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WHY USE SILICONE RUBBER?

Silicone rubbers are rubber compounds with both organic and inorganic properties, as well as highly pure fumed silica as two main components. They possess many characteristics which are not present in other organic rubbers and have important roles in numerous industries, such as electrical, electronics, automobiles, food, medical, household appliances and leisure products. Silicone rubber is uniquely different from conventional rubber in that the molecule structure of the polymer consists of long chains of alternating silicone and oxygen atoms. This polymer therefore has an organic and inorganic nature. The inorganic part makes the polymer very resistant to high temperature and gives good electrical insulating properties and chemical inertness, while the organic components make it extremely flexible.

CHARACTERISTICS

- **Heat Resistance**
- **Cold Resistance**
- **Weathering Resistance**
- **Electrical Properties**
- **Electric Conductivity**
- **Thermal Conductivity**
- **Resistance to Radioactive Rays**
- **Resistance to Steam**
- **Resistance to Oil Solvents and Chemicals**
- **Compression Set**
- **Fatigue Resistance**
- **High Tensile and Tear Strength**
- **Incombustibility**
- **Gas Permeability**
- **Physiological Inertness**
- **Transparency and Colouring**
- **Non-stickiness Properties Non-corrosive**

Heat Resistance

Silicone rubbers are extremely heat resistant as compared to normal organic rubbers. There is almost no change in properties at 150oC and so they can be used almost permanently. Due to their excellent heat resistance they are widely used as material for rubber parts that are used at high temperatures.

Cold Resistance

Silicone rubbers are extremely cold resistant. The brittle point of normal organic rubbers is about -20oC to -30oC. The brittle point of silicone rubbers is as low as -60oC to -70oC.

Weathering Resistance

Silicone rubbers have excellent weathering resistance. Under the ozone ambience that are produced due to corona discharge, normal organic rubbers deteriorate tremendously but silicone rubbers remain almost unaffected. Even under long-term exposure to ultraviolet and weathering, their properties remain virtually unchanged.

Electrical Properties

Silicone rubbers have excellent electrical insulating properties and are stable under a wide range of both frequency and temperature. No significant deterioration in characteristics is observed when silicone rubbers are immersed in liquid. Therefore they are best to be used as electrical insulators. In particular silicone rubbers are extremely resistant to corona discharge or electric at its highest voltage and therefore are widely used as insulating materials for high voltage portions.

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Electric Conductivity

Electric conductive silicone rubbers are the rubber compounds with electric conductive materials such as carbon being incorporated. Various products with electric resistance ranging from a few ohms-cm to e+3 ohms-cm are available. Moreover, other properties are also comparable to those of normal silicone rubbers. Therefore they are widely used as contact points of keyboards, around heaters and as sealing materials for anti-static components and high voltage cables. In general, electric conductive silicone rubbers available on the market mostly those with volume electric resistivity ranging 1 to e+3 ohms-cm.

Thermal Conductivity

The thermal conductivity of silicone rubber is about 0.5 e+3 cal.cm.sec. C. This value shows excellent thermal conductivity for silicone rubbers, therefore they are used as heat sink sheets and heating rollers.

Resistance to Radioactive Rays

Normal silicone rubbers (dimenthyl silicone rubbers) do not show excellent resistance to radioactive rays in particular as compared to other organic rubbers. However methyl phenyl silicone rubbers, with the phenyl radical being incorporated into the polymer, possess good resistance to radioactive rays. They are utilized as cables and connectors in nuclear power stations.

Resistance to Steam

Silicone rubbers have low water absorption of about 1% even when they are immersed in water for a long duration. Mechanical tensile strength and electrical properties are almost unaffected. Generally silicone rubbers do not deteriorate when in contact with steam, the influence becomes significant when the steam pressure is increased. Siloxane polymer breaks under high-pressure steam above 150oC. This phenomenon can be rectified by silicone rubber formation, selection of vulcanizing agents and post cure.

Resistance to Oil Solvents and Chemicals

Silicone rubbers have excellent oil resistance at high temperature. Silicone rubbers are slightly inferior at temperatures below 100oC but offer superior resistance to oil above 100oC. In addition, resistance to solvents and chemicals are excellent.

Compression Set

When silicone rubbers are used as rubber materials for packing which undergo compressive deformation under heating condition, the capability to recover is especially important. The compression set of silicone rubbers is tabled over a wide range of temperatures from -60oC to 250oC.

Generally silicone rubbers require post cure. Especially in the case of the manufacturing products with low compression set. Post cure is desired and the selection of optimum vulcanizing agents is necessary.

Fatigue Resistance

In general silicone rubbers are not superior to normal organic rubbers in terms of strength in dynamic stress like fatigue resistance. However, to overcome this defect, rubbers which are 8 to 20 times better at fatigue resistance are being developed. These products are widely applied in many aspects such as keyboards of office automation machines and rubber parts of transport vehicles.

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High Tensile and Tear Strength

In general the tear strength of silicone rubbers is about 15kgf/cm. However, high tensile and tear strength products (30kgf/cm to 50kgf/cm) are also made available by improving the polymer as well as selection of fillers and cross-linking agents. These products are best utilized to manufacture complicated mouldings, which require greater tear strength, mould cavities with reverse tapers and huge mouldings.

Incombustibility

Silicone rubbers do not burn easily even though they are drawn closely to the flame. However once they catch fire, they burn continuously. With the incorporation of minute flame retardant, silicone rubbers can possibly acquire incombustibility and ability to extinguish.
These products do not release any smoke or toxic gases when they burn, as they do not consist of any organic halogen compounds which are present in organic rubbers. Therefore they are of course used in household electrical appliances and office machines as well as materials for the closed space in aircraft, subways and building interiors. They become the indispensable products in safety aspects.

UL94 COMBUSTIBILITY CLASSIFICATION STANDARDS	
CLASSIFICATION	STANDARDS
94V-0	Continuous combustion time: average below 5 seconds and maximum below 10 seconds
94V-1	Continuous combustion time: average below 25 seconds and maximum below 30 seconds
94HB	No combustion up to 4 inches standard line under horizontal combustion test

Gas Permeability

The membranes of silicone rubbers have better permeability for gases and water vapour as well as better selectivity in comparison to organic rubber.

Physiological Inertness

Silicone rubbers are generally inert to physiology. They also have interested properties such as they do not cause the coagulation of blood easily. Therefore they are being utilized as catheters, hollow fibres and artificial heart-lung, vaccines, medical rubber stoppers and lenses for ultrasonic diagnosis.

Transparency and Colouring

Normal organic rubbers are black due to the incorporation of carbon. As for silicone rubbers, it is possible to produce highly transparent rubbers by incorporating fine silica which do not deteriorate the original transparency of silicone.
Due to the excellent transparency, colouration by pigments is easy. Therefore colourful products are possible.

Non-stickiness Properties Non-corrosive

Silicone rubbers are chemically inert and possess excellent mould releasing property. As such they do not corrode other substances. Due to this property, they are used as fixed rolls of photocopy machines, printing rolls, sheets etc.

The above information is believed to be correct but does not purport to be all inclusive. As individual operating conditions influence the application of each product, the information in this data sheet can only be seen as a guide. It is the sole responsibility of the customer to evaluate his individual requirements, particularly whether the specified properties of our products are sufficient for his intended use.