

Silicone additives for plastics and composites

DOW

®

DOWSIL™

silicones by **DOW**

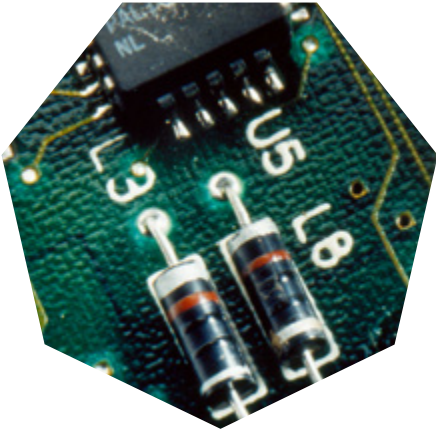


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INTRODUCTION

The miniaturization trend in electronic devices requires smaller, more durable and higher-performing materials. Dow can help you to find a solution to achieve these goals in your printed circuit boards and epoxy molding compounds. With plastic and composite additives from Dow, you will get the benefits of our materials, and you also can collaborate with our experts to find the product that meets your engineering requirements and business expectations for today and for tomorrow. Plastic and composite additives from Dow can help you make your processes efficient, achieve your quality goals and reach new levels of performance demanded by today’s ever-advancing electronics market.

Basic performance of Si-based material for EMC

	Molding	Flowability	Stress relief	Anti-moisture	Adhesion	Fire resistance
Fluid	●●	●	●			
Resin		●	●	●	●	●
E-powder			●●			
Silane		●		●●	●●	

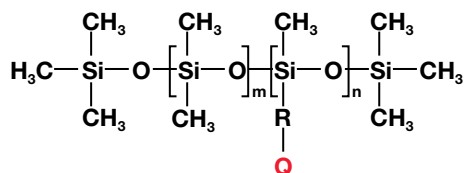
●● Excellent ● Good

SILICONE FLUID

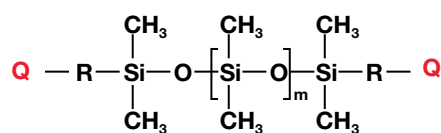
Functional silicone fluid have thermally stable siloxane backbones and organo-functional groups, which can improve the compatibility of silicone fluids with organic resins. The structure can provide such benefits as better dispersion of fillers, more flowable polymer, stress relief. Dow can supply both non-reactive and reactive silicone fluid.

NON-REACTIVE SILICONE FLUID

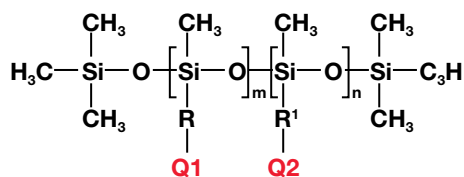
Structure A



Structure B



Structure C



Q = Organo-functional group

Polyether modified silicone fluid

Product name	Appearance	Viscosity (mm ² /s)	Structure
DOWSIL™ BY 16-036 Fluid	pale yellow	630	A
DOWSIL™ SH 28 Paint Additive	pale yellow	250	A
DOWSIL™ SF 8428 Fluid	pale yellow	140	A
DOWSIL™ 501W Additive	pale yellow	20	A
DOWSIL™ L-7001 Fluid	pale yellow	2,400	A
DOWSIL™ FZ-2104 Fluid	pale yellow solid	900*	A
DOWSIL™ L-7002 Fluid	pale yellow	1,200	A
DOWSIL™ SF 8427 Fluid	pale yellow	300	B

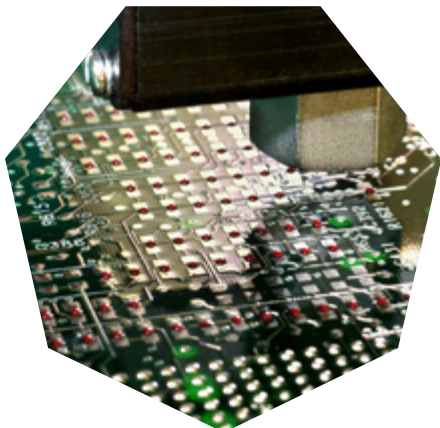
*Measured at 38°C

These are typical values and not specifications

Alkyl modified silicone fluid

Product name	Appearance	Viscosity (mm ² /s)	Structure
DOWSIL™ SF 8416 Fluid	pale yellow	950	A
DOWSIL™ BY 16-846 Fluid	pale yellow	20	A
XIAMETER™ SH 203 Fluid	pale yellow	950	C
DOWSIL™ 56 Additive	pale yellow	1,300	C

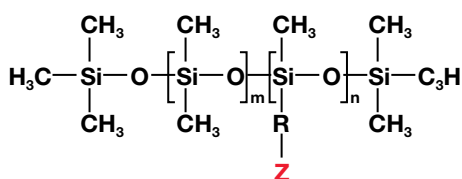
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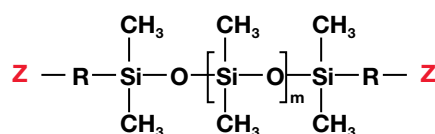
REACTIVE SILICONE FLUID

Reactive silicone fluid can react with base plastic through reactive functional groups such as epoxy, amino and carboxylic acid. The reaction can provide durable bonding and reduce bleeding from composites. Also, these reactive polymers can be used for copolymerization with organic resins.

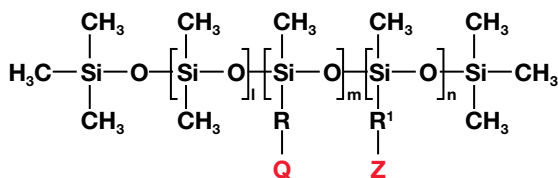
Structure A



Structure B



Structure C



Q = Non-reactive functional group
Z = Reactive functional group

Carboxyl functional fluid

Product name	Appearance	Viscosity (mm ² /s)	Equivalent (g/mol)	Structure
DOWSIL™ BY 16-880 Fluid	amber	2,500	3,300	A
DOWSIL™ BY 16-750 Fluid	amber	170	750	B

These are typical values and not specifications

Amino functional fluid

Product name	Appearance	Viscosity (mm ² /s)	Equivalent (g/mol)	Structure
XIAMETER™ OFX-8417 Fluid	pale yellow	1,200	1,700	A
DOWSIL™ BY 16-849 Fluid	pale yellow	1,200	600	A
DOWSIL™ FZ-3785 Fluid	pale yellow	3,600	6,000	A
DOWSIL™ 16-853 U Fluid	pale yellow	14	450	B

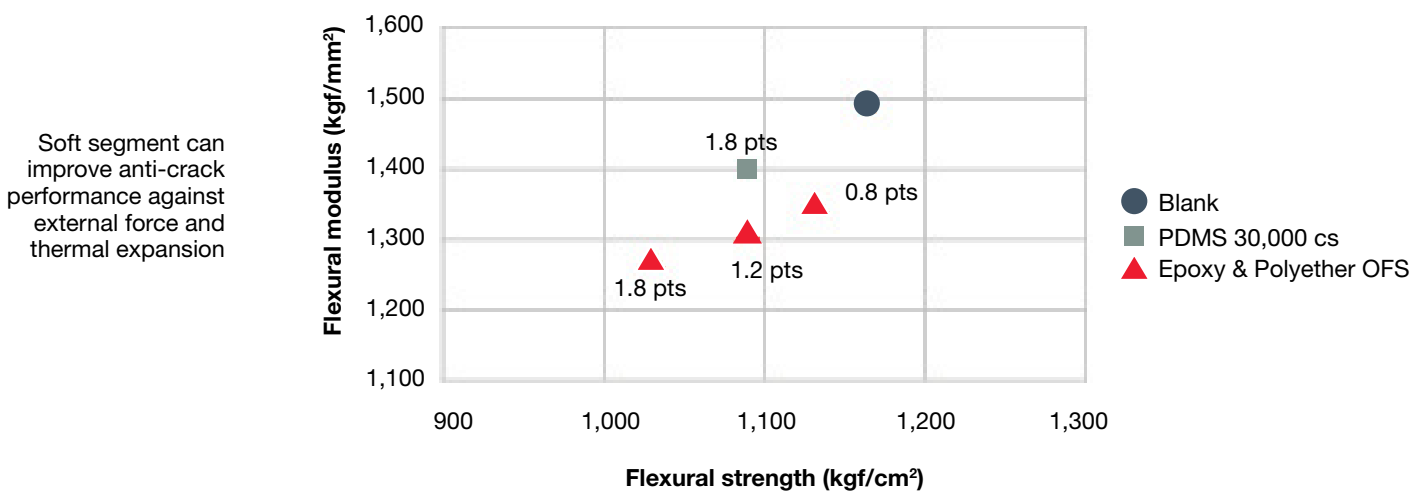
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Epoxy functional silicone fluid

Product name	Appearance	Viscosity (mm ² /s)	Equivalent (g/mol)	Structure
DOWSIL™ SF 8413 Fluid	pale yellowish brown	17,000	3,800	A
DOWSIL™ SF 8411 Fluid	yellowish brown	8,000	3,300	A
DOWSIL™ BY 16-839 Fluid	pale yellowish brown	6,000	3,700	A
DOWSIL™ FZ-3736 Fluid	pale yellow	2,200	5,200	C
DOWSIL™ SF 8421 EG Fluid	pale yellowish brown	3,100	11,000	C
DOWSIL™ BY 16-870 Fluid	pale yellowish brown	550	1,300	C
DOWSIL™ BY 16-876 Fluid	yellowish brown	2,400	2,800	C
DOWSIL™ BY 16-760 Fluid	pale yellow	1,500	2,300	C

These are typical values and not specifications



Flexural modulus vs. flexural strength of an epoxy molding compound (EMC) with silicone fluid.

SILICONE POWDER AND SILICONE RESIN

SILICONE POWDER

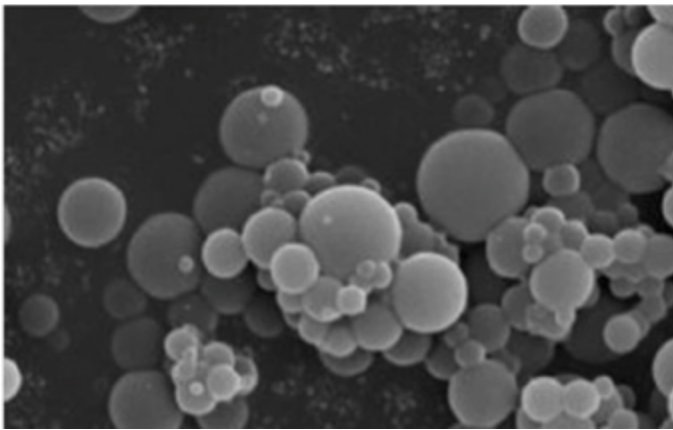
Silicone elastomer provides excellent stress relief in epoxy molding compounds. Dow has a wide range of silicone powder to formulate with epoxy molding compounds.

Silicone powder

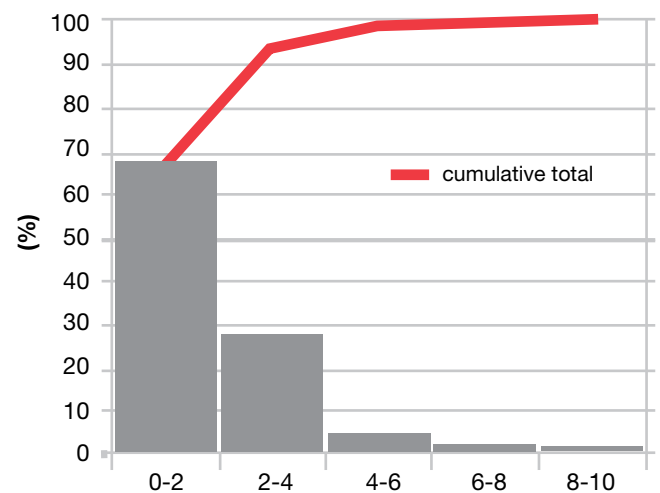
Product name	Appearance	Particle size (µm)	Bulk density	Note
DOWSIL™ EP-5500 Powder	fine powder	3	0.3	soft powder
DOWSIL™ EP-5518 Powder	fine powder	3	0.2	soft powder
DOWSIL™ EP-2600 Powder	fine powder	2	0.1	moderate hardness
DOWSIL™ TREFIL E-606 Silicone Powder	fine powder	2	0.1	hard powder
DOWSIL™ EP-2601 Powder	fine powder	2	0.1	epoxy functional
DOWSIL™ EP-2720 Powder	fine powder	2	0.1	methacryl functional

These are typical values and not specifications

Powder image of DOWSIL™ EP-2720 Powder



Powder size distribution of DOWSIL™ EP-2720 Powder



SILICONE RESIN

Silicone resins can increase flowability of compounds and reduce flexural modulus of cured composites. The Si-O-Si crosslinked structure helps fire resistance property.

Silicone resin

Product name	Appearance	OH content (%)	Note
DOWSIL™ AY 42-119	powder	0	epoxy functional
DOWSIL™ FCA-107 Flake Resin	flake	8	

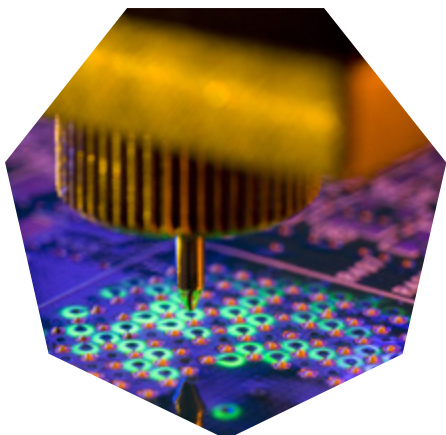
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SILANE COUPLING AGENT

Silane coupling agent is often used in filler-reinforced plastic because of unique reactivity between inorganic and organic material. The silanes can help filler dispersion and adhesion and improve mechanical strength, long-term durability, anti-moisture property and more.

Product name	Compositions
XIAMETER™ OFS-6224 Silane	Vinylbenzylaminoethylaminopropyltrimethoxysilane; partially hydrolyzed, in MeOH solution – low-chloride coupling agent
XIAMETER™ OFS-6269 Silane	Vinylbenzylaminoethylaminopropyltrimethoxysilane; in MeOH solution
DOWSIL™ Z-6132 Silane	Hydrolyzed version of XIAMETER™ OFS-6032 Silane, in MeOH solution
DOWSIL™ Z-6883 Silane	Phenylaminopropyltrimethoxysilane

Dow also offers a variety of organo-functional silanes.
For more information, please contact Dow.



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To learn more about Dow's wide range of Plastics and Rubber solutions, visit dow.com.

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