VITOLANE™
TECHNOLOGY

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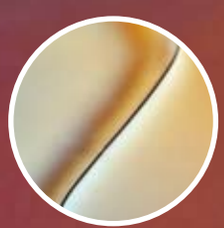


VITOLANE™ TECHNOLOGY

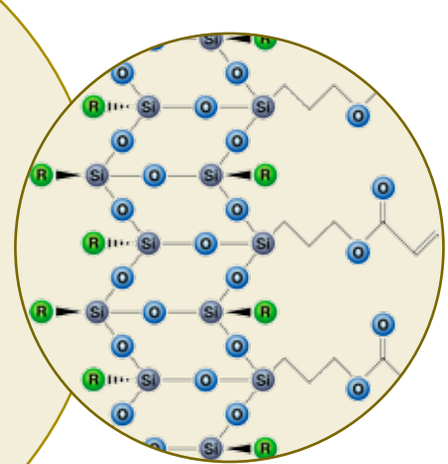
Vitolane™ Technology introduces a novel, low cost manufacturing route for silsesquioxanes, allowing formulators the ability to enhance and optimise the performance of key end properties.

What is Vitolane™ Technology?

Vitolane™ Technology is a novel, low cost method of fabricating silsesquioxane oligomers with a ceramic backbone and an organic shell. These silsesquioxanes are the basis for the excellent abrasion resistance evident in Vitolane™ Technology.

In its standard form, the oligomer is a clear, medium to high viscosity resin, which can confer abrasion resistance. It is extremely versatile and can be readily blended, for example in its acrylic form, with conventional acrylate oligomers and monomers to create a wide range of adhesives, coatings or bulk materials.

The versatility is achieved by altering the nature of the pendant organic groups that make up the shell. These groups can be acrylate, epoxy, vinyl or fluorocarbon, etc. The shell can be made of one type of group, or a mixture, e.g. acrylate/fluorocarbon.

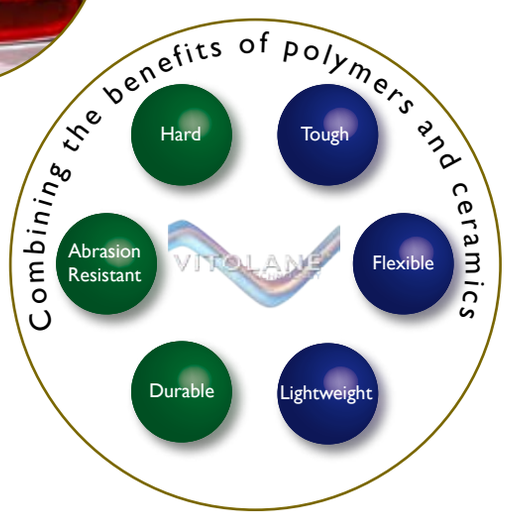


What can Vitolane™ Technology be used for?

The functional versatility and high ceramic loading of Vitolane™ Technology means that a new series of novel products can be manufactured, offering significant differentiation from the rest of the market. Typical products include:

- Abrasion resistant additives for bulk polymers
- Solvent free hard coats for transparent plastics
- Abrasion resistant anti-fog coatings
- Coatings with high heat distortion capabilities
- Very rapid cure coatings
- Novel adhesives
- Low viscosity adhesives with high cure stiffness
- Anti fouling coatings

This technology is already finding favour in a number of industrial applications, such as the electronics sector, and has the potential to penetrate much further into this and other sectors.



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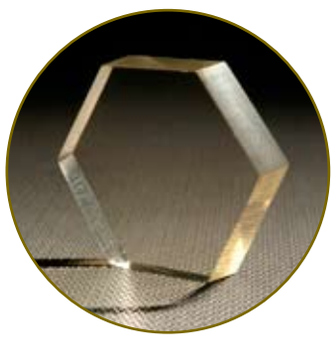
What's so special about Vitolane™ Technology?

The versatility of Vitolane™ is such that it can use many different pendant organic groups. This makes it readily incorporated into polymeric materials, since it can be done at the start of the formulation process. It can be seamlessly integrated into most production routes. Vitolane™ Technology is a low cost way of making silsesquioxane oligomers, and these are readily fabricated in liquid form - an ideal state for formulation.

The structure of silsesquioxanes allows high inorganic connectivity and high cross-linking to the polymer system. This leads to:

- Improved abrasion resistance
- Improved solvent resistance
- Improved barrier properties
- Enhanced stiffness
- Increased heat distortion temperatures

TWI has applied for patent protection for Vitolane™ Technology. Innovators and early adoptors of Vitolane™ will benefit from a novel, versatile, low cost manufacturing route.



What is TWI?

TWI is an independent global Research and Technology Organisation delivering world class research, innovation and advice on materials joining to companies across the world.

With more than 60 years experience, we specialise in welding, joining materials science, product and process development, surfacing, structural integrity, non-destructive testing, failure investigations and manufacturing support.

Our headquarters are in Cambridge, UK, with regional offices around the UK and other sites in Asia, the Middle East and the Americas. These all act as a portal to the full range of TWI expertise.

We invest £3.5m each year in our research and innovation programme, and create more than £1bn of economic value for our Members every year.

We have developed many innovative technologies, including friction stir welding, high power CO_2 lasers, power beam texturing, CTOD fracture tests, gas assisted laser cutting, Surfi-Sculpt®, and many more.

In the area of advanced materials, TWI covers all aspects of polymers, composites, ceramics, adhesive bonding, fastening, surfacing welding and joining. Some of the key developments to come out of the group include:

- Clearweld® - a method of laser welding polymers using a special transparent dye
- Comeld™ - a novel approach to composite-metal joining
- Development of Sol-Gel coatings
- AdhFast® - a method of adhesive bonding for large surfaces without jigging
- PCM - a method of welding dissimilar materials using thermoplastics
- Barrikade® - a novel fire resistant material
- Phyz™ - an echogenic coating for biopsy needles for enhanced visibility under ultrasound.

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