The Ingredients *Column*

The Many Faces of Silicones

by Irena James

Over 50 percent of all new cosmetics introduced globally in the last 10 years contain at least one silicone. Slowly, but surely, silicones are becoming one the most valued ingredient categories used in the luxury skin care products. They have become critical in many high-end, high-performance skin care formulations, giving them never-before-seen glide, spreadability, and ultra-smooth application and finish for a luxurious, silky, comfortable-skin feel without any sticky residue.

Silica, Silicon, Silicone

Many people get confused about the differences between silica, silicon, and silicone. Silicon is the 14th element on the periodic table and the second most abundant element in the earth's crust, after oxygen. Silicon readily bonds with oxygen and is rarely found in nature in its pure form. You have likely seen silicon as silicon dioxide or silica, better known as quartz, which is the most common component of sand.

Silicon has many industrial uses. As silica, silicon is a key ingredient in bricks, concrete, and glass. Elemental silicon is a major player in modern electronics because it is an ideal semiconductor of electricity.

Silicone is a synthetic polymer made up of silicon, oxygen, and other elements, most typically carbon and hydrogen. In the medical field, silicone can be found in implants, contact lenses, and bandages. Hospitals and other medical practices primarily use silicone-based medical adhesives because silicone has an extremely low occurrence of allergenic skin reaction.

Cosmetic grade synthesized silicon-carbon polymers, known as silicones, were first introduced in the 1950s, offering a number of unique characteristics that made them useful for improving the feel, appearance, and performance of cosmetic products. Today, new silicone compounds are being developed all the time, available in many different shapes and forms, from heavy fluids, to light fluids, to powders.

Silicone fluids can increase slip, reduce irritancy, and enhance ingredient deposition on and over skin, preventing accumulation or concentration of potentially irritating or potent ingredients in one spot, a phenomenon sometimes referred to by clients and aestheticians as "hot spots." *Silicone waxes* can prevent water loss from skin and various *silicone and gum blends*, providing smooth long-lasting feel and wash-off resistance. *Silicone polyethers* enhance moisturization by attracting water to the skin, while *elastomer silicones* can minimize the appearance of enlarged pores and provide the most astonishing visual reduction in the appearance of lines and wrinkles.

Hair Care, Makeup, and Sun Care Uses

In hair care, they have long been known as the "conditioning workhorses," capable of repairing signs of damage, filling in cracks in the hair's surface and preventing new damage from occurring. Silicones have revolutionized the application and longevity of most makeup products, including sophisticated foundations, eye shadows, blushes and high gloss, and long-lasting lipsticks. Silicones also keep water-resistant sunscreens on our skin, even when we sweat or get wet.

Silicones in Skin Care Applications

Silicones perform a number of highly specialized and extremely versatile roles in skin care products: retaining moisture, protecting our skin, and imparting smoothness, making the application feel silky as the product is spread on without any oily, sticky feeling. They can mattify surface shine in oily skin and even minimize the appearance of surface wrinkles and provide line-blurring effect.

- Common silicones found in most skin care products are cyclopentasiloxane and dimethicone. If you are looking to identify silicones on a product label, they generally end in "-cone," "-conol," or "-siloxane."
- Cyclomethicones are used because they evaporate quickly and act as a carrier to deliver other ingredients that are meant to be absorbed by the skin. Various actives can be entrapped within their structures, allowing them to act as delivery systems for actives. Cyclomethicones are available with different rates of evaporation, so formulators can control the "play time," or the time it takes for a liquid cosmetic to dry on the skin.
- Dimethicone and dimethicone copolyol are used because they do not evaporate and stay on the skin longer. They create a breathable, non-occlusive, flexible film, allowing the pigments to ride on the surface

of the skin without absorbing. Without their benefits, the dry powder would be more likely to move into wrinkles or laugh lines, enhancing them, rather than concealing them. In the case of extremely popular multifunctional "alphabet creams" (BB, CC, DD), this same property helps maintain the even distribution of pigments to help ensure optimum appearance for a longer period of time.

Silicone Elastomers: The Shortcut to Wrinkle-Smoothing and Line-Blurring

One of the newest and most rapidly growing classes of silicones used in skin care is silicone elastomers. Just look at the first few ingredients in some of the most popular products luxury brands offer. Silicone elastomers appear on the label as cyclomethicone and dimethicone cross-polymer. It is the first encounter with the elastomer silicones that causes the client to fall in love with the product upon application. Luxury brands realized long ago that silicones are our friends when it comes to formulating sophisticated formulas capable of hiding the telltale signs of aging quickly and effectively, while creating a *wow* effect within minutes of application.

Wrinkles are essentially permanent indentations in the skin and often occur in areas of the face that are stretched or compressed with changing facial expressions, movements that tend to form creases over time. The best approach to concealing wrinkles is to apply materials that reflect and scatter light. This phenomenon is often referred to as the "soft focus" effect, because it is similar to what happens when skin is photographed with a camera that is out of focus; skin features such as wrinkles are "blurred" by the effects of treatments with products containing elastomer silicone.

Apart from their aesthetic and optical properties, silicone elastomer particles offer the added benefit of absorbing sebum. Their distinctive feel on the skin can be described as dry, smooth, silky and powdery.

Anhydrous skin treatment products based on silicones are often sold as small gelatin capsules that provide a single application when the capsule is broken. The protective effect of a silicone elastomer acts as a delivery system for certain actives that are soluble in silicone, providing immediate and long-term age-defying benefits.

Are Silicones Natural?

While silicone originates from a natural source (sand), it undergoes extensive chemical processing before being added to beauty products. Many companies that position themselves as eco-friendly and market their product as "natural" are choosing to create silicone-free formulas in which blends of botanical oils and waxes are usually used in place of silicones. While there is certainly a market for these types of formulas, many different issues are associated with an increased use of oils and waxes, such as increased cost, potential comedogenicity and a not so elegant feel, such as heaviness and tackiness. Unlike silicones, whose molecular size is too large to seep into pores, vegetable and nut oils often have a molecular size that will pass through pores easily and absorb into the skin, in some instances clogging pores. Furthermore, if that oil carrier has an insoluble mineral pigment in it, it will leave it behind on the skin's surface like a mask, once the carrier fluid has been absorbed into the skin, an issue easily resolved with the use of silicones.

Silicone Safety and Controversy

Silicones have been used for decades without concern, and scientific data suggests that silicones are neither dangerous nor allergenic; yet suddenly, they have become one of the ingredients some clients love to hate. The American Academy of Dermatology (AAD) suggests cosmetic grade silicone in silicone-based makeup might reduce skin redness, stinging or irritation for cystic acne and rosacea patients.

Silicones are large molecules that do not penetrate the skin or cell membranes. Numerous studies have shown that they are non-comedogenic and hypoallergenic, biologically inert, and do not cause eye or skin irritation. In addition, they are also biodegradable and eco-friendly.

The Future of Silicone Technology in Skin Care

In today's competitive skin care market, consumers look for a range of benefits, superior aesthetics and cost effectiveness. Formulators striving to create successful products that stand out from the competition most often rely on silicones to not only deliver the most unique aesthetics benefits, but also because silicones are multifunctional, easy to use, and effective in small quantities.

The future of silicones in the skin care industry is looking bright. Over 10,000 patents for cosmetic silicones have been assigned by the United States Patent and Trademark Office (USPTO) since 1976, with over 65 percent of them assigned since 2004, with new patents expanding silicone's capabilities being created every day. As technology continues to evolve, silicones will increasingly offer multifunctional, high performance properties, and we will continue to benefit from the unique ways they can improve our skin. Understanding them rather than fearing them will help you stay on the cutting edge of ingredient technology and ahead of the competition.

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