

What are Silicones?

- Organo metallic polymers with Si-O-Si back bone
- Organic pendent groups like, methyl, ethyl, phenyl and/or other organic functionality
- Silicones are manufactured from silica SiO₂, which is abundant in nature
- **Difference Between Silicone and Organics**
- The ability to form long chains is one of the key differences between silicones and organics.
- When organic molecules start growing into longer chains, they tend to turn into cyclic. Or if the chains get past 15 units, they turn into solids.
- Silicones can grow extremely long chains stretching as long as 3,000 units!

Silicon – The Raw Material

- Silicon is in the same group of the periodic table as carbon
- Structurally similar to carbon in that it will conveniently bond to four other Atoms
- More electropositive than carbon, doesn't form stable double bonds and is capable of unique chemical reactions
- The structural similarities between carbon and silicon allow you to take advantage of the differences to add a new set of tools to your textile and nonwoven manufacturing capabilities
- **These tools offer novel ways to incorporate silicone properties, such as**
- Low surface tension
- Nonionic/nonpolar characteristics
- Unique solubility characteristics
- Hydrophobicity
- Thermal stability
- Oxidation resistance

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- Good dielectric properties
- Liquid at high molecular weight
- Low freezing and pour points
- Low volatility at high molecular weight
- High volatility at low molecular weight
- Minimum viscosity/temperature slope
- Shear stability
- High gas transmission rates
- Low flammability
- Relatively inert
- Nontoxic
- Environmentally safe
- **The Si-O bond – the key to silicone’s unique properties**
 - The Si-O bond has higher bond energy than the C-O bond
 - The Si-O bond is longer and flatter than the C-O bond.
 - The Si-O bond has a lower barrier to rotation than the C-O bond and higher free volume
 - All of these factors contribute to silicone’s open, flexible structure and low glass transition temperature.

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Difference between Carbon and Silicon

CARBON	SILICON
C is organic (plant-based)	Si is inorganic (mineral-based)
C forms covalent bonds	Si forms hybrid ionic/covalent bonds
CO ₂ is a simple gas	SiO ₂ is a complex solid polymer
CCl ₄ is a reasonably stable fluid	SiCl ₄ is highly reactive to water and some organic substances

Because of the hybrid ionic and covalent bond nature of Silicon leads to more modification and stable silicone Polymer .

To be contd

“Have a happy week ahead”

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