ExxonMobil

Model formula for farm tire innerliner
Exxon™ bromobutyl 2222, natural rubber, SBR blend

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Exxon™ bromobutyl is readily blended with other materials to improve processibility or take advantage of material properties from other types of rubber.

Material	Units	Amount
Exxon bromobutyl 2222	PHR (1)	60.00
Natural rubber SMR 20	PHR	20.00
Styrene butadiene rubber (IISRP 1712)	PHR	27.50
Carbon black grade N660	PHR	35.00
Waterwashed clay	PHR	35.00
Naphthenic oil	PHR	8.00
Aromatic and aliphatic hydrocarbon resin blend	PHR	7.00
Phenolic tackifying resin	PHR	4.00
Magnesium oxide	PHR	0.15
Stearic acid	PHR	2.00
Zinc oxide	PHR	3.00
Sulfur	PHR	0.50
N-t-butyl-2-benzothiazole sulfenamide (TBBS)	PHR	1.50
Zinc isopropyl xanthate (ZIX)	PHR	0.25
Total (PHR)		**203.90**

Properties	Test method based on	Units and conditions (2)	Typical values (3)
Mooney viscosity ML (1+4) at 100°C	ASTM D1646	MU, 100°C	31.2
Mooney scorch	ASTM D1646	at 125°C	
Minimum viscosity		MU	12.5
Time to 5pt rise		minutes	22.8
Time to 10pt rise		minutes	29.5
MDR rheometer	ASTM D5289	160°C; 30 minutes; 0.5 deg. arc	
Minimum torque ML		dNm	0.7
Maximum torque MH		dNm	4.1
MH - ML		dNm	3.4
Ts2		minutes	3.4
Tc'50		minutes	8.0
Tc'90		minutes	15.7
Peak rate		dNm/min	0.5

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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	
Ml (minimum torque)		dNm	0.6
Mh (maximum torque)		dNm	3.8
Mh -Ml (delta torque)		dNm	3.2
Tc_{10} (time to 10% torque increase)		minutes	1.3
Tc_{50} (time to 50% torque increase)		minutes	2.4
Tc_{90} (time to 90% torque increase)		minutes	4.2
Cure rate (rate at tc50)		dNm/min	1.9
Cure time		25 minutes at 160°C	
Tensile strength	ASTM D412	MPa	9.8
Elongation at break	%	%	812
Modulus 100%	MPa	MPa	1.2
Modulus 200%	MPa	MPa	2.0
Modulus 300%	MPa	MPa	2.9
Energy to break		joules	9.6
Tear strength (die B) peak load	ASTM D624	KN/m	75.9
Tear Strength (die B) mean			44.4
Hardness	ASTM D2240	shore A	43.7
Rebound	DIN53512	%, 23°C	15.9
Fatigue to failure (cycles)	ExxonMobil method	cycles at 134% strain	173389
Mocon oxygen permeability coefficient		cc*mm (m^2-day-mmHg) at 60°C	1.36
ARES dynamic properties at 0°C	ExxonMobil method	1% strain, 1.0 Hz.	
G'		MPa	6.16
G"	MPa	MPa	1.80
Tan_delta			0.29
ARES dynamic properties at 60°C		1% strain, 1.0 Hz.	
G'		MPa	1.88
G"		MPa	0.43
Tan_delta			0.23
ARES dynamic properties at 0°C	ExxonMobil method	1% strain, 10.0 Hz.	
G'		MPa	8.22
G"		MPa	3.80
Tan_delta			0.46
ARES dynamic properties at 60°C	1% strain, 10.0 Hz.		
G'		MPa	2.28
G"		MPa	0.57
Tan_delta			0.25

1. Parts per hundred rubber.
2. Samples cured 14 minutes at 160°C.
3. Values given are typical and should not be interpreted as a specification.

Contact your ExxonMobil Chemical representative for more information:
butylrubber.com

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