

Dow Corning Corporation Silicones Backgrounder

About Silicon and Silicones

The missing link between organic and inorganic chemistry, silicones are a family of polymers made from the products of nature – silicon, oxygen, carbon and hydrogen. Silicon, the basic raw material for silicone production, comes from ordinary quartz sand and is the second most abundant element in the Earth's crust.

Everyday Uses of Silicon-Based Products

Silicones are revolutionizing our present and shaping our future. They make existing materials work better, longer and more reliably. They fuel our imaginations and make new products possible.

Silicones also help manufacturers streamline production, save time, reduce costs and minimize environmental impact.

Since 1943, Dow Corning Corporation has introduced numerous innovations that have improved lives around the world. Here is a small sampling of the ways silicon-based products impact our lives every day.

Alternative Energy – Solar and Wind

Because they can withstand the sun's unrelenting rays, year after year, silicones improve the cost-effectiveness, durability and performance of both solar panels and wind turbines. Solar cells are made from silicon, and silicones are used throughout solar panel assembly and installation as adhesives and sealants, encapsulants, potting agents, and protective coatings. In wind turbines, silicones enable more efficient designs and extend maintenance intervals.

Automotive

From the airbags to the brakes, from the powertrain to the chassis, silicones coat, seal, insulate, weatherproof and protect our vehicles. They improve dependability and fuel efficiency and make our journeys safer and more enjoyable.

Beauty and Personal Care

Silicones help consumers of any age feel good about their appearance. They help create make-up that lasts longer and is more comfortable to wear. Their luxuriously smooth and silky feel and unique wetting and spreading qualities mean lotions, moisturizers and cleansers are easier and more pleasant to apply. And, silicone-enhanced shampoos and conditioners give greater shine and help make hair easier to manage.

Construction

Silicone sealants outperform and outlast most organic weather-proofing materials. They protect the structural integrity of buildings; allow skyscrapers to withstand seismic activity; and enable architects to create more energy-efficient, people-friendly designs.

Electronics

Silicones have played an essential role in advancing computer technology, telecommunications and other innovations that rely on microchips. They enable the design of smaller devices and are contributing to new generations of "thinking appliances."

Energy Storage

Silicon-lithium solutions increase the performance and improve the cost-effectiveness of lithium-ion batteries used in consumer electronics, electric cars and utility-scale energy storage.

Energy Transmission

Silicone high-voltage insulating rubbers and coatings protect power transmission equipment from weather and environmental pollution. This helps prevent costly and dangerous interruptions to industrial and community power supplies.

Healthcare

From the hospital operating room to the medicine cabinet, silicones contribute to our health and well-being. Silicone improves the performance of medical devices and healthcare products and makes them more comfortable to use.

Infrastructure

Silicones add years of cost-effective performance to public buildings, roads, transportation systems and utilities, giving citizens more value for their tax money.

Manufacturing and Processing

Silicones add reliability, durability and value to products used every day. They also make products easier and more economical to produce. Because silicones have such a long history of success, they make it easier for designers and manufacturers to pursue high-value opportunities and enter new markets.

Paints and Coatings

From steel bridges to high-style cookware, silicones protect our infrastructures and brighten our lives. Silicones can be tailored to meet almost any paint or coating challenge – from performance and cost-effectiveness to compliance with environmental regulations.

Paper

Silicones have a positive effect on virtually every aspect of the pulp and paper industry – from pulp processing to paper finishing, label making and paper recycling. They enable the development of innovative new products, improve productivity and lessen the impact of paper-making operations on our environment.

Textiles

Fabrics coated with silicone are used to make everything from easy-care clothing to sails, parachutes and hot air balloons. Silicones impart a variety of “feel” properties. They also improve fabric strength, abrasion resistance, water repellency and wrinkle recovery.

The Advantages of Silicones

From a handful of readily available ingredients, thousands of durable, waste-reducing silicone materials can be created.

A silicone fluid will flow more quickly and easily and create a thinner, more complete film than a hydrocarbon fluid with the same viscosity.

Silicones can be designed to stick or slip, insulate or conduct, create foam or destroy it.

Silicones are both water-repellent and “breathable.” So they can keep rain from entering a building while letting water vapor trapped inside the building escape.

Adaptable and Versatile

Combining the advantages of glass and plastics, silicones are among the most versatile materials on our planet.

Like glass (which is silicon-based), silicones are temperature- and moisture-resistant, chemically inert, and dielectric. Like plastics (which are carbon-based), silicones are strong and able to assume many forms – from fluids thinner than water to emulsions, solids, resins and stretchy elastomers.

By changing the size or structure of a silicone molecule or by attaching different functional groups, chemists can enhance or change the way a silicone behaves. Consequently, silicones can be designed to perform an amazing range of functions and to deliver a multitude of benefits.

Silicones can be durable or transient; hydrophobic or hydrophilic; clear or pigmented; release agents or adhesives; glossy, shiny or dull; soluble or insoluble; polar or non-polar; industrial, food or medical grade.

Typical Silicone Properties

- Outstanding weathering and aging resistance
- Thermal stability
- High water-repellency
- Extremely strong adhesion qualities
- Ability to withstand long-term exposure to the atmosphere
- Resistance to the sun’s ultraviolet rays
- Extremely low volatility
- Inertness – does not react with most materials
- Chemical resistance
- Long-term elasticity, pliability and flexibility
- Excellent electrical insulation properties
- Tensile strength
- Antifoaming properties
- Microbial resistance

What Can Be Made from Silicones?

- Fluids, emulsions and dispersions
- Oils, greases, compounds and pastes
- Resins, gels and powders
- Rubbers
- Coatings and encapsulants
- Adhesives and sealants
- Delivery and release agents
- Coupling agents and crosslinkers
- Chemical building blocks
- Space-age composites
- Antifoams and surfactants
- Formulating and processing aids
- And more!



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