General information

Designation

Nitrile rubber / Acrylonitrile butadiene copolymer (NBR) : 25-33% carbon black filled, 5-10% oil/plasticizer

Tradenames

Buna-N, Perbunan, Krynac, Baymod N, NBR Nipol, Breon, Chemigum, Europrene N, Hycar, Nysyn, KER, Humex, JSR, Kosyn KNB, Nitriflex N, Arnipol, Chemaprene, Paracril, Polyblack

Typical uses

Automotive, seals, fuel and oil hose,

Composition overview

Compositional summary

Copolymer of 50-82% butadiene and 18-50% acrylonitrile (ACN), (CH2CH=CHCH2)n, (CH2CH(CN))m. Most common ACN content is 32-35%.
Properties on this datasheet are for a representative compound with NBR (34% ACN), 25-33% carbon black, 5-10% plasticizer.

Material family	Elastomer (thermoset, rubber)		
Base material	NBR (Nitrile butadiene rubber)		
% filler (by weight)	25	-	33	%
Filler/reinforcement	Carbon		
Filler/reinforcement form	Particulate		
Additive	Plasticizer/oil		
Polymer code	NBR-CD30-P		

Composition detail (polymers and natural materials)

Polymer	57	-	70	%
Plasticizer/oil	5	-	10	%
Carbon (powder)	25	-	33	%

Price

Price	* 2.57	-	3.24	USD/kg
Price per unit volume	* 2.86e3	-	3.62e3	USD/m^3

Physical properties

Density	1.11e3	-	1.12e3	kg/m^3

Mechanical properties

Young's modulus	0.0049	-	0.008	GPa
Yield strength (elastic limit)	15	-	25	MPa
Tensile strength	15	-	25	MPa
Tensile stress at 100% strain	1.4	-	3.5	MPa
Tensile stress at 300% strain	10	-	15	MPa

Elongation	350	-	700	% strain
Elongation at yield	350	-	700	% strain
Compressive modulus	* 0.0049	-	0.008	GPa
Compressive strength	* 18	-	30	MPa
Flexural modulus	0.0049	-	0.008	GPa
Flexural strength (modulus of rupture)	* 27.9	-	42.8	MPa
Shear modulus	0.0016	-	0.0027	GPa
Bulk modulus	* 1.5	-	2	GPa
Poisson's ratio	0.48	-	0.495	
Shape factor	1.6			
Hardness - Vickers	* 5	-	8	HV
Hardness - Shore D	* 19	-	25	
Hardness - Shore A	65	-	75	
Fatigue strength at 10^7 cycles	* 6	-	10	MPa
Mechanical loss coefficient (tan delta)	* 0.1	-	0.2	
Compression set at 23℃	* 5	-	15	%
Compression set at 70℃	* 5	-	15	%
Compression set at 100℃	17	-	56	%
Tear strength	* 30	-	50	N/mm

Impact & fracture properties

Fracture toughness	0.241	-	0.396	MPa.m^0.5
Impact strength, notched 23 ℃	590	-	600	kJ/m^2
Impact strength, notched -30 ℃	* 590	-	600	kJ/m^2

Thermal properties

Glass temperature	-40	-	-30	℃
Maximum service temperature	110	-	120	℃
Minimum service temperature	-30	-	-20	℃
Thermal conductivity	* 0.2	-	0.6	W/m.℃
Specific heat capacity	* 1.5e3	-	1.7e3	J/kg.℃
Thermal expansion coefficient	* 180	-	200	µstrain/℃

Electrical properties

Electrical resistivity	1e10	-	1e16	µohm.cm
Galvanic potential	0.07	-	0.15	V

Magnetic properties

Magnetic type	Non-magnetic

Optical properties

Transparency	Opaque

Critical materials risk

Contains >5wt% critical elements?	No

Absorption & permeability

Water absorption @ 24 hrs	* 0.05	-	0.2	%
Permeability (O2)	* 36	-	150	cm³.mm/m².day.atm

Processing properties

Polymer injection molding	Acceptable
Polymer extrusion	Acceptable
Polymer thermoforming	Unsuitable

Durability

Water (fresh)	Excellent
Water (salt)	Excellent
Weak acids	Acceptable
Strong acids	Unacceptable
Weak alkalis	Excellent
Strong alkalis	Excellent
Organic solvents	Limited use
Oils and fuels	Acceptable
Oxidation at 500C	Unacceptable
UV radiation (sunlight)	Good
Flammability	Highly flammable

Primary production energy, CO2 and water

Embodied energy, primary production	* 118	-	130	MJ/kg
CO2 footprint, primary production	* 2.92	-	3.22	kg/kg
Water usage	* 101	-	112	l/kg

Processing energy, CO2 footprint & water

Polymer molding energy	* 16.3	-	18	MJ/kg
Polymer molding CO2	* 1.31	-	1.44	kg/kg
Polymer molding water	* 11.6	-	17.4	l/kg
Grinding energy (per unit wt removed)	* 4.43	-	4.9	MJ/kg
Grinding CO2 (per unit wt removed)	* 0.333	-	0.368	kg/kg

Recycling and end of life

Recycle	✖
Recycle fraction in current supply	0.1	%

Values marked * are estimates.
No warranty is given for the accuracy of this data

Downcycle	✔			
Combust for energy recovery	✔			
Heat of combustion (net)	* 35.7	-	37.5	MJ/kg
Combustion CO2	* 3.09	-	3.24	kg/kg
Landfill	✔			
Biodegrade	✘			

Notes

Other notes

Strengths: Resistance to aliphatic hydrocarbon oils and fuels up to 100-120 C. Wear resistance, resilience.
Limitations: Weathering, oxidation/ozone attack, aromatic oils, modest strength.
Effect of composition: Acrylonitrile content increases strength, chemical resistance, Tg and heat resistance; it reduces low temperature flexibility, resilience, die swell, and gas permeability. ACN & Tg: 20%, -60C; 34%, -35C; 48%, -10C.

Links

ProcessUniverse
Producers
Reference
Shape