Application note

Medical-quality silicones and skin care

As the body's largest organ, not to mention its protective shield against the outside world, skin should be treated with the same care as any other body part. This level of care can be provided by silicone; innovation in silicone technology from its history in healthcare and especially medical implant applications need only be extrapolated and applied. The crossover between silicones for medical implants and for skin care lies in material purity: Like medical implant silicones, silicones designed to care for the skin in the way the rest of the body is cared for undergo purification in which volatiles are stripped from their polymers, preventing outgassing sometimes related to unwanted residues after product use. Utilizing medical-quality silicones in lotions, serums, etc., actively solidifies the approach to skin as a facet of health and not just cosmetics. More importantly, it improves the quality of the skin care product within the silicone ingredient's realm of influence.

The legacy of silicone in the medical industry, beginning in the 1950s, has been built by the reliable performance it brings thanks to its biocompatibility and the unique combination of high chemical stability and versatility it offers. The essence of silicone could be the opportunities it provides for purposeful, precise optimization according to application needs. Silicone is versatile in the form it can take depending on how it is designed, from a clay-like elastomer to a low viscosity gel; and it is flexible in ability, allowing for property modification and even for the incorporation of actives to meet the needs of virtually any skin care application - from moisturizers and sun screens to skin repair serums and anti-wrinkle lotions, or anything in between. Once a silicone's aptitudes are designed as desired, processing the silicone for the level of purity indicative of medical suitability fortifies the material's chemical stability for optimal performance and reliability in skin care products.

Largely responsible for the opportunities silicone can be made to provide is the free volume afforded by the large bond angles of the repeating helical silicon-oxygen (Si-O) on the polymer backbone.

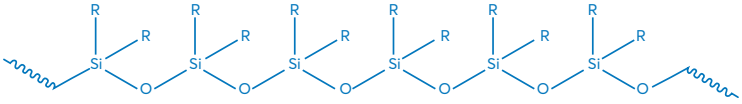

FIGURE 1: Basic structure of polysiloxane chain.

A significant contribution this free volume makes to silicone's versatility is that it renders the substituent groups on the polymer interchangeable, allowing for control of mechanical and physical properties. Common R groups that commend silicone for use in

skin care, for example, are methyl and phenyl. Methyl, formative of polydimethylsiloxane polymers (PDMS), is most known for its water resistance and desirable surface properties, which aid in moisture retention and contribute to lubricity and gentleness in sunscreens, etc., for a silky feeling during application. This is the most common substituent group found in cosmetic formulations as well as in biomedical applications. Moreover, phenyl groups can be employed in resulting diphenyldimethylpolysiloxane polymers to increase or decrease a silicone's permeability to moisture as needed, as well as to adjust its refractive index, or RI. Advanced light-refracting silicones play a critical role in wrinkle treatment formulations.

Free volume is also one of the reasons silicone is so often made a conduit for the delivery of various actives to particular parts of the body. The other reason is silicone's chemical stability for its role in preserving the active's effectiveness at no cost to the silicone's material integrity or properties. As a vehicle carrying actives for skin-tightening, anti-aging, or other purposes, silicone can benefit wrinkle formulations and other skin care products just as much as it benefits implanted drug delivery devices. Still, medical-quality performance and reliability require medical-quality purity.

A facet not only of beauty but also, and even more so, of health, the skin deserves the same level of care as any other part of the body. As their legacy in medical implants proves, medically driven silicones provide gentle, effective, and dependable care. And their talents can be optimized to tend to the needs of the skin, whether the intent is to make wrinkles invisible to the human eye, improve complexion, or guard against sun burns.

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