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Guide to Rubber Materials

Components of a Rubber Compound

- **Rubber Base Polymer**
- **Fillers**
  - Used to improve rubber product properties and reduce formulation costs.
  - They can increase tensile strength, hardness, and resistance to tear and abrasion.
  - Examples: carbon black, clay, calcium carbonate
- **Process Aids**
  - Used to improve and enhance the processing of rubber in both the molding and mixing processes.
- **Activators**
  - Activators form chemical complexes with the accelerators, which further activate the curing process.
- **Antidegradents**
  - Antidegradents are added to the compound to protect rubber from oxidation, ozonation, and aging.
- **Accelerators**
  - Accelerators are used to accelerate the vulcanization of curing by increasing the cure rate.
- **Curing Agents**
  - Curing agents transform rubber into a more durable, resilient product.
  - Examples: sulfur, peroxide

Rubber Materials

Silicone

(VMQ/PMQ/PVMQ)
Temperature Range: -150°F to 550°F

Advantages
- Excellent Ozone, Sunlight and Oxidation Resistance
- Outstanding Resistance to High Temperature
- Excellent Low Temperature Flexibility
- Very Good Electrical Insulation
- Superior Color Stability
- Low Compression Set

Limitations
- Not for Super Heated Steam (Over 250°F)
- Poor Abrasion, Tear, and Cut Growth Resistance
- Inferior Oil, Gasoline, and Solvent Resistance
- Poor Resistance to Alkalis and Acids
- Generally Low Tensile Strength
- Not for Aromatic Mineral Oil

Fluorosilicone

(FVMQ)
Temperature Range: -85°F to 450°F

Advantages
- Excellent High & Low Temperature Resistance
- Excellent Resistance to Fuels & Solvents
- Excellent Ozone & Sunlight Resistance
- Excellent Compression Set Resistance
- Very Good Thermal Conductivity
- Superior Color Stability

Limitations
- Poor Resistance to Ketones & Phosphate Esters
- Fair Mechanical Resistance Properties
- High Thermal Expansion Coefficient
- Permeable to Most Vapors & Gases
- Fair Water & Steam Resistance
- Fair Tensile Strength

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Rubber Materials

Viton™ (Fluorocarbon)

(FKM)
Temperature Range: -30°F to 500°F

Advantages
- Very Good Resistance to Oxygen, Ozone & Sunlight
- Outstanding Resistance to High Heat (Up to 400 F)
- Excellent Resistance to Hydraulic Fluids & Grease
- Excellent Resistance to Oil, Gasoline, Silicone Oil
- Very Good Impermeability to Gases & Vapors
- Good Flame Resistance

Limitations
- Very Little Resistance to Oxygenated Solvents
- Limited Low Temperature
- Fair to Good Water & Steam Resistance
- Poor Tear and Cut Growth Resistance
- Fair Adhesion to Fabrics & Metals
- Fair Electrical Properties

Nitrile

(NBR)
Temperature Range: -65°F to 275°F

Advantages
- Superior Resistance to Petroleum Based Hydraulic Fluid
- Good Resistance to Hydrocarbon Solvents
- Excellent Cold Water Resistant Properties
- Good Resistance to Dilute Alkalis & Acids
- Wide Range of Service Temperatures
- Very Good Oil & Gasoline Resistance
- Good Abrasion Properties

Limitations
- Not Recommended for Chlorinated Hydrocarbons
- Not Recommended for Glycol Based Brake Fluids
- Not Recommended for Phosphate Ester Fluids
- Poor Resistance to Oxygenated Solvents
- Inferior Resistance to Ozone & Sunlight
- Not Recommended for Strong Acid
- Poor Flame Resistance

Hydrogenated Nitrile Butadiene Rubber

(HNBR)
Temperature Range: -40°F to 330°F

Advantages
- Superior Resistance to Petroleum Based Hydraulic Fluid
- Excellent Cold Water Resistant Properties
- Excellent Weather and Water Resistance
- Good Resistance to Polar Fluids
- Very Good Oil & Gasoline Resistance
- Excellent Adhesion to Metals
- Excellent Abrasion Resistance Properties

Limitations
- Not Recommended for Chlorinated Hydrocarbons
- Not Recommended for Phosphate Ester Fluids
- Poor Resistance to Halogenated Solvents
- Poor resistance to Ketones
- Not Recommended for Strong Acid
- Poor Flame Resistance

Neoprene™ (Chloroprene)

(CR)
Temperature Range: -70°F to 250°F

Advantages
- Good Resistance to Abrasion & Flex Cracking
- Good Resistance to Refrigerants & Ammonia
- Very Good Resistance to Ozone & Sunlight
- Good Resistance to Alkalis & Acids
- Moderate Oil & Gasoline Resistance
- Good Inherent Flame Resistance

Limitations
- Very Poor w/Polar Solvents (MEK, Acetone, Esters)
- Poor to Fair Resistance to Oxygenated Solvents
- Poor to Fair Resistance to Aromatic Solvents
- Limited Low Temperature
- Fair Electrical Resistivity
- Fair Dynamic Properties

Ethylene Propylene Rubber

(EPDM, EPR, EPT, EP)
Temperature Range: -60°F to 300°F

Advantages
- Good Resistance to Phosphate Ester Based Hydraulic Fluids
- Good Resistance to Alkalis, Acids, & Oxygenated Solvents
- Excellent Resistance to Heat, Ozone & Sunlight
- Good Resistance to Glycol Based Brake Fluids
- Very Good Low Temperature Flexibility
- Superior Resistance to Water & Steam

Limitations
- Not Compatible w/Di-Ester Based Lubricants
- Low Hydrocarbon Solvent Resistance
- Poor Mineral Oil Resistance
- Poor Flame Resistance
- Poor Gas Resistance
- Poor Oil Resistance

Natural Rubber

(NR)
Temperature Range: -70°F to 200°F

Advantages
- Good Resistance to Dilute Acids, Alcohols, and Dilute Alkalis
- Good Resistance to Water and Odors
- Excellent Abrasion Resistance, Tear Resistance, Impact Resistance, Resilience, Rebound, and Dampening

Limitations
- Poor Aromatic Hydrocarbon Resistance
- Poor Ozone, Sunlight and Weather Resistance
- Poor Oil and Gas Resistance
- Poor Coloring Capabilities
- Poor Resistance to Lacquer Solvents

Styrene Butadiene

(SBR)
Temperature Range: -50°F to 212°F

Advantages
- Excellent Resistance to Brake Fluids
- Good Resistance to Water / Low Water Absorption
- Good Abrasion Resistance
- Good Heat Resistance
- Good Low Temperature Flexibility

Limitations
- Poor Aromatic Hydrocarbon Resistance
- Poor Ozone Resistance
- Poor Oil and Gas Resistance
- Poor Animal and Vegetable Oil Resistance