Acrylonitrile-Butadiene (NBR)

Nitrile rubber (NBR) is the general term for acrylonitrile butadiene copolymer. The acrylonitrile content of nitrile sealing compounds varies considerably (18% to 50%) and influences the physical properties of the finished material

The higher the arcylonitrile content, the better the resistance to oil and fuel. At the same time, elasticity and resistance to compression set is adversely affected. In view of these opposing realities, a compromise is often drawn, and a medium acrylonitrile content selected. NBR has good mechanical properties when compared with other elastomer and high wear resistance. NBR is not resistant to weathering and Ozone.

Heat resistance

- Up to 100 °C with shorter life @ 121°C

Cold flexibility

- Depending on individual compound , between -34 °C and -57 °C

Chemical resistance

- Aliphatic hydrocarbons (propane , butane , petroleum oil , mineral oil and grease , diesel fuel , fuel oils) vegetable and mineral oil and greases.
- HFA , HFB and HFC hydraulic fluids.
- Dilute acids, alkali and salt solution at low temperatures.
- Water(special compounds up to 100°C)

Not compatible with :

- Fuels of high aromatic content (for flex fuels a special compound must be used)
- Aromatic hydrocarbons (benzene)
- Chlorinated hydrocarbons (trichloroethylene).
- Polar solvents (ketone , acetone , acetic acid, ethylene-ester)
- Strong acids
- Brake fluid with glycol base.

- Ozone , weather and atmospheric aging.

Carboxylated Nitrile (XNBR)

Carboxylated Nitrile (XNBR) is a special type of nitrile polymer that exhibits tear and abrasion resistance. For this reason, XNBR base material are often specified for dynamic applications.

Heat resistance

- Up to 100 °C with shorter life @ 121°C

Cold flexibility

- Depending on individual compound , between -18 °C and -48 °C

Chemical resistance

- Aliphatic hydrocarbons (propane , butane , petroleum oil , mineral oil and grease , diesel fuel , fuel oils) vegetable and mineral oil and greases.
- HFA , HFB and HFC hydraulic fluids.
- Many dilute acids, alkali and salt solution at low temperatures.

Not compatible with :

- Fuels of high aromatic content (for flex fuels a special compound must be used)
- Aromatic hydrocarbons (benzene)
- Chlorinated hydrocarbons (trichloroethylene).
- Polar solvents (ketone , acetone , acetic acid, ethylene-ester)
- Strong acids
- Brake fluid with glycol base.
- Ozone , weather and atmospheric aging.

Hydrogenated Nitrile (HNBR , HSN)

Hydrogenated Nitrile is a synthetic polymer that results from the hydrogenation of nitrile rubber (NBR). Superior mechanical characteristics, particularly high strength, help reduce extrusion and wear.

Heat resistance

- Up to 150 °C

Cold flexibility

- Down to approximately -48°C

Chemical resistance

- Aliphatic hydrocarbons.
- Vegetable and animal fats and oils.
- HFA, HFB and HFC hydraulic fluids.
- Dilute acids, bases and salt solution at moderate temperatures.
- Water and stream up to 149°C
- Ozone, aging and weathering.

Not compatible with :

- Chlorinated hydrocarbons.
- Polar solvents (ketones , esters and ethers).
- Strong acids.

Ethylene Acrylate (AEM , Vamac)

Ethylene carylate is a terpolymer of ethylene and methyl acrylate with the addition of a small amount of carboxylated curing monomer. Ethylene acrylate rubber is not to be confused with polyacry;ate rubber (ACM).

Heat resistance

- Up to 149 °C with shorther life up to 163°C

Cold flexibility

- Between -29°C and -40°C

Chemical resistance

- Ozone.
- Oxidizing media.
- Moderate resistance to mineral oils.

Not compatible with :

- Ketones.
- Fuels.
- Brake fluids.

Ethylene Propylene Rubber (EPR, EPDM)

EPR copolymer ethylene propylene and ethylene-propylene diene rubber (EPDM) terpolymer are particularly useful when sealing phosphate-ester hydraulic fluids and in brake systems that use fluids having a glycol base.

Heat resistance

- Up to 150 °C (max. 204°C in water and /or steam)

Cold flexibility

- Down to approximately -57 °C

Chemical resistance

- Hot water and stream up to 149 °C with special compounds up to 260°C
- Glycol based brake fluids and silicone-based brake fluids up to 149°C.
- Many organic and Inorganic acids.
- Cleaning agents , sodium and potassium alkalis.
- Phosphate-ester based hydraulic fluids (HFD-R).
- Silicone oil and grease.
- Many polar solvents (alcohols, ketones, esters)
- Ozone, aging and weather resistant.

Not compatible with :

- Mineral oil products(oils, greases and fuels)

Butyl Rubber (IIR)

Butyl(isobutylene , isoprene rubber, IIR) has a very low permeability rate and good electrical properties.

Heat resistance

- Up to approximately 121°C

Cold flexibility

- Down to approximately -59 °C

Chemical resistance

- Hot water and stream up to 121°C .
- Brake fluids with glycol base
- Many acids
- Salt solutions
- Polar solvents (e.g. alcohols, ketones and esters).
- Poly-glycol based hydraulic fluids (HFC fluids) and phosphate-ester bases (HFD-R fluids).
- Silicone oil and grease.
- Ozone, aging and weather resistant.

Not compatible with :

- Mineral oil and grease.
- Fuels.
- Chlorinated hydrocarbons.

Chloroprene Rubber (CR)

Chloroprene was the first synthetic rubber developed commercially and exhibits generally good ozone, aging and chemical resistance. It has good mechanical properties over a wide temperature range.

Heat resistance

- Up to approximately 121°C

Cold flexibility

- Down to approximately -40 °C

Chemical resistance

- Paraffin based mineral oil with low DPI. E.g. ASTM oil No. 1
- Silicone oil and grease.
- Water and water solvents at low Temperatures.
- Refrigerants.
- Ammonia.
- Carbon Dioxide.
- Improved Ozone, weathering and aging resistance compared with nitrile.

Limited compatibility:

- Naphthalene based mineral oil (IRM 902 and IRM 903 oils).
- Low molecular weight aliphatic hydrocarbons (propane , butane , fuel).
- Glycol based brake fluids.

Not compatible with :

- Aromatic hydrocarbons (benzene).
- Chlorinated hydrocarbons (trichloroethylene).
- Polar solvents (ketones , esters, ethers)

Fluorocarbon (FKM)

Fluorocarbon (FKM) has excellent resistance to high temperatures, Ozone , oxygen , mineral oil , synthetic hydraulic fluids, fuels, aromatics and many organic solvents and chemicals. Low temperature resistance is normally not favorable and for static applications is limited to approximately -26 °C although certain compounds are suitable down to -46 °C . Under dynamic conditions, the lowest service temperature is between -15 °C and -18 °C.

Gas permeability is very low and similar to that of butyl rubber. Special FKM compounds exhbit an improved resistance to acids and fuels.

Heat resistance

- Up to 204°C and higher temperatures with shorter life expectancy.

Cold flexibility

- Down to -26 °C (some to -46 °C).

Chemical resistance

- Mineral oil and grease, ASTM oil No. 1 , and IRM 902 and IRM 903 oils.
- Non-flammable hydraulic fluids (HFD)
- Silicone oil and grease.
- Mineral and vegetable oil and grease.
- Aliphatic hydrocarbons (butane , propane , natural gas).
- Aromatic hydrocarbons (Benzene , toluene)
- Chlorinated hydrocarbons (trichloroethylene and carbon tetrachloride).
- Gasoline (including high alcohol content).
- High vacuum.
- Very good ozone, weather and aging resistance.

Not compatible with :

- Glycol based brake fluids.
- Ammonia gas, amines, alkalis.
- Superheated stream.
- Low molecular weight organic acids (formic and acetic acid)

Fluorosilicone (FVMQ)

FVMQ contains trifluoropropyl groups next to the methyl groups. The mechanical and physical properties are very similar to VMQ. However. FVMQ offers improved fuel and mineral oil resistance but poor hot air resistance when compared with VMQ.

Heat resistance

- Up to 177°C max.

Cold flexibility

- Down to approximately -73 °C .

Chemical resistance

- Aromatic mineral oils (IRM 903 oil).
- Fuels.
- Low molecular weight aromatic hydrocarbons (benzene , tolulene).

Perfluoroelastomer (FFKM)

Perfluoroelastomer (FFKM) currently offers the highest operating temperature range, the most comprehensive chemical compatibility, and the lowest off-gassing and extractable levels of any rubber material.

Heat resistance

- Up to 320°C .

Cold flexibility

- -18 °C to -26 °C

Chemical resistance

- Aliphatic and aromatic hydrocarbons.
- Chlorinated hydrocarbons..
- Polar solvents (ketone , ester , ethers).
- Inorganic and Organic acids.
- Water and Steam.
- High vacuum with minimal loss in weight.

Not compatible with :

- Fluorinated refrigerants
- Perfluorinated lubricants (PFPE)

Polyacrylate (ACM)

ACM (acrylic rubber) has good resistance to moniral oil , oxygen and ozone. Water compatibility and cold flexibility of ACM are significantly worse than with nitrile.

Heat resistance

- Up to approximately 177°C .

Cold flexibility

- Down to approximately -21 °C

Chemical resistance

- Mineral oil (engine, gear box, ATF oil).
- Ozone, weather and aging.

Not compatible with :

- Glycol based brake fluid
- Aromatics and chlorinated hydrocarbons.
- Hot water , steam.
- Acids , alkalis, amines.

Polyurethane (AU, EU)

Polyurethane elastomer , as a class , have excellent wear resistance, high tensile strength and high elasticity in comparison with any other elastomers. Permeability is good and comparable with butyl.

Heat resistance

- Up to approximately 82°C .

Cold flexibility

- Down to approximately -40 °C

Chemical resistance

- Pure aliphatic hydrocarbons (propane , butane).
- Mineral oil and grease.
- Silicone oil and grease.
- Water up to 50°C

Not compatible with :

- Ketones , Esters, Ethers, Alcohols , Glycols.
- Hot water, Steam , Alkalis, amines, acids.

Silicone Rubber (Q , MQ , VMQ , PVMQ)

Silicone have good Ozone and weather resistance as well as good insulating and physiologically neutral properties. However, Silicone elastomers as a group, have relatively low tensile strength, poor tear strength and little wear resistance.

Heat resistance

- Up to approximately 204°C special compounds up to 260°C

Cold flexibility

- Down to approximately -54°C special compounds down to 115°C

Chemical resistance

- Animal and vegetable oil and grease.
- High molecular weight chlorinated aromatic hydrocarbons (including flame-resistant insulators ,and coolant for transformers).
- Moderate water resistance.
- Diluted salt solutions.
- Ozone , aging and weather.

Not compatible with :

- Superheated water stream over 121 °C
- Acids and alkalis.
- Low molecular weight chlorinated hydrocarbons (trichloroethylene).
- Hydrocarbon based fuels.
- Aromatic hydrocarbons (benzene , tolulene).
- Low molecular weight silicone oils.

Natural Rubber (NR)

Natural Rubber has many good characteristics. It has high resilience, good compression set, food roll building behavior, and molding properties; very good friction surface, but not a fine smooth surface when ground; high tear strength, low crack growth; usable for ketones and alcohol, and good low temperature properties, Natural Rubber is not recommended for oil and solvent resistance and ozone attacks it.

Heat resistance

- Up to 79°C

Cold flexibility

- -29°C to -51 °C

Chemical resistance

- Dilute acids, Alcohol and dilute alkalis.
- Water resistance

Not compatible with :

- Concentrated Acids, amines
- Animal & Vegetable oils, diester oils,
- Hydrocarbon based fuels.
- Aromatic hydrocarbons (benzene , tolulene).
- Polar solvents (ketones , esters, ethers).

SBR (Styrene Butadiene)

SBR is low cost non-oil resistant material. It has good water resistance and resilience up to 70 durometer; compression set becomes poorer with higher durometer; generally satisfactory for most moderate chemicals and wet or dry organic acids. SBR is not recommended for ozone, strong acids , oils, greases, fats and most hydrocarbons.

Heat resistance

- Up to 107°C

Cold flexibility

- -18°C to -45 °C

Chemical resistance

- Dilute acids
- Weather and Water resistance

Not compatible with :

- Concentrated Acids, amines
- Animal & Vegetable oils, diester oils,
- Hydrocarbon based fuels.
- Aromatic hydrocarbons (benzene , tolulene).
- Polar solvents (ketones , esters, ethers).