Nitrile/Acrylonitrile-Butadiene (NBR)

Trade Name: Chemigum®, NySyn, Hycar®, Paracril®, Krynac®
Temperature Range: -50ºC to 140ºC
Usual Hardness Range: 40-90 Shore A
Density: 0.95-1.35 g/cc
Tensile Strength, Ultimate: 7.0-25.0 MPa
Elongation at Break: 150-750%

Nitrile or Buna-N is the most widely used elastomer in the seal industry. The popularity of nitrile is due to its excellent resistance to petroleum products and its ability to be compounded for service over a temperature range of -50°F to140°C. In addition to its resistance to petroleum oils and aromatic hydrocarbons, NBR is highly resistant to mineral oils, vegetable oils, and many acids. It also has good elongation properties as well as adequate resilience, tensile and compression set.

Properties:

- Nitrile Rubber belongs to the family of unsaturated copolymers of acrylonitrile and butadiene
- The physical and chemical properties of this rubber vary depending on the polymer's composition of acrylonitrile. Different grades are available for this rubber. The higher the acrylonitrile content within the polymer, higher the oil resistance but at the same time, elasticity and resistance to compression set is adversely affected
- It is generally resistant to fuel, aliphatic hydrocarbons and other chemicals
- It can withstand wide range of temperatures
- It has inferior strength and flexibility, compared to natural rubber
- Less resistant to ozone, aromatic hydrocarbons, ketones, esters and aldehydes
- High resilience and high wear resistance but only moderate strength
- Limited weathering resistance
- It can generally be used down to about -50ºC, but special grades can also operate at lower temperatures

Applications:

NBR is considered the workhorse of the rubber products of the automotive and industrial industries. By selecting an elastomer with the appropriate acrylonitrile content in balance with other properties, NBR is used in a wide variety of application areas requiring oil, fuel, and chemical resistance. In the automotive area, NBR is used in water handling applications and in fuel and oil handling hose, seals and grommets. With a temperature range of -50ºC to 140ºC, NBR materials can withstand all automotive applications. This form of synthetic rubber because of its resilience is the perfect material for disposable lab, cleaning, and examination gloves.

On the industrial side NBR is used for:

- Roll Covers
- Hydraulic Hoses
- Conveyor Belts
- Graphic Arts
- Oil Field Packers
- Seals for all kinds of Plumbing and Appliance applications
- Injection or Transfer Molded Products
- Extruded Hose or Tubing
- Calendered Sheet Goods (floor mats and industrial belts)
- Various Sponge Articles

Carboxylated Nitrile (XNBR)

Trade Name: Krynac ®, Nipol®, Paracril®, Nysyn®

Temperature Range: -30ºC to 150ºC
Usual Hardness Range: 40-95 Shore A
Density: 0.98-1.00 g/cc
Tensile Strength, Ultimate: 8-23 MPa
Elongation at Break: 200-725%

Carboxylated Nitrile, or XNBR, is a specialty type of Nitrile rubber which, inherently, has outstanding abrasion resistance and toughness. Chemically it is a Nitrile rubber but modified in the polymerization stage to contain Carboxylic acid groups as an additional curing site, which yields the extra strength characteristics.

The insertion of an acidic group gives the rubber special properties such as:

- Extra cross-linking
- Better tensile properties
- Higher continuous service temperature
- Chemical resistance
- Very good hardness/density balance

Properties:

- Exceptional abrasion resistance
- Cost effective when compared to Neoprene and Polyurethane
- Good resistance to aliphatic type chemicals
- Easy to work with
- Suitable for use in water
- Resists "chunking" in severe mechanical applications
- Excellent alcohol and Paraffinic Hydrocarbons resistance
- It can resist temperatures up to 150°C
- It can be used as an alternative to traditional NBR in harsher application conditions

Applications:

- V- Belts
- High Abrasion Resistance Shoes
- O-rings
- Printing Rolls
- Rice Dehusking Rolls
- Rod Seals
- Rod Wipers
- Oil Extraction Industry Artifacts
- Other Technical Goods

Ethylene Acrylate (AEM

Trade Name: Vamac®
Temperature Range: -40ºC to 160ºC
Usual Hardness Range: 40-85 Shore A
Density: 1.26-1.53 g/cc
Tensile Strength, Ultimate: 8.30-21.04 MPa
Elongation at Break: 139-250%

Ethylene acrylate is a mixed polymer of ethylene and methyl acrylate with the addition of a small amount of carboxylated curing monomer. It is commercially known as Vamac®. Ethylene acrylic elastomer (AEM) products are a comprehensive family of heat and fluid resistant elastomers for flexible applications ranging from hoses, dampers and boots to seals and gaskets. It provides significant performance advantages over low temperature ACM and HNBR grades, including better low temperature resistance and high temperature performance up to 160°C. Compared to HNBR substantial cost savings can be achieved with the use of AEM.

Properties:

- High-temperature durability
- Good oil resistance with service lubricants
- Excellent water resistance
- Good low-temperature flexibility
- Outstanding ozone/weather resistance
- Good mechanical strength
- Very good compression set
- Good flex resistance
- Vibration-damping consistency
- Low permeability to many gases
- Non-halogen, low smoke emissions

Applications:

- Seals
- Gaskets
- Hoses
- Tubes
- Parts for automotive and other industrial uses
- Potential automotive seal and gasket applications include powertrain, rocker cover and bonded piston seals.
- Potential hose and tube uses include components for oil coolant, power steering, coolant, crankcase ventilation and coverings for fuel hoses.
- O-rings
- Grommets
- Dampers
- Rubber Boots

Ethylene Propylene Rubber (EPM, EPDM)

Trade Name: Vistalon®, Epsyn®, Fpcar®, Royalene®, Nordel®
Temperature Range: -45ºC to 150ºC
Usual hardness Range: 30-90 Shore A
Density: 0.86-1.35 g/cc
Tensile Strength, Ultimate: 6.00-18.00 MPa
Elongation at Break: 150-500%

EPM is a copolymer of ethylene and propylene. Ethylene- propylene diene rubber (EPDM) is produced using a third monomer and is particularly useful when sealing phosphate-ester hydraulic fluids and in brake systems that use fluids having a glycol base.

Properties:

- Excellent resistance to atmospheric ageing and oxygen
- Good ozone resistance
- Good resistance to most water-based chemicals
- Good resistance to vegetable-based hydraulic oils
- Very poor resistance to mineral oils and di-ester based lubricants
- It has stable, saturated polymer backbone structure
- Excellent resistance to heat
- Good electrical resistivity
- The EPM or EPDM rubber is also resistant to polar solvents like water, acids, alkalis, phosphate esters and many ketones and alcohols

Application:

Since EPM or EPDM rubber does not crack outdoors, it is widely used for seals in buildings and in the automotive industry. Some other applications are steam hose, high temperature resistant seals and roll covers. Polymerization and catalyst technologies in use today provide the ability to design EPM to meet specific and demanding application and processing needs.

This has resulted in broad usage in following industries:

- Automotive weather-stripping and seals
- Glass-run Channel
- Radiator
- Garden and Appliance Hose
- Tubing
- Belts
- Electrical Insulation
- Roofing Membrane
- Rubber Mechanical Goods
- Plastic Impact Modification
- Thermoplastic Vulcanizates
- Motor Oil Additive Applications

Butyl Rubber (IIR)

Trade Name: Bucar Butyl, Exxon Butyl, Polysar Butyl
Temperature Range: -65ºC to 105ºC
Usual Hardness Range: 40-90 Shore A
Density: 0.92-1.35 g/cc
Tensile Strength, Ultimate: 7.00-18.00 MPa
Elongation at Break: 250-800%

Butyl (isobutylene, isoprene rubber, IIR) is produced by many companies in different types and varies widely in isoprene content. Isoprene is necessary for proper vulcanization. The primary attributes of butyl rubber are excellent impermeability/air retention and good flex and electrical properties. The first major use of butyl rubber was Tire inner-tubes, and this continues to be a significant market today.

Properties:

- It consists of isobutene with a minor part of isoprene. The isoprene helps the rubber to unsaturate and possible to vulcanize
- Generally for all rubber types, the gas permeability increases with increased temperature but for butyl rubber it is very low, up to 70 -75ºC.
- Low glass transition temperature
- It displays high damping at ambient temperatures
- Good ozone resistance
- This rubber also has good weathering, heat, and chemical resistance
- Good impermeability and stability
- It is not suitable for use in contact with mineral oils

Applications:

- Butyl Rubber when added in small amounts to the lubricating oils used in machining results in a significant reduction in the generation of oil mist and thus reduces the operator's inhalation of oil mist. It is also used to clean up waterborne oil spills.
- As a fuel additive, butyl rubber or so called polyisobutylene has detergent properties. When added to diesel fuel, it resists fouling of fuel injectors, leading to reduced hydrocarbon and particulate emissions.
- Butyl rubber sealant is used for rubber roof repair and for maintenance of roof membranes
- Gas Masks and Chemical Agent Protection
- Butyl rubber is one of the most robust elastomers when subjected to chemical warfare agents and decontamination materials. It is a harder and less porous material than other elastomers such as natural rubber or silicon, but still has enough elastic quality to create an airtight seal.
- Automobile Tires
- Rubber Tubes
- Stoppers for medicine bottles and pharmaceuticals
- O-rings
- Joint replacements (biomedical)
- Tank and pond liners

Butadiene Rubber (BR)

Trade Name: Butadiene
Temperature Range: -70ºC to 70ºC
Usual Hardness Range: 40-80 Shore A
Density: 0.64-0.91 g/cc
Tensile Strength, Ultimate: 10-15 MPa
Elongation at Break: 200-400%

Butadiene rubber is supposed to be the most elastic rubber type. The chemical name of this rubber is Polybutadiene. This rubber is polymerized butadiene and usually used in combination with other rubber types. Butadiene (BR) is mostly used in combination with other rubbers to improve cold flexibility and wear resistance. BR is primarily used in the tire industry, for some drive belts and conveyor belts and is not suitable as a sealing compound.

Properties:

- High Elasticity
- Low temperature suitability
- Good wear resistance
- Low hysteresis
- Good flexibility at ambient temperatures
- High abrasion resistance in severe conditions
- Low rolling resistance

Applications:

- Polybutadiene is largely used in various parts of automobile tires. Its use in the tread portion of giant truck tires helps to improve the abrasion, i.e. less wearing, and to run the tire comparatively cool, since the internal heat comes out quickly.
- In the sidewall of truck tires, the use of polybutadiene rubber helps to improve fatigue to failure life due to the continuous flexing during run. As a result, tires will not blow out in extreme service conditions.
- Polybutadiene rubber may be used in the inner tube of hoses for sandblasting, along with natural rubber. The main idea is to increase resilience. This rubber can also be used in the cover of hoses, mainly pneumatic and water hoses.
- This rubber can also be used in railway pads, bridge blocks, golf balls, etc.
- In car tires, polybutadiene rubber can be used with SBR in the tread portion.
- Polybutadiene rubber can be blended with nitrile rubber for easy processing. However large use may affect oil resistance of nitrile rubber.
- Polybutadiene is used in the manufacturing of the high-restitution toy Super Balls. Due to the High Resilience Property, 100%Polybutadiene Rubber based vulcunizate is used as crazy balls i.e. a ball if you drop from 6th floor of a house it will rebound up to 5 1/2 to 6th floor considering no air resistance.
- Polybutadiene Rubber is blended with Polystyrene to prepare High Impact Polystyrene (HIPS).

Chlorobutyl Rubber (CIIR)

Trade Name: Chlorobutyl
Temperature Range: -50ºC to 125ºC
Usual hardness Range: 50-80 Shore A
Density: 1.11-1.24 g/cc
Tensile Strength, Ultimate: 5-15 MPa
Elongation at Break: `50-450%

Chlorobutyl (CIIR) is produced by chlorinating butyl polymer. Its chlorine content is approximately 1.1% to 1.3%. Apart from the properties of butyl rubber (IIR), chlorobutyl (CIIR) shows improved compression set properties and can be compounded with other materials.

Properties:

- Low permeability to air, gases and moisture
- Vibration damping
- Low glass transition temperature
- Resistance to ageing and to weathering from atmospheric exposure
- Wide vulcanization versatility
- Fast cure rates

Applications:

- Articles needing low permeability to gases and liquids
- Tire Inner Liners
- Hoses
- Seals
- Membranes.
- Pharmaceutical Stoppers
- Rubber articles needing good resistance to chemicals, weathering, and ozone
- Tank linings,
- Conveyor Belts
- Protective Clothing
- Heat-resistant Tubes
- Medical Items

Chloroprene Rubber (CR)

Trade Name: Neoprene®
Temperature Range: -45ºC to 100ºC
Usual Hardness Range: 30-95 Shore A
Density: 1.10-1.50 g/cc
Tensile Strength, Ultimate: 15-28 MPa
Elongation at Break: 100-400%

Chloroprene has excellent resistance to refrigerants, ozone, oxygen, sunlight, and weathering, good resistance to heat and flame, fair resistance to oil, resists flexing and stain, and has low compression set. It has good mechanical properties over a wide temperature range. Chloroprene is not recommended for exposure to water, phosphate,

esters, aromatic hydrocarbons, chlorinated solvents, and ketones. Good resistance to cold and voltage, applied to general commodities.

Properties:

- Good mechanical strength
- High ozone and weather resistance
- Good aging resistance
- Low flammability
- Good resistance toward chemicals
- Moderate oil and fuel resistance
- Adhesion to many substrates
- Polychloroprene can be vulcanized by using various accelerator systems over a varied temperature range
- It is less resistant than natural rubber to low temperature stiffening. But this can be compounded to give improved low temperature resistance
- Suitable for use with mineral oils and greases and dilute acids and alkalis

Applications:

- Raw material for adhesives which can both solvent based and water based.
- Latex applications (gloves)
- Molded Foam
- Molded Goods
- Cables
- Belts
- Gaskets
- Washers
- Rubber Sheets
- Hoses
- Corrosion Resistant Coatings
- Sleeves,
- Orthopedic braces (wrist, knee, etc.)
- Electrical Insulation

Chlorosulfonated Polyethylene (CM, CSM)

Trade Name: Hypalon®
Temperature Range: -30ºC to 120ºC
Usual Hardness Range: 40-95 Shore A
Density: 1.07-1.60 g/cc
Tensile Strength, Ultimate: 21-28 MPa
Elongation at Break: 200-500%

Chlorosulfonated polyethylene is a synthetic rubber based on polyethylene. Chlorosulfonated polyethylene has shown long life in harsh environments and is used in a variety of industrial and automotive applications that require high performance. The polyethylene polymer contains additional chlorine and sulfur groups. Chlorine gives the material resistance to flame and mineral oil and also improves the cold flexibility. It also has excellent resistance to oxygen, ozone and most chemicals, including water but it has poor fuel resistance.

Properties:

- Excellent resistance to oxygen, ozone and most chemicals, including water.
- Poor fuel resistance.
- Low gas permeability.
- Poor compression set resistance which limits its usefulness in dynamic sealing applications.
- Good resistance to weather
- Good abrasion resistance

Applications:

- Adhesives
- Insulation
- Shoe Soles
- Automotive components like high-temperature timing belts, power steering
- Coatings
- Flexible Tubes
- Seals
- Flexible Magnetic Binders
- Industrial products such as hose, rolls, seals, gaskets, diaphragms and lining for chemical processing equipment
- Jacketing and insulation for wire and cable
- Liners and covers for portable water reservoirs
- Variety of protective and decorative coatings

Epichlorohydrin (CO, ECO)

Trade Name: Herclor, Hydrin
Temperature Range: -50ºC to 135ºC
Usual Hardness Range: 40-90 Shore A
Density: 1.31-1.60 g/cc
Tensile Strength, Ultimate: 6.0-15.0 MPa
Elongation at Break: 150-500%

Epichlorohydrin is available in two types: the homopolymer (CO) and the copolymer (ECO). Both CO and ECO have good resistance to mineral oils, fuels and ozone. The high temperature resistance is good. Compression set and the tendency to corrode metal sealing faces increase at 150°C. ECO has a good cold flexibility. CO has a high resistance to gas permeability.

Properties:

- High temperature resistance
- Epichlorohydrin rubber has excellent dynamic properties
- Better heat, oil and petrol resistance than nitrile rubber
- Low gas permeability
- Better low temperature flexibility than NBR
- Excellent resistance to acids, alkalis and ozone
- Good Resilience
- Good Flex Cracking Resistance

Applications:

- Automotive Fuel Systems
- Bladders
- Diaphragms
- Rollers

Fluorocarbon (FKM)

Trade Name: Viton®, Fluorel®
Temperature Range: -20ºC to 200ºC
Usual Hardness Range: 40-90 Shore A
Density: 1.31-1.60 g/cc
Tensile Strength, Ultimate: 6-17 MPa
Elongation at Break: 150-500%

Fluorocarbon (FKM) has excellent resistance to high temperatures, ozone, oxygen, mineral oil, synthetic hydraulic fluids, fuels, aromatics and many organic solvents and chemicals. Gas permeability is very low and similar to that of butyl rubber. Special FKM compounds exhibit an improved resistance to acids, fuels, water and steam.

Properties:

- Excellent resistance to chemical attack by oxidation, by acids and by fuels
- Good oil resistance
- Limited resistance to steam, hot water, methanol, and other highly polar fluids
- It has outstanding heat stability and excellent oil resistance and it is due to the high ratio of fluorine to hydrogen, the strength of the carbon-fluorine bond, and the absence of unsaturation
- Can withstand strong bases and ketones as well as aromatic hydrocarbons, oils, acids, and steam
- Peroxide cured fluoroelastomers have inherently better water, steam, and acid resistance

Applications:

- Aerospace
- O-ring seals in fuels, lubricants
- Seals
- Fuel Hoses
- Fuel Injector O-rings
- In tank and quick connect
- Flue duct exp. Joints
- Valve liners
- Roll covers
- Sheet stock/cut gaskets
- Automotive
- Check valve balls
- Diaphragms
- Military flare binders
- Electrical connectors
- Tire valve stem seals
- Clips for jet engines

- Lathe cut gaskets
- Fuel Tank Bladders

Fluorosilicone (FVMQ)

Trade Name: Silastic®, FE®, FSE®
Temperature Range: -50ºC to 175ºC
Usual Hardness Range: 25-90 Shore A
Density: 1.47-1.51 g/cc
Tensile Strength, Ultimate: 6-10 MPa
Elongation at Break: 150-500%

The mechanical and physical properties of FVMQ are very similar to VMQ. However, FVMQ offers improved fuel and mineral oil resistance but poor hot air resistance when compared with VMQ. Fluorosilicones resist solvents, fuel, and oil (similar to fluorocarbons). They also have high and low temperature stability (as with silicones). Fluorosilicones are resilient, with low compression set characteristics. Though widely used in aerospace fuel systems and auto fuel emission controls, fluorosilicones are really only good as static seals. High friction tendencies, limited strength, and poor abrasion resistance disqualify them from dynamic uses. Fluorosilicone rubber is primarily specified for gasket applications requiring the broad temperature range and age resistance of silicone rubber - along with resistance to fuels, coolants and oils that would damage silicone rubber.

Properties:

- High Resiliency
- Poor Abrasion Resistance
- Good stability at low temperatures
- Good resistance to hydrocarbons, ozone and sunlight
- Good Vibration Dampening
- Excellent Flame Resistance
- Very Low Compression Set
- Low Tear Strength

Applications:

- Extruded Tubes, strips, solid cord or any custom
- O-rings
- Gaskets
- Window and Door Seals
- Expansion Joints
- Cables and Cable Terminations
- Insulation Tubing
- Keyboards and contact mats
- Conductive profiled seals
- Rubber Sheets

Hydrogenated Nitrile (HNBR)

Trade Name: Therban®, Zetpol®, Tornac
Temperature Range: -25ºC to 150ºC
Usual Hardness Range: 50-95 Shore A
Density: 0.95-1.35 g/cc
Tensile Strength, Ultimate: 8.0-24.0 MPa
Elongation at Break: 150-750%

Hydrogenated nitrile is a synthetic polymer that results from the hydrogenation of nitrile rubber (NBR). HNBR is superior to NBR in low brittle temperature, heat, oil, oil additive and sour oil resistance, and is far more resistant to sour gasoline and ozone than NBR. For sealing applications, HNBR has an advantage as it prevents extrusion and wear. HNBR is ideal for industrial products normally made of NBR, and can be used in more severe conditions with much longer service life. This compound is extensively used in R-134A cooling systems. HNBR is not recommended for exposure to ketones, esters, ethers, and aromatic fluids.

Properties:

- Good physical strength and retention of properties after long-term exposure to heat, oil, and chemicals.
- Can be used over a broad temperature range with minimal degradation over long periods of time.
- For low-temperature performance, low ACN grades should be used; high-temperature performance can be obtained by using highly saturated HNBR grades with white fillers.
- As a group, HNBR elastomers have excellent resistance to common automotive fluids (e.g., engine oil, coolant, fuel, etc.) and many industrial chemicals. Like NBR, fluid and chemical resistance improves as the ACN content is increased.
- Excellent heat and oil resistance
- Improved fuel and ozone resistance (approximately 5x) over Nitrile
- Good abrasion resistance
- Increased cold flow with hydrogenation
- Decreased elasticity at low temperatures with hydrogenation over standard Nitrile

Applications:

- A/C Seals and Hoses
- Blow-out Preventors
- High Performance Shoe Soles
- Engine Seals
- Grommets
- Gaskets
- Chevron Seals
- Fuel System Seals and Hoses
- Heat Exchanger Gaskets
- Serpentine (multi-V) belts
- Oil-field Packers
- Suspension Seals
- Paper-mill and Steel-mill Rolls
- Synchronous (timing) Belts
- Rotary Shaft Seals, Piston Seals

Perfluoroelastomer (FFKM)

Trade Name: Kalrez® Aegis®, Chemraz®
Temperature Range: -10ºC to 250ºC
Usual Hardness Range: 35-90 Shore A
Density: 1.85-2.30 g/cc
Tensile Strength, Ultimate: 9-22 MPa
Elongation at Break: 125-225%

Perfluoroelastomers are a type of synthetic rubber having even greater heat and chemical resistance than the fluoroelastomers. Perfluoroelastomers are widely used as seals on semiconductor wafer processing equipment. . The basic disadvantages of this rubber are difficult processing, very high cost, poor physical properties at high temperature, and their high glass transition temperatures which limit their use at low temperatures.

Properties:

- It has extraordinary resistance to harsh chemicals and heat
- They are enable to withstand virtually any process media, including reactive plasmas, at temperatures as high as 250°C
- In plasma and chemical vapor deposition applications, perfluoroelastomers can withstand long term exposure in etching, stripping and cleaning processes
- In wet chemical operations, swelling due to prolonged chemical exposure and poor elastic recovery are frequent causes of seal failure. These inadequacies are eliminated in perfluoroelastomers
- The reliability of seals made from perfluoroelastomers leads to reduced wafer yield losses and lowered frequency of maintenance and operations disruptions

Applications:

- It is used in highly aggressive chemical processing, semiconductor wafer processing, pharmaceutical, oil and gas recovery, aerospace and petroleum applications
- O-rings
- Diaphragms
- Seals
- Gaskets
- Semi-conductor Industry
- Plasma Applications
- High Temperature Applications

Polyacrylate (ACM)

Trade Name: Hytemp®, Cyanacryl®, Hycar®
Temperature Range: -15ºC to 150ºC
Usual Hardness Range: 50-90 Shore A
Density: 1.09-1.40 g/cc
Tensile Strength, Ultimate: 5.0-14.0 MPa
Elongation at Break: 100-350%

Polyacrylate has outstanding resistance to petroleum fuel and oil, and possesses complete resistance to oxidation, ozone and sunlight, and an ability to resist flex cracking. It's resistance to hot air is slightly superior to nitrile polymers, but strength, compression set and water resistance are inferior to many of the other polymers. The water compatibility

and cold flexibility of ACM are significantly worse than with NBR. It has poor resistance to acids and bases. Acrylic rubber is widely used in automotive transmissions and hoses.

Properties:

- Petroleum fuel and oil resistance
- Resists flex cracking
- Good ozone resistance
- Good heat resistance
- Poor compression set performance relative to NBR
- Lesser water resistance and low temperature performance than some other elastomers
- Polyacrylates exhibit good resistance to cracking when exposed to ozone and sunlight

Applications:

- O-rings
- Rubber Seals
- Custom molded rubber components for automotive transmissions and automotive steering systems
- Automotive Gaskets
- Rubber Hoses

Polyurethane (AU, EU)

Trade Name: Urepan®, Adiprene, Estane, Genthane
Temperature Range: -35ºC to 85ºC
Usual Hardness Range: 50-95 Shore A
Density: 1.15-1.22 g/cc
Tensile Strength, Ultimate: 15.0-35.0 MPa
Elongation at Break: 250-700%

Polyurethane elastomers, 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. Polyurethane exhibits outstanding mechanical and physical properties in comparison with other elastomers, especially in its resistance to oils, hydrocarbon fuels, oxygen, ozone and weathering. Its toughness and abrasion resistance is particularly suitable for seals in systems of high pressures, shock loads and abrasive contamination.

Properties:

- Good Abrasion Resistant
- Excellent Oil and solvent resistant
- Polyurethane has a higher load-bearing capacity than any conventional rubber. Because of this characteristic, it is an ideal material for load wheels, heavy duty couplings, metal-forming pads, shock pads, expansion joints and machine mounts.
- Good Tear Resistance
- Polyurethane has outstanding resistance to oxygen, ozone, sunlight and general weather conditions.
- Excellent noise abatement properties
- Extremely high flex-life and can be expected to outlast other elastomer materials where this feature is an important requirement. Dust boots, bellows, diaphragms, belts, couplings and similar products are made from urethane for this reason.
- Good electrical insulation properties

Applications:

- Belts
- Foams and Metal forming pads
- Wear strips and Diaphragms
- Bumpers and Boots
- Gears
- Bellows
- Machinery mounts
- Cutting Surfaces
- Sound-dampening pads
- Rubber Liners
- Prototype machined parts
- Gaskets and Seals
- Rollers and Roller covers
- Expansion Joints
- Interior components of automobiles, in seats, headrests, armrests, roof liners, dashboards and instrument panels

Silicone Rubber (Q, MQ, VMQ, PVMQ)

Trade Name: Silastic®, Thermoflex®
Temperature Range: -50ºC to 210ºC
Usual hardness Range: 30-90 Shore A
Density: 1.18-1.40 g/cc
Tensile Strength, Ultimate: 4.0-9.0 MPa
Elongation at Break: 400-600%

Silicone elastomers as a group have relatively low tensile strength, poor tear and wear resistance. However, they have many useful properties as well. Silicones have good heat resistance up to 210°C, good cold flexibility down to -50°C and good ozone and weather resistance as well as good insulating and physiologically neutral properties. The characteristic of this rubber is such that it provides the perfect balance of mechanical and chemical properties which is required in today's most demanding applications. Silicone is not recommended for exposure to petroleum fluids, and ketones. It is also not recommended where physical strength or abrasion resistance is required, since it has poor tensile and tear strength.

Properties:

- The outstanding property of this form of rubber is its very wide temperature range. It offers excellent resistance to extreme temperatures, the range of which can be from -50ºC to 210ºC
- Good oil and water resistance
- Because of its compatibility with varied temperature range, the tensile strength, elongation, tear strength and compression set of this rubber can be far superior to conventional rubbers
- It is less susceptible to ozone, UV, heat and other aging factors
- Good resistance to steam
- Good electrical insulation
- It is resistant to chemical/oil/acid/gas resistance
- It has low smoke emission and flame retardant
- High gas permeability

Applications:

- Extruded Tubes, strips, solid cord or any custom
- Shaft Sealing Rings
- Spark Plug Caps
- Radiator and automotive heating hoses
- O-rings
- Gaskets
- Window and Door Seals
- Expansion Joints
- Cables and Cable Terminations
- Insulation Tubing
- Keyboards and contact mats
- Conductive profiled seals
- Bellows
- Footwear

Styrene-Butadiene (SBR)

Trade Name: GRS
Temperature Range: -45ºC to 95ºC
Usual Hardness Range: 30-95 Shore A
Density: 0.95-1.35 g/cc
Tensile Strength, Ultimate: 7.0-28.0 MPa
Elongation at Break: 125-850%

SBR probably is better known under its old names Buna-S and GRS (government rubber styrene.) SBR serves as a replacement for natural rubber. The basic monomers are butadiene and styrene, with styrene content approximately 23.5%. SBR is mostly used in seals for non-mineral oil based brake fluid applications. SBR can be compounded into materials with high tensile strength, high modulus, and high hardness without the use of large amount of fillers; it has good abrasion resistance, and when it is a low styrene and high butadiene compound, it has good flexibility at low temperature. Styrene butadiene is not recommended for exposure to solvents, oils, dieter lubricants, and aromatic hydrocarbons.

Properties:

- This type of rubber is usually very weak unless reinforcing fillers are incorporated. With suitable fillers, this becomes a strong rubber
- It has similar chemical and physical properties like natural rubber
- It has better abrasion resistance than natural rubber
- It has poor fatigue resistance than natural rubber
- Heat resistance is better than natural rubber
- Low temperature flexibility and tensile strength are less than that of natural rubber
- Poor weather resistance
- Poor petroleum oil and solvent resistance
- Good resistance to brake fluids
- Good resistance to water

Applications:

- Tires
- Tubes

- O-rings
- Seals
- Hydraulic Systems
- Diaphragms
- Plumbing Applications
- Mechanical Goods
- Automotive Applications
- Shoe Soles

TEFLON/Tetrafluoroethylene-Propylene (AFLAS)

Trade Name: Aflas™
Temperature Range: -40°C to 260°C
Usual Hardness Range: 50-90 Shore A
Density: 1.51-1.55 g/cc
Tensile Strength, Ultimate: 14.7-19.6 MPa
Elongation at Break: 210-300%

This elastomer is a copolymer of tetrafluoroethylene (TFE) and propylene. Its chemical resistance is excellent across a wide range of aggressive media. This material is unique due to its resistance to petroleum products, steam, phosphate esters and brake fluids. It is often described as having similar properties to Ethylene Propylene and Fluoroelastomer. It has fair compatibility with brake fluids and phosphate esters while exhibiting good resistance to petroleum oils.

This material is used in the Petroleum industry for seal applications requiring resistance to petroleum, steam and ammine. Other areas of use include applications requiring resistance to petroleum and brake fluid, or petroleum and phosphate ester resistance.

Properties:

- Excellent heat resistance with continuous service temperature capability of 260°C
- Chemical resistance including resistance to strong acids and bases,
- High electrical resistivity
- Excellent oil resistance.

Applications:

- AFLAS® based seals are widely used throughout many industries especially in oil and gas, food processing, nuclear power generation and other thermal power, ocean development, chemical processing, automotive, heavy-duty diesels, electronics, machinery, fluid controls, steam generation and control, etc.
- Packings
- Gaskets
- O-rings
- Seals
- Wire and Cable
- Hoses
- Insulation
- Flexible Joints

Polyisoprene/Natural Rubber (NR, IR)

Trade Name: Natsyn, Natural Rubber
Temperature Range: -50°C to 100°C
Usual Hardness Range: 30-100 Shore A
Density: 0.90-1.00 g/cc
Tensile Strength, Ultimate: 14.0-30.0 MPa
Elongation at Break: 150-850%

Natural rubber is polyisoprene. Chemical and environmental resistance and mechanical properties are improved through crosslinking (vulcanizing), usually through treatment with sulfur. Natural rubber usually withstands polar organic solvents (alcohols, ketones, aldehydes), organic acids, and mild chemicals. It is adversely affected by most hydrocarbons, oil/grease/fat, strong acid, and ozone.

Properties:

- Ease in processing
- Excellent Abrasion Resistance
- Excellent Dielectric Strength
- Good Tear Resistance
- Low permeability to gases
- Poor resistance to hydrocarbons, oils and solvents
- Poor ozone resistance
- Poor flame resistance
- Excellent resilience
- It has a long fatigue life and high strength even without reinforcing fillers

Applications:

- Rubber bands,
- Baby bottle nipples, and
- Hoses
- Tires
- Motor Mounts
- Shock absorbers
- Gaskets
- Bushings
- Footwear
- Balloons
- Toys

Polysulfide Rubber (PSR)

Trade Name: Polysulfide Rubber
Temperature Range: -55°C to 105°C
Usual Hardness Range: 55-70 Shore A
Density: 1.30-1.35 g/cc
Tensile Strength, Ultimate: 8-12 MPa
Elongation at Break: 280-570%

Polysulfide Rubber was one of the earliest commercial synthetic polymers and is prepared form dichlorides and sodium polysulfide. It has a remarkable combination of solvent resistance, low temperature flexibility, flex-crack resistance and oxygen and ozone resistance. However, heat resistance, mechanical strength and compression set are not outstanding. Other seal compounds are more versatile from the performance standpoint, hence polysulfide rubber is recommended by only for specific applications which cannot be satisfied by any other elastomer. Seals of polysulfide are recommended for service involving contact with solutions of petroleum solvents, ketones and ethers.

Properties:

- Polysulfide rubber is known for its excellent resistance to solvents
- Low temperature flexibility
- It has flex-crack resistance
- It has good oxygen and ozone resistance
- It is resistant to light
- It is impermeable to gases
- Poor tensile strength and abrasion resistance

Applications:

- Rubber Rollers
- Hoses
- Hose Liners
- O-rings
- Balloons
- Gaskets
- Seals
- Life Rafts
- Inflatable Items
- Flexible Mountings
- Jackets