

Model formula for Exxon™ chlorobutyl 1066 based tire innertube: low permeability

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Innertubes formulated with 100 PHR Exxon™ chlorobutyl maximize the air barrier properties of the innertube ensuring the best performance and reducing time and energy of tire maintenance.

Material	Units	Amount
Exxon chlorobutyl 1066	PHR ⁽¹⁾	100.0
Carbon black grade N660	PHR	60.0
High viscosity paraffinic oil	PHR	15.0
Magnesium oxide	PHR	0.15
Stearic acid	PHR	1.0
Zinc oxide	PHR	5.0
Zinc dibenzyl dithiocarbamate (ZBEC)	PHR	2.0
Sulfur	PHR	0.5
Total (PHR)		183.65

Properties	Test method based on	Units and conditions	Typical values ⁽²⁾
Mooney viscosity ML (1+4) at 100°C	ASTM D1646	MU, 100°C	50
Mooney scorch (tested at 125°C)	ASTM D1646		
Minimum viscosity	ASTM D1646	MU	49
Time to 5pt rise	ASTM D1646	minutes	18.2
Time to 10pt rise	ASTM D1646	minutes	20.6
MDR rheometer	ASTM D5289	160°C; 30 minutes; 0.5 deg. arc	
M _l (minimum torque)	ASTM D5289	dNm	1.5
M _h (maximum torque)	ASTM D5289	dNm	6.8
M _h - M _l (delta torque)	ASTM D5289	dNm	5.3
Tc ₁₀ (time to 10% torque increase)	ASTM D5289	minutes	1.0
Tc ₅₀ (time to 50% torque increase)	ASTM D5289	minutes	2.3
Tc ₉₀ (time to 90% torque increase)	ASTM D5289	minutes	10.0
Cure rate (peak rate)	ASTM D5289	dNm/min	1.8

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Properties	Test method based on	Units and conditions ⁽²⁾	Typical values ⁽³⁾
MDR rheometer	ASTM D5289	180°C; 30 minutes; 0.5 deg. arc	
M _l (minimum torque)	ASTM D5289	dNm	1.2
M _h (maximum torque)	ASTM D5289	dNm	9.6
M _h - M _l (delta torque)	ASTM D5289	dNm	8.4
Tc ₁₀ (time to 10% torque increase)	ASTM D5289	minutes	0.6
Tc ₅₀ (time to 50% torque increase)	ASTM D5289	minutes	1.3
Tc ₉₀ (time to 90% torque increase)	ASTM D5289	minutes	2.9
Cure rate (peak rate)	ASTM D5289	dNm/min	5.2
Stress strain properties		cure time ³ 12 minutes at 160°C	
Tensile strength	ASTM D412	MPa	10.1
Elongation at break		%	530
Modulus 100%		MPa	1.2
Modulus 200%		MPa	3.1
Modulus 300%		MPa	5.6
Energy to break		joules	7.5
Tear strength (die B)	ASTM D624	kN/m	34.0
Hardness	ASTM D2240	shore A	43
Fatigue to failure (cycles)	ExxonMobil method	kilo cycles at 136% strain	100.0
Oxygen permeability coefficient at 40°C	ExxonMobil method	cc*mm (m ² -day-mmHg)	0.53

1. Parts per hundred rubber.

2. Values given are typical and should not be interpreted as a specification.

3. Samples cured Tc 90 + 2 at 160°C.

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