The Safety and Sustainability of Silicone Materials

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Seek Together™

Properties of Silicones

Silicones are a product family. You will never see silicone in the ingredient list of a product, as no ingredient on its own is named “silicone.”

By modifying the following parameters on the polymer

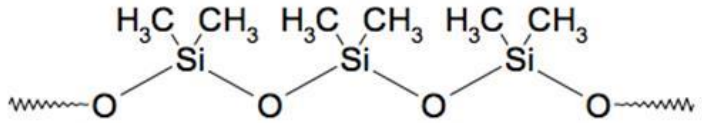
- Molecular Weight
- Substituent
- Structure

Different “families” of silicones are obtained

These will have specific properties particular to each family

Chain has spiral shape

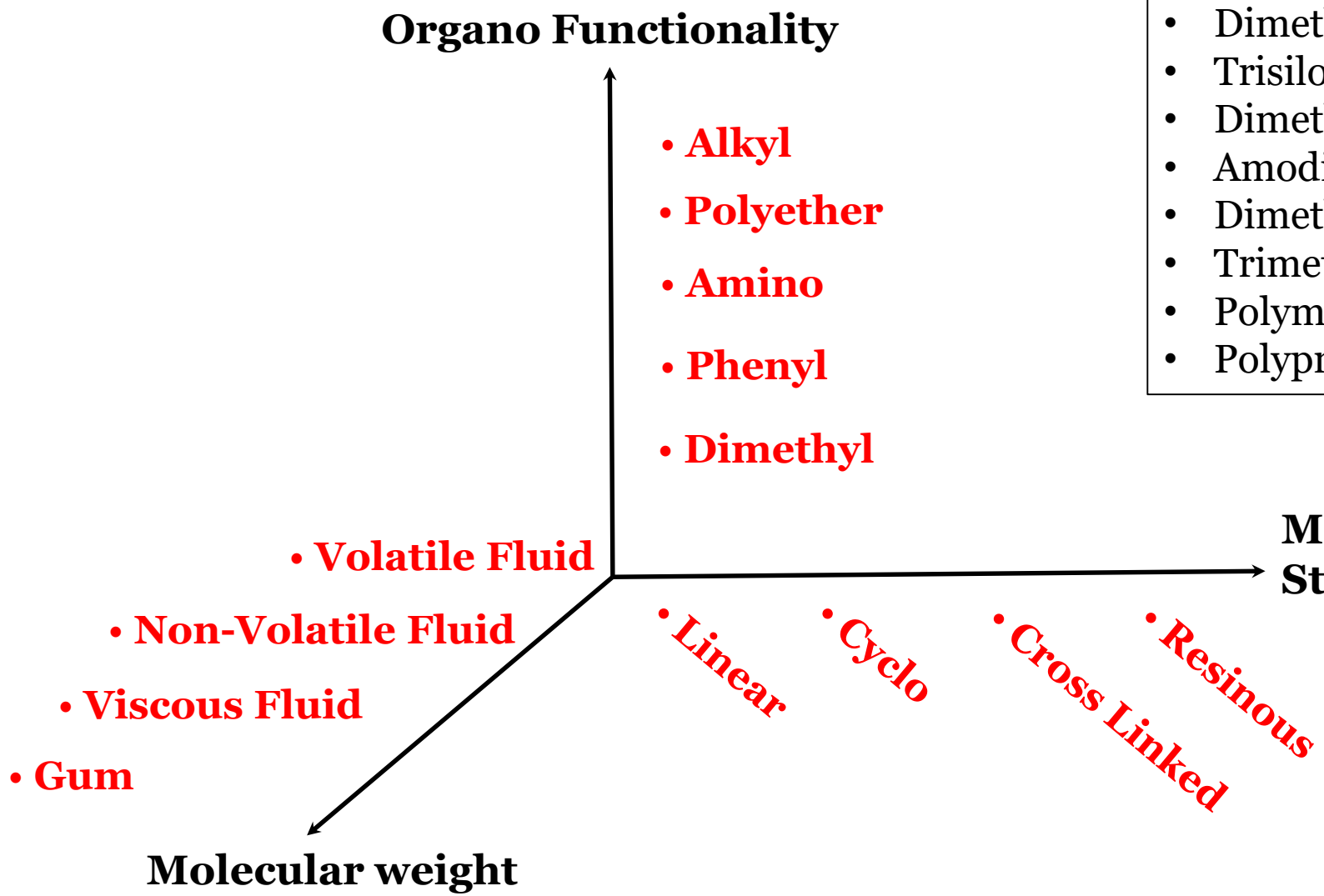
The “starting” polymer is the **P**oly**D**i**M**ethyl **S**iloxane (**PDMS**)



- **Silicon**
  - Bond Energies
    - Si-O 445 kJ/mol
    - Si-C 306 kJ/mol
  - Rotational Energies
    - Si-O-Si ~ 0 kJ/mol
  - Bond Angles
    - Si-O-Si 145^0
  - Bond Lengths
    - Si-O 0.163 nm

- **Carbon**
  - Bond Energies
    - C-O 358 kJ/mol
    - C-C 346 kJ/mol
  - Rotational Energies
    - C-C 14 kJ/mol
  - Bond Angles
    - C-O-C 111^0
  - Bond angles
    - C-O 0.142 nm

Building Around PDMS Polymers for Personal Care: Silicone Families



Common silicone INCI names

- Dimethicone
- Trisiloxane
- Dimethiconol
- Amodimethicone
- Dimethicone crosspolymer
- Trimethysiloxysilicate
- Polymethylsilsesquioxane
- Polypropylsilsesquioxane

Sustainable silicone manufacturing

Production of Silicone

Silicon Metal

Chlorosilane mixture

Specific Chlorosilanes

Water

Siloxanes

Hydrochloric Acid

Methanol

Methyl chloride

ADDING MORE RENEWABLES TO OUR PURCHASED POWER MIX

Sustainability trends

- Clean Energy
- Lower GHG Emissions
- Diversified Grid

Our Value Proposition

DOW MATERIALS SCIENCE
Leverage Dow Core Expertise as large-scale power & steam consumer & producer

CUSTOMER FOCUS
Reliable power & steam ensures reliable supply

RESOURCE EFFICIENCY
Increasing use of renewable power to obtain 750 MW of our demand by 2025

Industry-leading clean energy use

- **Dow is #1 user of clean energy** in the chemical industry
- **Top 25 global corporations** for renewable power use
- Our reductions **reduce scope 3 emissions** for our customers
- **We support additionality** that makes renewable power available to local consumers as well

As we add more clean energy through our purchased power agreements, we lower our emission footprint, become a more sustainable supplier to our customers and often support the growth of renewable power for local consumers.

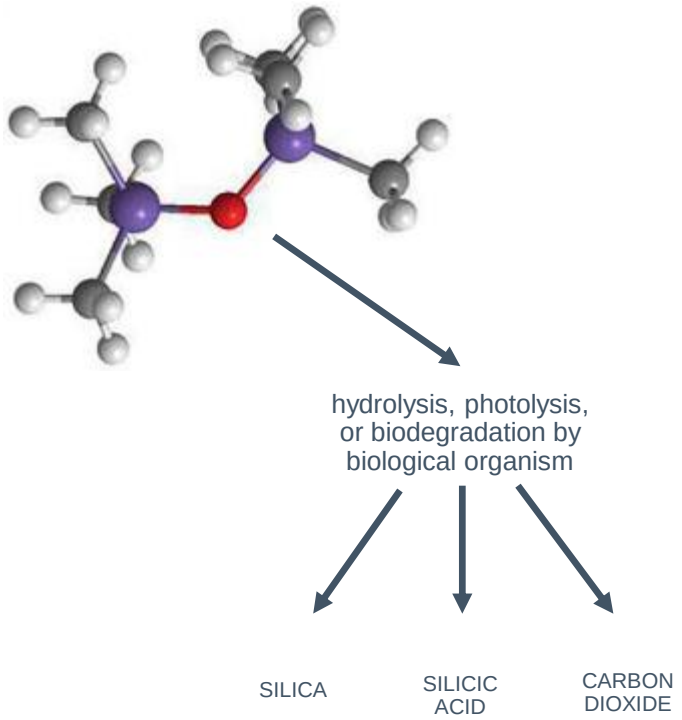
2020 – Solar energy for our silicone site in **Carrollton, KY** through new solar complex

2020 – Solar energy for **Brazil**, adding to clean energy use through hydropower and biomass

2019 – Addition of second wind turbine at **Seneffe,** the site of Dow Silicones Belgium, supplying the Dow site and contributing to the grid

Silicones in the environment

Degradability



In the environment, silicones are expected to be ultimately converted to **silica**, **silicic acid**, and **carbon dioxide**, primarily through non-biological degradation processes such as hydrolysis or photolysis, and through biodegradation by biological organism.[1]

Safety of silicones in personal care applications

Testing

Silicones are among the most extensively studied materials used in consumer and industrial applications today[2]

More than 1,000 studies have been conducted by silicone manufacturers to assess their safety relative to consumers, workers, the environment and manufacturing processes

The results of this continued research and testing demonstrate the safety of silicones in their diverse and important applications

Dow assesses every product that is sold or sampled into personal care products from a human health and environmental perspective

Silicones in beauty care

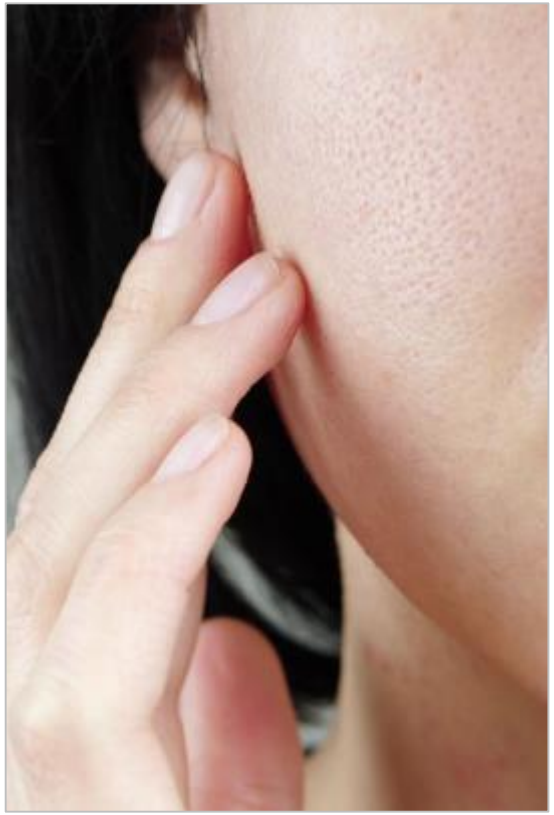
Does silicone block moisture from entering skin or hair? Do silicones block active ingredients from penetrating skin, hair or scalp?

- No, silicones do not interfere with the breathability of the skin and scalp. Silicones are permeable to water vapor and oxygen. In fact, films of common silicones on a skin-mimicking substrate (collagen) show nearly 100% permeability[3]
- Silicones do not prevent cosmetic bioactives nor other actives from penetrating the skin. On the contrary, studies have shown that silicones can contribute to the delivery of Vitamin C, Niacinamide and other actives[4].
- Dimethicone is also approved by the US Food and Drug Administration (FDA) as an Over-the-Counter (OTC) skin protectant for minor cuts, scrapes, burns, chapped skin and lips, etc. when used ≥ 1% level

Silicones in beauty care

Do silicones cause allergic reactions?

- Silicones do not cause breakouts or allergic reactions, as most silicone molecules used in beauty care are either too large to enter the skin, or evaporate, minimizing absorption through the skin
- Due to these attributes, silicones are often used in products positioned in the market for sensitive skin, with claims for treatments for rosacea, eczema, psoriasis, post-surgery, diaper rash and skin ulcers.[4]
- Silicones are often used as a coating for latex in adhesives, gloves and a wide array of other items, preventing the allergen latex from coming in contact with human skin
- No silicone derivatives are listed on American, European and British allergen lists.[21]



Skin and sun care

Do silicones clog pores and cause acne?

- No. Silicones are inert, non-reactive materials that have proven to be non-comedogenic and are extremely safe for topical use. Several silicone materials have proven to be non-comedogenic, and no silicone derivatives are listed on American, European and British allergen lists[5,6].
- They do not promote bacterial or other microbial growth, and do not impact the natural breathing function of the skin, making them ideal additives for foundations and other long-lasting personal care formulations.[3,7,8]

Silicones in beauty care

Are silicones suitable for clean beauty?

- Yes, silicones are the ideal ingredients for clean beauty. Silicones are mineral derived, which makes them a good choice for non-GMO products
- No silicone components are derived from animals, making them vegan-friendly, for example.
- Many silicone materials can be considered as cruelty free as not tested on animals.

References

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Thank you