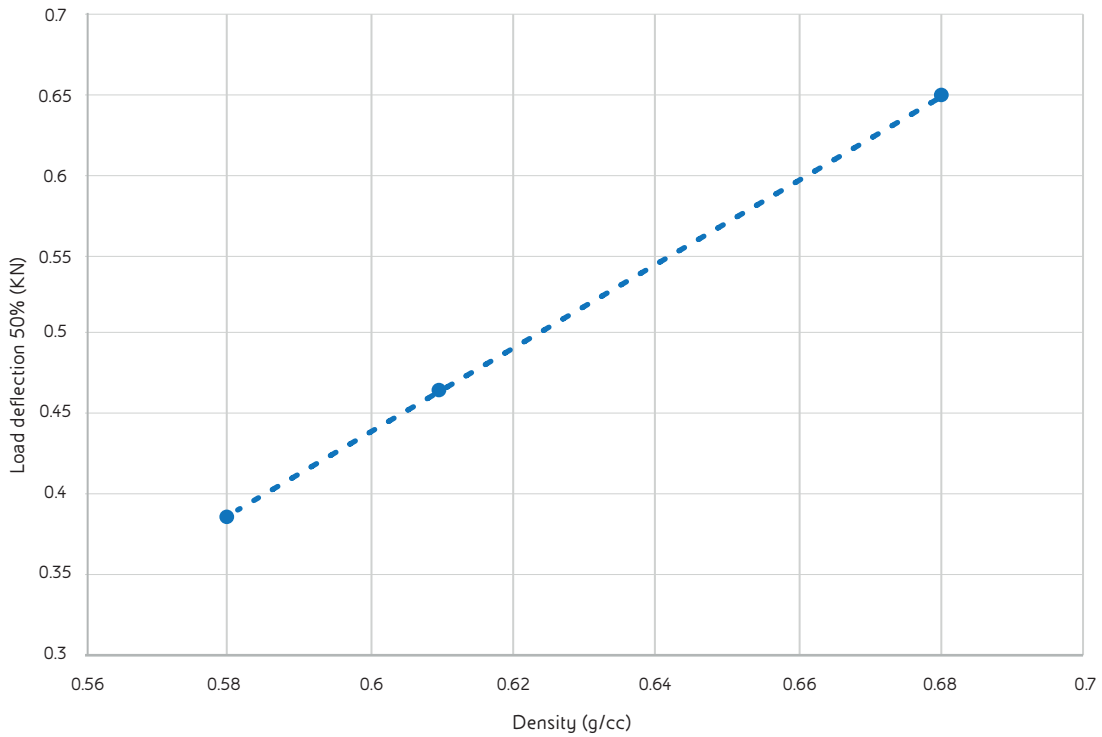
Dutral® BTX 8148 WO is extended with 17% white paraffinic oil.

The tailor made molecular structure of Dutral® BTX 8148 WO and Dutral® BTX 9049 is below compared with the performance of a linear prototype having the following characteristics: ML (1+4) @ 125°C 68 MU, propylene content 39%, ENB content 8.5%, oil extended 17.5%.

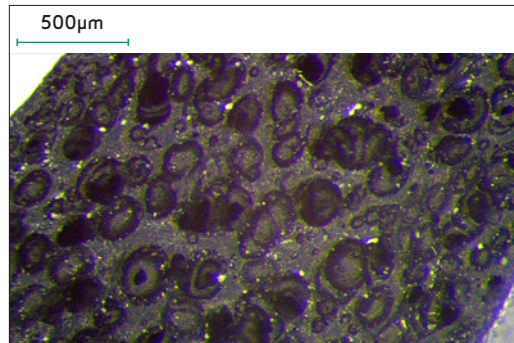
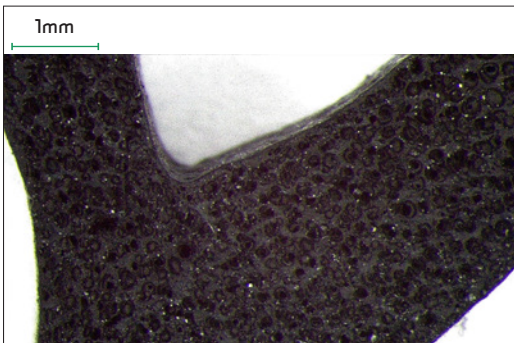
Sponge profile formulation

Ingredients (phr)			
Linear prototype	121		
BTX 8148 WO		120.5	
BTX 9049			100
Spheron 6400A		95	
Paraffinic Oil	64	64.5	85
Socal U1S1		40.0	
ZnO		5.0	
Stearic Acid		1.0	
PEG 4000		3.0	
CaO		2.5	
Sulphur		1.5	
MBTS		1.1	
ZBOP/S		1.8	
ZBEC		0.8	
TBBS		0.6	
TBzTD		0.5	
Geniplex 70		1	
ADC 80		1.5	
OBSH		2.5	
Mooney Viscosity and Scorch Time			
Polymer ML (1+4) @ 125 °C	68	75	90
ML CV (1+4) @ 100 °C	55.2	44.5	35.1
Scorch 121°C - t 5 (min)	4.3	4.7	4.5
Sponge Sample			
Load Deflection 50% (KN)	0.65	0.46	0.39
Density (g/cc)	0.68	0.61	0.58

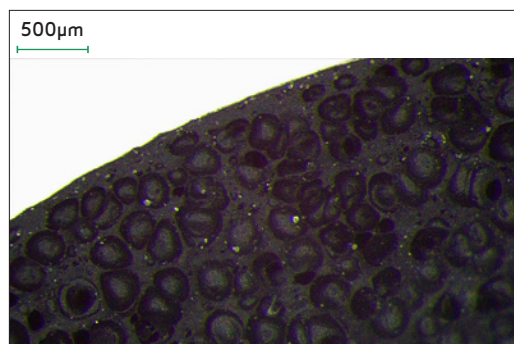
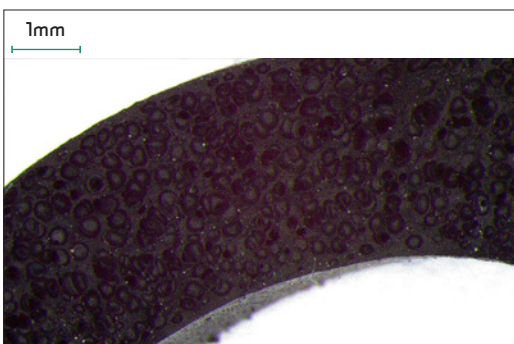
Compression Load Deflection



The tailor made molecular structure of Dutral® BTX 8148 WO and Dutral® BTX 9049 effectively reduces the mooney compound and this is beneficial for proper closed cells formation. Indeed the density of sponge samples made with Dutral® BTX grades is lower than that of the linear prototype, which brings to lower load deflection results.



Sponge profile made with Dutral® BTX 9049



Sponge profile made with Dutral® BTX 8148 WO

Dutral® BTX 9049: a physical form to help processing

Thanks to our experience in producing the Easy Processing (EP) form for semi-crystalline grades, we applied the same strategy to improve Dutral® BTX 9049 processability.

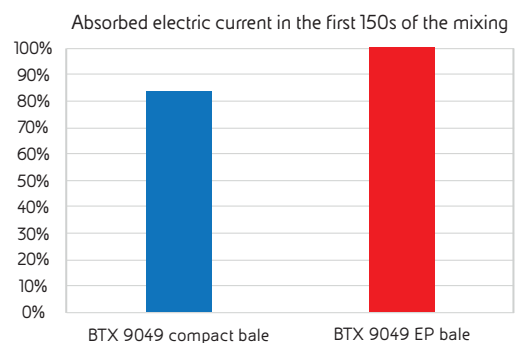
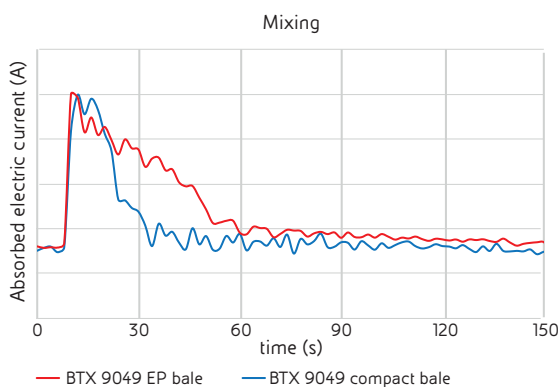


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Mixing cycle

Mixer	Banbury
Capacity	1.6 L
Inizial temperature	70°C
Fill Factor	75%
Rotor speed	55 rpm
Cycle type	UPD 5'

Compound recipe (phr): polymer 100, filler 190, oil 95, processing aids 16, curing agents 8.



BTX 9049 in Easy Processing bale form absorbs almost 20% more than in compact bale form. It means better filler incorporation and the possibility to shorten mixing cycles.



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