SILICONE COATED ARCHITECTURAL TEXTILES

Johann Müller,
Wacker Chemie GmbH, Burghausen

Presented by James Dar
Sila Australia

Silicone coated technical textiles are well established in many application fields. In many cases silicone coating opened completely new application possibilities.

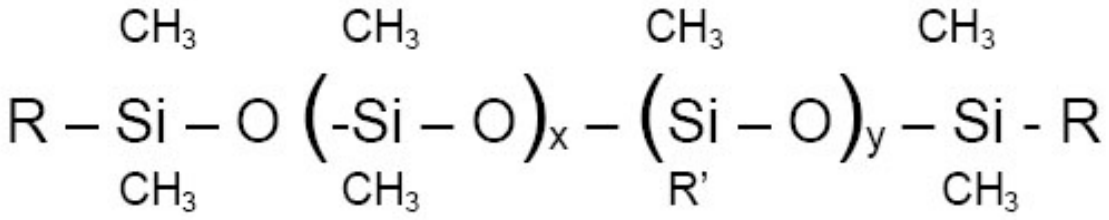
In the last century, silicone coatings have shown a really fast growing development. Airbags, conveyor belts, protective clothing, hospital textiles, high performance clothing and Para gliders would not be possible without the benefits conveyed by silicone coatings.

Can these special properties of silicone coatings also be used for architectural textiles, such as awnings, black out curtains, or even membranes for large roof constructions?

In this lecture we will try to answer this question.

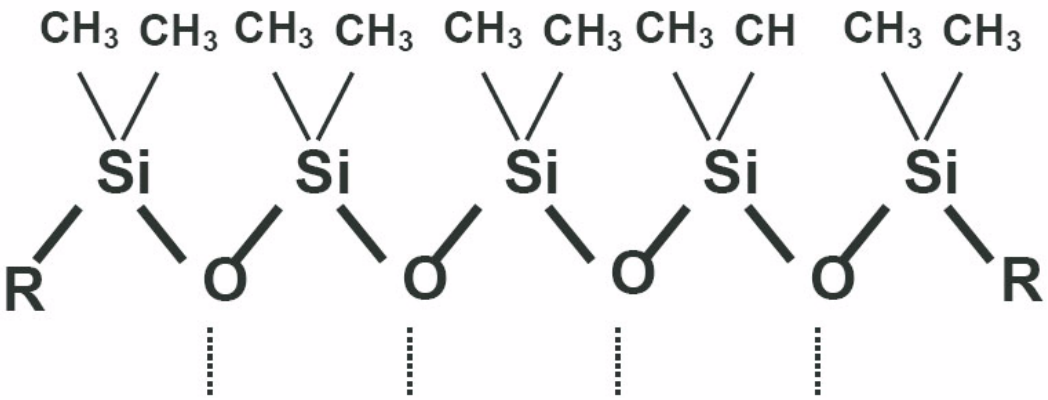
Properties of Silicone Rubber

Let us briefly look at silicone chemistry. Silicone rubber consists mainly of dimethyl polysiloxane units with reactive groups. Reinforcing fillers and different additives are added to influence to the final mechanical properties.



R = vinyl, hydroxy, methyl, phenyl R' = vinyl, methyl

When applied to a surface the silicone rubber orients itself according the polarity of the substrate surface. The non polar, non reactive methyl groups tend to move away from the surface.



This is the reason for the typical surface characteristics of silicone rubber coatings.

- Low surface energy (22 mJ/m2)
- Hydrophobicity (Contact angle > 100 degrees)
- Dirt repellence
- Self cleaning with rain

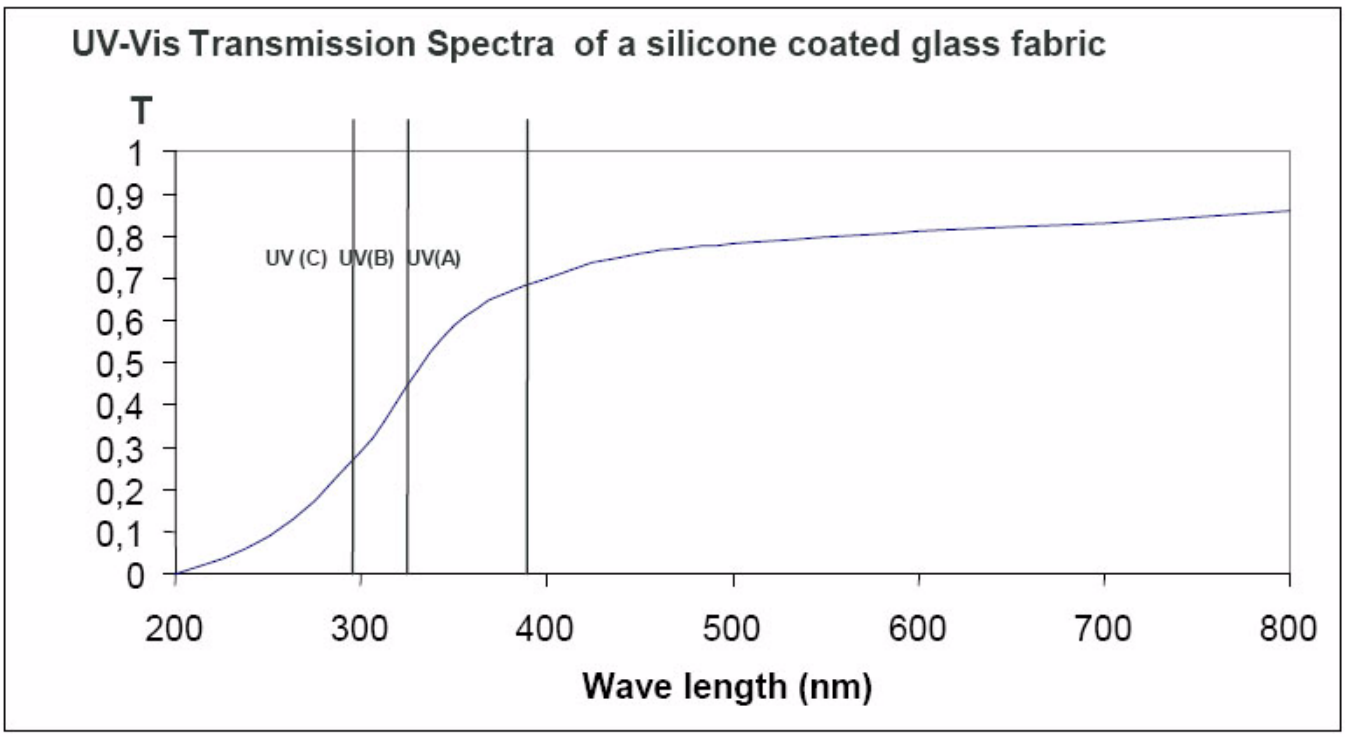
In combination with the well know properties of silicone rubber such as

- Temperature resistance from – 50 to + 200 degrees C
- Flame retardancy
- Durable elasticity
- Transparent or readily pigmented
- Resistant to weathering and ageing
- Resistant to many chemicals
- Free of halogens
- Ease of use

you can see why Silicone Rubber is a nearly ideal coating material for architectural textiles, both for interior and exterior applications.

When pedestrian areas, sports stadiums or official buildings – that means big projects – are covered with a membrane, it is important that as much as possible of the visible light should pass through the membrane.

The transmission spectra of a silicone coated glass fabric shows that exactly this requirement can be met by a silicone rubber coating. And there is an additional benefit: UV–B and UV–C radiation, which is harmful for plants, animals and humans, is largely blocked by the silicone coating but the UV–A radiation, necessary for plant growth, is transmitted.



Welding

Silicone rubber is not thermoplastic unlike, for example, PVC. Thermal welding or high frequency welding is not possible. Fast and durable gluing with silicone adhesives is, however, well established.

Room temperature curing 1 – component silicone glues or 2 – component, heat curing silicone adhesives are well known from the past.

Recently a silicone adhesive tape has been developed. It can be applied from a roll directly to the silicone coated fabric. It cures under heat and pressure. Well known press bars can be used to achieve reliable bonding of the fabrics.

Curing temperature can be from 150 to 200 degrees C. Dependant on temperature, the curing time is from 20 to 60 seconds.

Silicone adhesive tape | Peel test

Peel forces up to 400 N/5 cm according DIN 53 530 can be reached.

Comparison of Different Membranes

Property	PVC/PE	Silicone/fiberglass	PTFE/fiberglas
Average life-time	10 -15 years depinding. on exposure, opacity, finish	> 25 years	> 25 years
Translucency	Up to 25%	up to 50% dep. On pigments, fabric	5% - 15%
Colorability	all colors available opaque + translucent no discoloration	all colors available opaque + translucent no discoloration	white and a few other colors discoloration
Soiling behavior	satisfactory	satisfactory	very good
Flammability Std	B1	A2	B1
Temperature Range	-30°C to 70°C	-50°C to 200°C	stiff below -20°C
Weather resistance	good	very good	very good

Property	PVC/ PES	Silicone/fiberglass	PTFE/fiberglass
Tensile Strength	medium	high	high
Tear Strength	medium	high	high
Construction stretch	medium	low	low
Dimensional Stability	medium	high	high
Flexibility	high, easy fabrication, transportation and installation	high, easy fabrication, transportation and installation	low, difficult to handle, accurate cutting and installation crucial
Jointing	HF welding hot-air welding	gluing	sintering
Eco-toxicity		halogen free	

Silicone coated fabrics are very well suitable for all architectural applications.

For interior applications, for example, awnings, black out curtains, wall coverings and sound protection, and exterior applications such as membranes for air supported constructions, big tents and various kinds of roof, silicone coated fabrics have been used very successfully.

Black out curtain

Expo 2002 Biel

Expo 2002 Biel

SILICONE RUBBER – A HIGH TECH MATERIAL FOR INNOVATIVE APPLICATIONS