EPDM rubber (ethylene propylene diene monomer (M-class) rubber), a type of synthetic rubber, is an elastomer which is characterized by a wide range of applications. The E refers to ethylene, P to propylene, D to diene and M refers to its classification in ASTM standard D-1418. The M class includes rubbers having a saturated chain of the polymethylene type. Dienes currently used in the manufacture of EPDM rubbers are dicyclopentadiene (DCPD), ethylidene norbornene (ENB), and vinyl norbornene (VNB).

A roll of EPDM foil, used for waterproofing roofs

The ethylene content is around 45% to 75%. The higher the ethylene content the higher the loading possibilities of the polymer, better mixing and extrusion. Peroxide curing these polymers give a higher crosslink density compared with their amorphous counterpart. The amorphous polymer are also excellent in processing. This is very much influenced by their molecular structure. The dienes, typically comprising from 2.5% up to 12% by weight of the composition, serve as crosslinks when curing with sulphur and resin, with peroxide cures the diene (or third monomer) functions as a coagent, which provide resistance to unwanted tackiness, creep or flow during end use.

An EPDM rubber roof

EPDM rubber is used in seals, glass-run channel, radiators, garden and appliance hose, tubing, washers, belts, electrical insulation, vibrators, and speaker cone surrounds. It is also used as a medium for water resistance in electrical cable-jointing, roofing membranes, geomembranes, rubber mechanical goods, plastic impact modification, thermoplastic, vulcanizates, and many other applications.
EPDM exhibits satisfactory compatibility with fireproof hydraulic fluids, ketones, hot and cold water, and alkalis, and unsatisfactory compatibility with most oils, gasoline, kerosene, aromatic and aliphatic hydrocarbons, halogenated solvents, and concentrated acids.

The main properties of EPDM are its outstanding heat, ozone and weather resistance. The resistance to polar substances and steam are also good. It has excellent electrical insulating properties.

Mechanical properties: Hardness, Shore A 40–90, Tensile failure stress, ultimate 25 Mpa, Density Can be compounded from 0.90 to >2.00 g/cm3.

Typical properties of EPDM vulcanisates are given below. EPDM can be compounded to meet specific properties to a limit depending first on the EPDM polymers available, then the processing and curing method(s) employed. EPDMs are available in a range of molecular weights (indicated in terms of Mooney viscosity ML(1+4) at 125 °C), varying levels of ethylene, third monomer and oil content.

<table>
<thead>
<tr>
<th>Thermal properties</th>
<th></th>
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<tbody>
<tr>
<td>Coefficient of thermal expansion, linear</td>
<td>160 μm/m • K</td>
</tr>
<tr>
<td>Maximum service temperature</td>
<td>150 ° C</td>
</tr>
<tr>
<td>Minimum service temperature</td>
<td>−50 ° C</td>
</tr>
<tr>
<td>Glass temperature</td>
<td>−54 ° C</td>
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</tbody>
</table>

Common applications

Vehicles

EPDM rubber is commonly used in weatherseals on all vehicles. This includes door seals, window seals, trunk seals, and sometimes hood seals. Frequently these seals are the source of noise due to movement of the door versus the car body. This is due to friction between the EPDM rubber and the mating surface (car painted sheet metal or glass). This can be alleviated using specialty coatings that are applied at the time of manufacture of the weatherseal, not as an aftermarket application. Such coatings can also greatly increase the chemical resistance of EPDM rubber. Some vehicle manufacturers such as General Motors also recommend a light application of silicone dielectric grease to weatherstripping to reduce noise.

In general, EPDM is especially used in cooling system circuit hoses in an automobile. Water pump, thermostat, EGR valve, EGR cooler, heater, oil cooler, radiator and degas bottle is connected with hoses of which material is usually EPDM.

Additionally, EPDM can be used as charge air tubing on turbo charged engines. More specifically, it can be used to connect the cold side of the charge air cooler (intercooler) to the intake manifold.

Cold-room doors and refrigeration

EPDM provides good thermal resistance in insulation. It is used in cold-room doors for sealing purpose.

Safety equipment
EPDM is also commonly used as a material for the face seals of industrial respirators, most frequently chosen where the use of silicone must be avoided, typically in automotive paint spray environments.

**Cable insulation**

EPDM is also commonly used as a material for the outer casing on wires used on electrical appliances for outdoor installation, or exposed to UV light. E.g., for tubular motors for awnings, shutters, and roller blinds and also Venetian blind drives.

**Solar pool panels**

Extruded EPDM is used to make a solar heat collector for swimming pool solar water heating systems.

**Roofing**

EPDM is used as a covering to waterproof roofs. It has the benefit that it does not pollute the run-off rainwater, which is of vital importance if the house owner wishes to use this water for personal sanitation/hygiene. Several houses equipped with rainwater harvesting thus make use of this type of roofing.

**Playground and pool deck surfacing**

Granulated, colored EPDM granules are mixed with polyurethane binders and trowled or sprayed onto concrete, asphalt, screenings, interlocking brick, wood etc. to create a non-slip, soft, porous safety surface for wet-deck areas such as pool decks or playgrounds.

**Pond liners**

EPDM sheeting is used to line and waterproof man made ponds. Most back yard water gardens and koi ponds use an EPDM liner.

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