



MOMENTIVE
performance materials

Silicone elastomers for coating applications

Material selector guide



SILICONES, A MOST VERSATILE MATERIAL

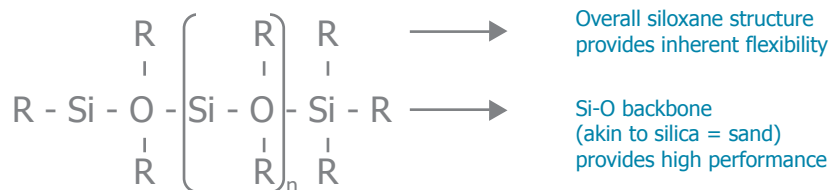
Silicones are a remarkably versatile family of synthetic materials with hundreds of uses. Silicones are polymers that, depending on the lengths of the chains and the natures of the attached groups, can range from liquids (used in personal care) to gels (e.g. for shock absorption in sport shoes) to resins (e.g. in lipsticks) to elastomers (for conveyor belts or pacifiers for instance).

SILICONE ELASTOMERS FOR COATING APPLICATIONS

Silicone elastomers can be categorized by catalyst and/or by processing technology. The industry distinguishes three major types: Liquid Silicone Rubbers (LSR) which are addition curable, Heat Cured Elastomers (HCE) which are either peroxide or addition curable and Room Temperature Vulcanizable (RTV) materials which are either condensation curable or addition curable systems. All three types can in principle be used as elastomeric coating materials. However, RTVs are most commonly used for coating applications as their viscosity range enables ready-to-use grades that can be applied in a coating process without the need for mixing with solvents which is often required for HCE's resulting in additional process steps and the need to comply with the regulations on Volatile Organic Compounds (VOC's).

FEATURES AND BENEFITS OF SILICONE ELASTOMERS

The basic chemistry of silicone elastomers provides many useful features that enable a wide range of coating applications. The principle structure of the polymer (polyorganosiloxanes) consists of an inorganic Si-O backbone (akin to silica or sand) which provides high performance characteristics, whereas the overall siloxane structure provides inherent flexibility without the need for plasticizers.



The key benefits of silicone RTVs for coating applications are:

- High flexibility, high elongation
- High temperature resistance up to 200°C
- Low temperature flexibility down to -50°C
- Suitable for food contact compliance
- Suitable for skin contact applications
- Neutral odour and taste
- Dynamic strength
- Chemically inert, non-stick
- Weatherability, UV resistance
- Transparency, colorability
- Processability, safe handling

Limitations of silicone elastomers are the relatively low abrasion resistance and the resistance against oils (swells in organic fluids). Properties that may be provide an advantage or a disadvantage, depending on the application, are: high coefficient of friction, high gas permeability and electrical insulation properties.

MARKETS FOR SILICONE ELASTOMER COATINGS

The versatility of silicone elastomers caused these materials to find a wide range of applications in many different markets:

Typical markets

Conveyor belts
Construction
Medical
Protective clothes
Home textiles
Billboards
Inflatable textiles
Tents & marquees
Air bags
Public transportation

Key silicone fit

Food contact, Grip
Low temp. resistance
Skin compatibility, Sterile.
Soft touch
Fire resistance
UV resistance
Elongation
Moisture repellency redry
Vibration resistance, LTF
Fire resistance

Momentive Performance Materials participates in all of the above markets and offers a broad portfolio to meet the specific needs of the various applications.

KEY TRENDS AND IMPLICATIONS

A number of major trends drive increasing demand for silicone elastomer coatings, especially for addition curable technology and RTV Gels:

- Increasing demand for higher performing, easy-to-use materials.
- Technical textiles are projected to see double digit growth over next 5 years¹, requiring high performance materials.
- Increasing interest in silicone gel coatings to improve user comfort and the efficacy of scar- and wound management solutions.
- New regulatory compliance requirements for the EU:
 - EU directive 31 BimSchV to reduce VOC's by November 2005
 - EU Commission classified Di-butyl Tin (DBT) compounds as CMR Cat. 2 (i.e. regarded as Carcinogenic, Mutagenic and Toxic to Reproduction in Humans) in November 2005
- Increasing need for higher outputs to maximize productivity in competitive segments.

The above trends result in an increasing use of addition cure technology, enabling regulatory compliance, high performance and productivity (see further explanations in the next paragraph).

ADDITION CURE VERSUS CONDENSATION CURE TECHNOLOGY

RTV elastomers can be cross linked using addition cure or condensation cure catalyst technology. Condensation cure has traditionally been favourite as it allows the coated silicone surface to cure at room temperature given sufficient moisture levels. However, Addition cure technology is rapidly becoming more popular now as this catalyst technology does not produce any by-products making it more suitable for regulatory compliance. Addition cure technology needs to be cured at elevated temperatures but enables much faster curing, resulting in higher output levels.

Addition cure feature	Benefit to the coater	Benefit to the OEM
Fast Cure	Ability to increase line speeds	Competitiveness
No post cure	Increase production speed No blocking	Consistent product quality No blocking
No dependency on humidity Levels	Simpler coating equipment (smaller & cheaper machines) Reduced operator time	Higher quality
Less susceptible to atmospheric conditions	Higher consistency	Consistent product quality
No tin based catalyst	Irritation risk eliminated Improved environmental position	Irritation risk eliminated Improved environmental position ÖKO Tex / Skin Contact Compliant
High adhesion performance	Product quality	Life & reliability

¹Technical Textiles Symposium, Würzburg September 2004

RTV COATING PROCESSES

Momentive Performance Materials provides a wide choice of products for different applications and processes. Common processes are knife over roller, knife over air and floating knife. Other processes are also possible but most of these would require solvents to control viscosity during processing like with immersion coating, metering rod coating, roller coating, curtain coating and spray coating.

ADDITION CURABLE RTV PRODUCT HIGHLIGHTS

For skin- and food-contact

RTV 830: High modulus, tin free, thermally cured RTV suitable for skin contact applications and food contact compliance. Rapid curing gives real savings in consumption and productivity.

Application examples:

stocking grippers, medical stockings, underwear and hosiery, socks and waistbands.

RTV 834: solvent-free, flowable 2-component tacky RTV Silicone rubber. Specially developed as a tacky coating for fabric.

Application examples:

lace coating, clothes and conveyor belt coating.

Silopren* TP3904: RTV gel, removable/repositionable adhesion, thermally cured, suitable for skin contact applications

Application examples:

Scar management, wound care, colostomy bags

For glass fiber coating

TC5050 & TC5060: Developed specifically for glass fibre coating provides excellent adhesion to glass.

Application examples:

glass fibre coatings like automotive cable sleeve, marine engine cover, PPE glass fibre suite for heat protection

For textile bonding / lamination

XE15-B0344: screen printable grade with high adhesion and good elongation works very well as a patch adhesive.

RTV 820: New bonding/laminating grade with superior mechanical and adhesive properties.

Application examples:

airbag seam adhesive, heat reflective foils and adhesion of multi layer systems.

INCREASING DEMAND FOR SILICONE GELS

Silicone gels provide a new generation of coating solutions. Gels are visco-elastic and provide maximum comfort and pressure care therefore. Adhesive gels are increasingly popular for instance for applications where adhesion to the skin and repositioning without causing trauma is required. Main applications for gels are scar- and wound-management solutions where the gel provides protection and adhesion around the wound area respectively.

GLOSSARY

Blocking	Adhesion of successive layers of coated fabric	Penetration	Amount which a coating enters between the fibres of a fabric (key for adhesion)
BVL	Bundesamt für Verbraucherschutz und Lebensmittelsicherheit (Federal Office for Consumer Protection and Food Safety) Principle European approval body for food contact	PPE	Personal Protective Equipment
CWT	Common abbreviation for coat-weight	Residence Time	Time fabric spends in oven (a function of oven length and machine speed)
Cohesive Strength	The internal strength of the adhesive (as opposed to the adhesive strength)	Seam Sealing	A process in which the stitch line of a garment is made leak proof by the application of seam tape or seam sealing glue
Denier	The weight measurement of filament yarns and fibres. The low numbers represent the finer sizes and the higher numbers, the heavier yarns.	Strike-through	The silicone textile coating goes through the textile to the back side during the coating process
Decitex	The weight in grams of 10.000 meters of a given yarn (also Dtex)	Tensile Strength	The maximum stress that a material can withstand without breaking
Filament	A fine or thinly spun thread or fibre	Tear Strength	Force required per unit area to initiate a tear in a sample (can also be viewed as resistance to tearing)
FDA	Food & Drug Administration – US approval body for food contact	UL	Underwriters Laboratories – provide accreditation in relation to fire resistance
Heat-set	Process for stabilization of fabric by exposure to heat	VOC	Volatile Organic Compound
Hypoallergenic	Substance has little likelihood of causing an allergic response Web	Web	Fabric
Modulus	Ability of a material to resist deformation (elasticity)	Weft	The horizontal (crosswise) threads that intersect the warp (lengthwise) threads in a woven fabric
		Warp	Lengthwise yarns found in all woven fabrics. The warp is stronger and denser than the weft (crosswise) yarns.

Silicone elastomer coatings - Overview

RTV addition curable					
Product	Market	System	Key Features	Application examples	Colour
Addisil* 6300	Food contact	AC, 1K	FDA, high friction, adhesion	Conveyor belts, textile coatings	White
SLE 5401		AC, 2K	FDA, abrasion resistance, adhesion	Conveyor belts, textile, air bags ¹	Hazy
TP 3904	Skin contact	AC, 2K	Gel, skin compatibility, high tack	Stocking grippers, wound care	Transparent
TP 3239		AC, 2K	Gel, skin compatibility	Scar management	Transparent
TC 5050	Technical	AC, 2K	Adhesion to fibers, mechanical performance	Glass, Aramid fabrics, insulation	White
TC 5060		AC, 2K	Adhesion to fibers, mechanical performance	Glass, Aramid fabrics, insulation	White
SLE 5300		AC, 2K	Mixable with SLE 5500, high temperature	Glass fibers, textile coatings	White
SLE 5500		AC, 2K	Mixable with SLE 5500, high temperature	Glass fibers, textile coatings	White
SLE 5600		AC, 2K	Mechanical strength	Glass fibers, textile coatings	Beige
SLE 5700-D1		AC, 2K	Antiblocking, fabric strength	Glass fibers, textile coatings	Translucent
RTV 820	Textiles	AC, 2K	Bonding to nylon, fast cure, adhesion	Textile bonding, lamination, air bags	Translucent
RTV 830		AC, 2K	High modulus, fast cure, high friction	Stocking grippers, conveyor belts	Translucent
RTV 834		AC, 2K	Repositionable adhesion, high elongation	Stocking grippers, conveyor belts	Translucent
RTV 850		AC, 2K	High Temperature, mechanical bond	Textile coating, pressure cushions	Grey
XE 15 B0344		AC, 2K	Patch adhesive, pot life	Textile bonding, lamination, air bags	Grey

¹Air bag coating package

RTV condensation curable					
Product	Market	System	Key Features	Application examples	Colour
IS 5624	Food contact	CC, 1K	FDA, grindable, for bonding and sealing	Conveyor belts for food contact	Beige
IS 5625		CC, 1K	BfR, grindable, for bonding and sealing	Conveyor belts for food contact	Grey
RTV 116		CC, 1K	FDA, temperature resistance	Conveyor belts for food contact	Red
RTV 106		CC, 1K	FDA, fast cure	Metal bakery moulds, conveyor belts	Red
RTV 108	Skin contact	CC, 1K	USP Class VI, FDA, fast cure adhesive	Adhesives for medical devices	Translucent
RTV 118		CC, 1K	USP Class VI, FDA, fast cure adhesive	Adhesives for medical devices	Translucent
IS 5610/W130	Textiles	CC, 1K	High elongation, anti-slip, weatherable	Stocking grippers, anti slip	Translucent
IS 5610/60C2		CC, 1K	Medium penetration anti-slip, weatherable	Stocking grippers, anti slip	Translucent
IS 5628 E		CC, 1K	Tear strength, adhesion to silicone	Textile bonding, lamination	Translucent
IS 5628 / 90		CC, 1K	High penetration, anti-slip, clarity	Anti-slip coating, lamination	Translucent

LSR (Liquid Silicone Rubbers)					
Product	Market	System	Key Features	Application examples	Colour
LSR 2540	Textiles	AC, 2K	Mechanical strength, FDA, high friction	Glass fiber sleeves, textiles, Conveyor belts, tents	Translucent
LSR 2530	Food contact	AC, 2K	Mechanical strength, FDA, high friction	Glass fiber sleeves, textiles, Conveyor belts, tents	Translucent
LSR 2560		AC, 2K	Mechanical strength, FDA, high friction	Glass fiber sleeves, textiles, Conveyor belts, tents	Translucent
LSR 2540/01		AC, 2K	Mechanical strength, FDA, high friction	Glass fiber sleeves, textiles, Conveyor belts, tents	White
LSR Top coat TP 3719	Skin contact	AC, 2K	Reduce coefficient of friction, USP Class VI	Low friction surfaces	Colorless, matte
LSR Top Coat HE		AC, 2K	Reduce coefficient of friction, high elongation	Low friction surfaces	Colorless, matte

Silicone elastomer coatings - Product Data

RTV addition curable								
Product	Market	System	Cure speed	Viscosity [Pa.s]	Pot life at RT	Hardness (Shore A)	Elongation [%]	Tensile strength
Addisil* 6300	Food contact	AC, 1K	Fast ²	30	4 months	30	300	2,5
SLE 5401		AC, 2K	Fast ²	25	8 hours	48	200	5,5
TP 3904	Skin contact	AC, 2K	Fast ²	10	5 min	33 ⁴	NA	NA
TP 3239		AC, 2K	Room temperature ³	0,7	4 hours	26 ⁴	NA	NA
TC 5050	Technical	AC, 2K	Fast ²	45	60 hours	50	NA	5,2
TC 5060		AC, 2K	Fast ²	44	60 hours	57	NA	5,7
SLE 5300		AC, 2K	Very Fast ¹	16	48 hours	33	NA	NA
SLE 5500		AC, 2K	Very Fast ¹	100	48 hours	27	NA	NA
SLE 5600		AC, 2K	Very Fast ¹	150	48 hours	58	220	5,5
SLE 5700-D1		AC, 2K	Very Fast ¹	20	48 hours	40	>200	>5,0
RTV 820	Textiles	AC, 2K	Fast ²	320	72 hours	22	>600	5,2
RTV 830		AC, 2K	Fast ²	85	100 min	26	540	4,4
RTV 834		AC, 2K	Very Fast ¹	110	100 min	40 shore 00	500	2
RTV 850		AC, 2K	Fast ²	20	4 days	48	200	5,0
XE 15 B0344		AC, 2K	Fast ²	180	8 hours	33	460	5,4

RTV condensation curable								
Product	Market	System	Cure speed	Viscosity [Pa.s]	Pot life at RT	Hardness (Shore A)	Elongation [%]	Tensile strength
IS 5624	Food contact	CC, 1K	Room temperature ³	100	15 min	35	250	2,8
IS 5625		CC, 1K	Room temperature ³	150	15 min	40	270	4,5
RTV 116		CC, 1K	Room temperature ³	250	15-20 min	20	350	2,5
RTV 106		CC, 1K	Room temperature ³	Non flowable	15-20 min	30	400	2,6
RTV 108	Skin contact	CC, 1K	Room temperature ³	Non flowable	15-20 min	30	450	2,8
RTV 118		CC, 1K	Room temperature ³	200	15-20 min	25	325	2,3
IS 5610/W130	Textiles	CC, 1K	Room temperature ³	145	8 min	18	675	1,02
IS 5610/60C2		CC, 1K	Room temperature ³	80	8 min	20	300	1,02
IS 5628 E		CC, 1K	Room temperature ³	175	10 min	33	750	---
IS 5628 / 90		CC, 1K	Room temperature ³	90	6 min	18	650	2,4

LSR (Liquid Silicone Rubbers)								
Product	Market	System	Cure speed	Viscosity [Pa.s]	Pot life at RT	Hardness (Shore A)	Elongation [%]	Tensile strength
LSR 2540	Textiles	AC, 2K	Very Fast ¹	100	3 days	40	500	6,5
LSR 2530	Food contact	AC, 2K	Very Fast ¹	60	3 days	30	500	4,0
LSR 2560		AC, 2K	Very Fast ¹	110	3 days	60	300	7,0
LSR 2540/01		AC, 2K	Very Fast ¹	55	3 days	41	500	5,5
LSR Top coat TP 3719	Skin contact	AC, 2K	Fast ²	33	3 days	NA	NA	NA
LSR Top Coat HE		AC, 2K	Fast ²	33	3 days	NA	NA	NA

1. at high temperatures, e.g. 1 min @ 200°C

2. e.g. some minutes @ 200°C

3. e.g. 24 hrs, can be accelerated e.g. 20 min @ 60°C

4. penetration value

*Addisil is a trademark of Momentive Performance Materials Inc. or affiliates.

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