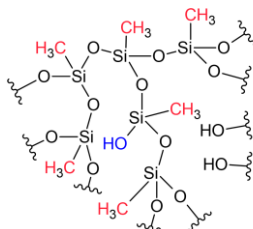


The Hydrophobic Properties of SESQ-ML5: A Detailed Explanation

SESQ-ML5 is synthesized from methyltrimethoxysilane, which is hydrolyzed to form polymethylsilsesquioxane. Polymethylsilsesquioxane is composed of $\text{SiO}_{1.5}\text{CH}_3$ with the chemical structure shown below.

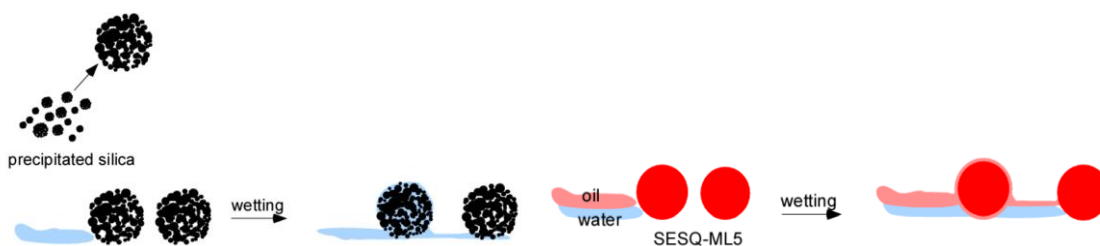


SiOH groups are hydrophilic, Si-O-Si groups are more hydrophobic than hydrophilic, and SiCH_3 groups are highly hydrophobic.

The most representative hydrophilic powders are precipitated silica and fumed silica, which consist of aggregated nanosized silica particles with a large number of SiOH groups. Water can easily penetrate the spatial voids between these silica nanoparticles due to their hydrophilic surfaces.

Wetting refers to the process of coating a surface with a liquid. Therefore, wettability depends on the surface characteristics (whether hydrophilic or hydrophobic) and the surface area.

Silica is highly hydrophilic and readily gets wet by hydrophilic liquids, including water. Precipitated silica, in particular, has a large surface area and significant interstitial spaces between nanosized silica particles. When silica is exposed to mixtures of hydrophobic liquids and water, it will preferentially be coated with water, leaving the hydrophobic oil untouched as illustrated below.



As mentioned above, SESQ-ML5 is polymethylsilsesquioxane with a very low SiOH content, to the extent that no absorption peak of OH is detected in the IR spectrum. SESQ-ML5 exhibits a very high contact angle, and when mixed with water, it floats on the surface and remains afloat for over a year of observation without settling.

The high oil absorption or oil wettability of SESQ-ML5 is a result of its exceptional hydrophobicity. When applied to the skin, hydrophilic water is repelled, while hydrophobic compounds preferentially adhere to its surface.

As a result, SESQ-ML5 demonstrates excellent performance in the selective absorption of oily compounds excreted by the skin as well as oily compounds from the environment.