

# Silicone Coated Glass Fabrics for Tensile Structures

James Dar  
Sila Australia




## Glass Fibres Fabric & Polymers

Since their development over 60 years ago, woven glass fibre fabrics have become indispensable throughout industry.

In the architecture of the 20th century glass increasingly dominated as the cladding style for high rise buildings. Associated with the production of glass from silica was the development of the synthetic polymers – silicone – with many advantages properties including chemical inertness, thermal stability and resistance to oxidation.

Originally used as sealants and bonding agents for glass the rapidly expanding market in the fabric architecture prompted the development of silicone coated glass fabrics.

Silicone coated glass fibre fabrics are increasingly used to create lightweight membrane structures that embrace a new contemporary freedom of form, lightness and ecological appeal.



## Silicon and Silicone

Silicon (Si) is a metalloid and after oxygen the most abundant element on earth

Silicon makes up approx 26% of Earth's crust by mass

Silicon dioxide SiO<sub>2</sub> also known as silica is found in form of sand, clay, quartz


Silicones are synthetic polymers produced from Silicon

Silicone is made of inorganic Oxygen-Silicon backbone with organic side groups

\*[Si](C)(C)O[Si](C)(C)O[\*]

Silicones vary in consistency from liquid to gel to rubber to hard resins & plastics

LSAA 2007 Lightweight Architecture



## Polysiloxane - Silicones

Another name for Silicone is Polysiloxane – polymerized siloxanes

The word Siloxane derives from the words Silicon, Oxygen and Alkane


World wide production of silicone in 2002 was approx 2,000 000 t

About 50% was used for elastomers and sealants, in Western Europe 350,000 t

The growth rate for Silicone elastomer is 5% pa, 10 – 20% pa for LSR

One-part silicone sealants are in common use to seal gaps, joints and crevices

LSAA 2007 Lightweight Architecture



## Materials for Tensile Structures

Diagram showing materials for tensile structures:

- Polyester (PES)
- Polyvinylchloride (PVC)
- Acrylic Lacquers
- PVDF Lacquers
- Fibre Glass
- Silicone
- expanded PTFE (Teflon®)
- PTFE Teflon®
- ETFE Foil Fluon®

LSAA 2007 Lightweight Architecture



## Features of silicone elastomer

Versatile & Superior	Advanced Silicone Top Coats
Lower Cost than PTFE	Easy Cleaning
Great Flexibility	Durable Joints with silicone adhesives
Non Toxic	Odourless
Temp Range - 50 to 200° C	Hydrophobic – Repels Water
Inherently Flame Retardant	Excellent Insulating Properties
Highly Translucent	Chemical Resistant

LSAA 2007 Lightweight Architecture



LSAA

### Medium weight membrane for external use

Chateau de Penthes, Switzerland by Blueoffice, Airlight & Canobbio 2006

LSAA 2007 Lightweight Architecture

LSAA

### Medium weight coloured membrane for external use

Zenith de Strasbourg, France by Fukuas, Pertuy-Construction and Canobbio, 2007

LSAA 2007 Lightweight Architecture

LSAA

### GPMG Montreux

LSAA 2007 Lightweight Architecture

LSAA

### Textile Membrane Structures

LSAA 2007 Lightweight Architecture

LSAA

### Bibliography

Bergan, Henrik. Light Structures - Architecture, 2006.

...under the fabric enclosure...  
Therefore, a surface treatment or compatible coating has been found to deal with this problem.

The other problem relates to the fact that silicon is not a thermo-plastic material and can, consequently, not be heat sealed (welded), as most of the other fabric material can. It needs to be glued. The gluing process is time and space consuming, and it requires control of the humidity of the environment. Therefore field seaming is difficult. Shop seaming is costly. These and other aspects, unrelated to the fabric material, led Dow Corning to abandon the fabric construction area, just as the material began to become successful.

I believe that the existing problems can be solved, and that - because of its superior translucency, long life expectancy, and good economics - Silicon/fiberglass is a prime candidate for a leading architectural fabric.

LSAA 2007 Lightweight Architecture