

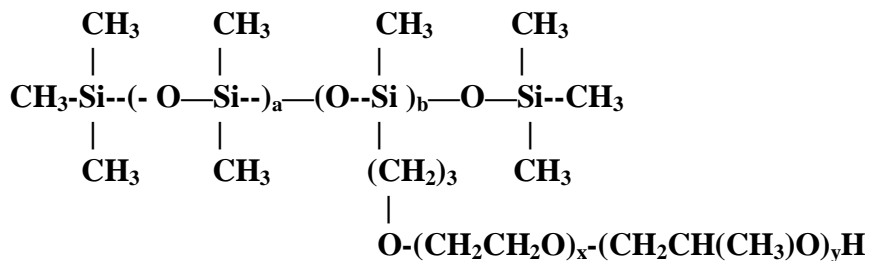


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*Technical Data*

*Silicone Polyether Surfactants and Derivatives*

The products of this class have been known by a variety of names over the years. For years they were known as dimethicone copolyol for cosmetic applications, they are now called PEG/PPG dimethicone. These highly functional materials have also called silicone glycols, and silicone surfactants. Regardless of what they are called, they are a class of compounds that offer many formulation benefits. They conform to the following structure:



Depending upon the exact structure, and molecular weight, the compounds of this class can be used as super wetters, traditional wetting agents, foam generators, conditioners and / or emulsifiers.

To demonstrate this, we have chosen a homologous series of compounds each having 8 moles of polyoxyethylene present. Although the total molecular weight increases over the series, the equivalent molecular weight changes little. What In essence we are doing is putting more and more groups on the molecule, knitting them together.

This results not only modification of molecular weight, in very different performance properties.

Silsurf	Molecular Weight	Wetting 0.1% Sol	CMC mg/l	Surface Tension @ CMC	Eye Irritation		Super Wetting*
					1 day	7day	
<b>A-008</b>	<b>633</b>	<b>7 sec</b>	<b>20</b>	<b>20</b>	<b>28</b>	<b>4</b>	<b>56</b>
<b>A-208</b>	<b>855</b>	<b>8 sec</b>	<b>20</b>	<b>20</b>	<b>13</b>	<b>2</b>	<b>5</b>
<b>B-208</b>	<b>1398</b>	<b>10 sec</b>	<b>20</b>	<b>20</b>	<b>5</b>	<b>2</b>	<b>2</b>
<b>C-208</b>	<b>2105</b>	<b>18 sec</b>	<b>23</b>	<b>22</b>	<b>4</b>	<b>0</b>	<b>2</b>
<b>D-208</b>	<b>2706</b>	<b>257 sec</b>	<b>23</b>	<b>22</b>	<b>2</b>	<b>0</b>	<b>2</b>
<b>J-208</b>	<b>6334</b>	<b>-</b>	<b>23</b>	<b>23</b>	<b>0</b>	<b>0</b>	<b>-</b>

### Wetting

The term super wetting as applied here relates to the ability of a 1% solution of the test surfactant to spread on paraffin without mechanical means. The trisiloxane (Silsurf A-008) is the only product in the series that demonstrates these properties. However, it also is the material with the most limited hydrolytic stability. Blending this material with another silicone glycol neither overcomes the hydrolytic instability of the trisiloxane, nor does it improve the wetting of the non trisiloxane component.

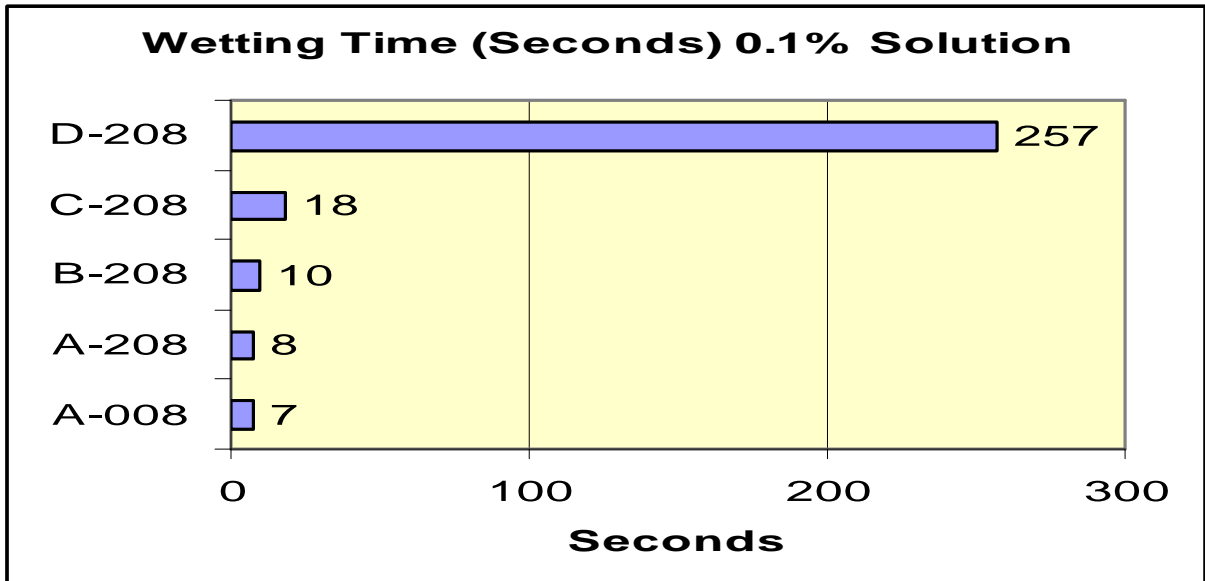
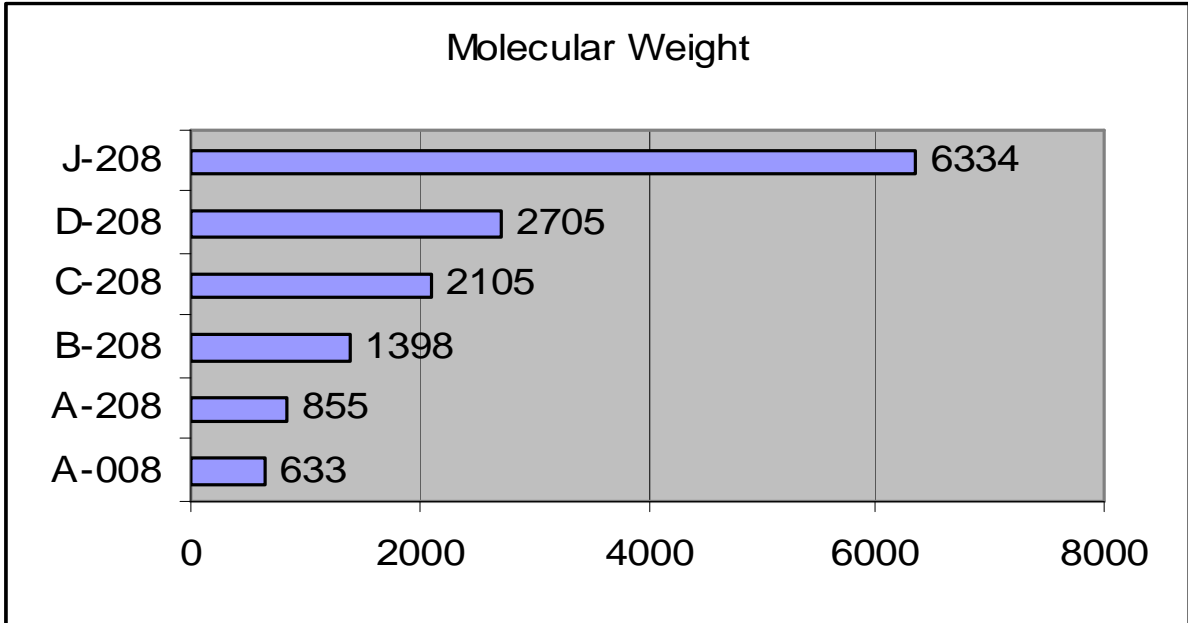
While super wetting is very structure specific, Draves wetting, (the ability to sink a cotton skein in a surfactant solution) is quite different. There is a gradual increase in wetting time as a function if increased molecular weight. Eye irritation of the surfactant drops off as molecular weight increases. This means there are a number of compounds that have outstanding Draves Wetting, and at the same time low irritation.

Wetting turns out to be a critical factor in almost every application for silicone surfactants. Silicone surfactants used for conditioning are high molecular weight materials. They are also poor wetting agents. Therefore the ability to spread uniformly on substrates is difficult, resulting in non-uniform films. It is therefore recommended that a lower molecular weight silicone surfactant be added to wet out the higher molecular weight silicone surfactant. This is true for textile fabrics, plastics and hair. Since wetting occurs at or below the CMC, one should add enough to have the product present at that concentration available after the formulation has been cut to use concentration.

Table 1 describes the molecular weight of several of the products. Table 2 describes the wetting time for those same compounds. As can be easily seen, there is quite a

variation in the speed of wetting. Proper selection offers the formulator products chosen for their specific properties.

Siltech offers a kit that contains four products having differing wetting attributes. They are: Silsurf A-208, Silsurf B-208, Silsurf C-208, and Silsurf D-208. The kit allows for the evaluation of the series of related materials in specific formulations to determine optimum performance.



The proper selection of silicone polyether for a give application will most likely include a lower molecular weight product for wetting and a higher molecular weight component for conditioning, slip and feel modification. Siltech has also developed and has patents pending on a variety of products that are synergistic blends of various silicone glycols and other surfactants.

### **Foaming and Conditioning**

The low surface tension of Silsurf surfactants allows for foaming properties as well. Silsurf surfactants provide foam in water and in hydro-alcoholic solutions. Silsurf surfactants provide foam in a variety of formulations where fatty surfactants are of ineffective. High molecular weight Silsurf products (specifically Silsurf J-208) provide foam and conditioning in aqueous systems. Silsurf products are non-ionic surfactants and as such are easily formulated with anionic, cationic, non-ionic or amphoteric surfactants. Siltech also offers cationic silicones and alkyl silicones for improved conditioning.

### **Emulsification**

Alkyl dimethicone copolyol compounds are very effective emulsifiers, especially for preparation of invert emulsions. Siltech offers a kit that contains four products having differing wetting attributes. They are: Silube J-208-212, Silube J-208-412, Silube J-208-612, and Silube J-208-812. The kit and the supporting literature allows for the evaluation of the series of related materials in specific formulations to determine optimum performance.

### **Silwax DMC Series**

Dimethicone copolyol compounds can be modified to allow for the delivery of outstanding softening and conditioning. The proper selection of a synergistic surfactant allows for the uniform application of high molecular weight silicone onto a variety of substrates. These substrates include hair, textile fabric, and polymer surfaces.

These high performance products are sold under the “Silwax-DMC” trade name.

<b>Silwax WD-IS</b>	PEG 8 Dimethicone isosterarate	Microemulsion that provides conditioner and tact modifier and fragrance emulsifier	2 in one shampoos body wash conditioners
<b>Silwax WD-O</b>	PEG 8 Dimethicone olivate	Natural oil derived water soluble conditioner and fragrance emulsifier	
<b>Silwax WS-L</b>	PEG 8 Dimethicone laurate	Water soluble conditioner and feel modifier and fragrance emulsifier	
<b>Silwax WD-AV</b>	PEG 8 Dimethicone avocadoate	Natural oil derived water soluble conditioner and feel modifier and fragrance emulsifier	

**Personal Care** -This class of materials provides lubrication and conditioning properties to hair and skin and may be used in products including creams, body lotions, after-shave balms and gels, shampoos and conditioners. It is a multi-functional ingredient that serves as a co-emulsifier, emollient, slip aid, tack reducer and gloss enhancer. Use levels range from 0.5 to 3% by weight.

**For additional information, contact your Siltech representative.**

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