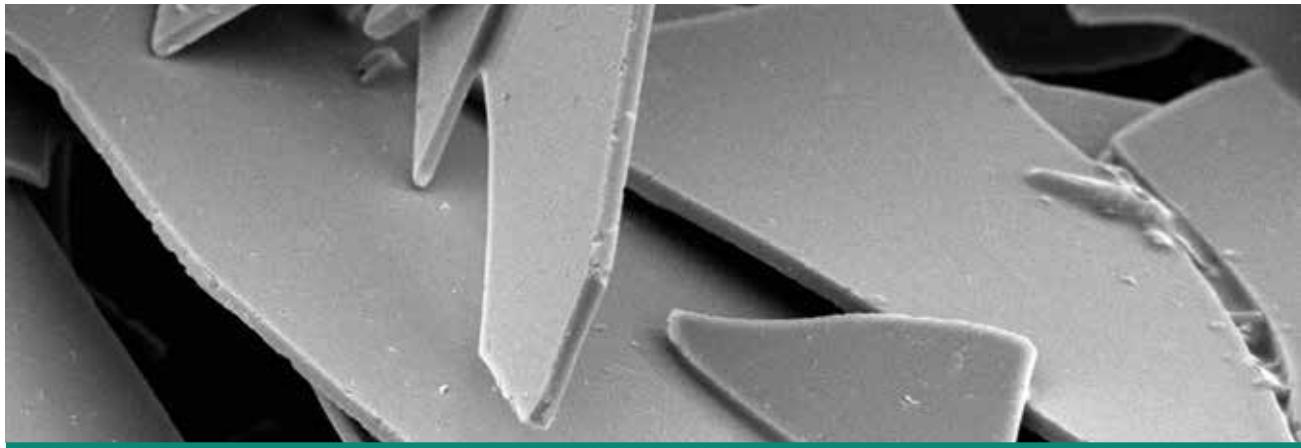
Polymers

Coatings

Pigments

Specialist

GLASS FLAKE LIMITED



Reinforcing Your Innovation

Company Introduction

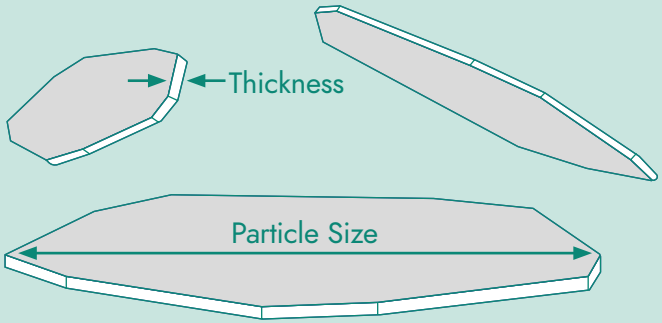
Glassflake Ltd is a world leader in the manufacture of innovative glassflake materials

Glassflake Ltd is a world leader in the manufacture of glassflake; an engineered, performance enhancing additive. Following an initial research project in the early 1980s to manufacture glassflake for anti-corrosive coatings, the development of the 'spun method' of production has enabled the material to expand into a broad range of applications. The Glassflake team is made up of a diverse group of material scientists, chemists and engineers, this mix of skills has allowed the company to develop an unrivalled range of standard products and to deliver innovative ideas to solve customer problems.

Glassflake is a major performance additive, some of the key benefits from its use include:

- ✓ Improved permeation resistance
- ✓ Isotropic mechanical reinforcement
- ✓ Improved heat and dimensional stability

What is Glassflake?

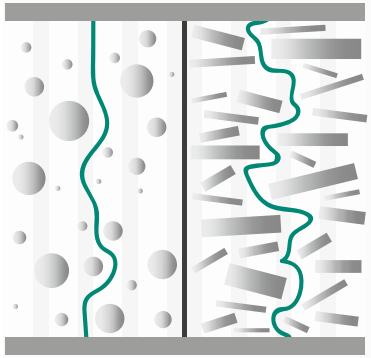


Glassflake is a platelet material, of high aspect ratio; controlled by manipulation of the thickness and diameter of individual flakes. Glassflake Ltd uses an innovative manufacturing process which has enabled accurate control of glass composition and the production of thinner flake (as low as 100nm), with uniform thickness and exceptional consistency. Flake is typically produced from 4 core glass formulations, though specific glass types can be formulated to accommodate customer requirements. The broad range of standard grades coupled with the capacity to manufacture tailored products allows our customers to improve both their products and processes.

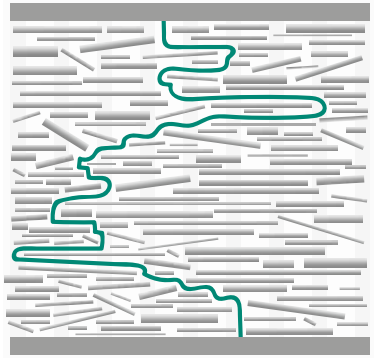
Coatings

Performance enhancer for demanding environments

Glassflake based coatings are used in a variety of sectors to give superior protection against the elements. Historically, the main application within coatings for glassflake has been in protective or anti-corrosive coatings. With advanced manufacturing technology and innovative products, glassflake can now be used in diversified markets, including powder coatings, wood and thin film coatings. The flake provides a barrier effect with overlapping layers of flake creating a tortuous path to permeation. The formulation of the glass can be altered to increase chemical resistance, in combination with the barrier effect. The hardness of the glass offers mechanical reinforcement, as well as improvements to mar resistance.



Typical permeation path observed with granular fillers and traditional glassflake



Exceptional barrier performance created by the use of advanced glassflake

Polymers

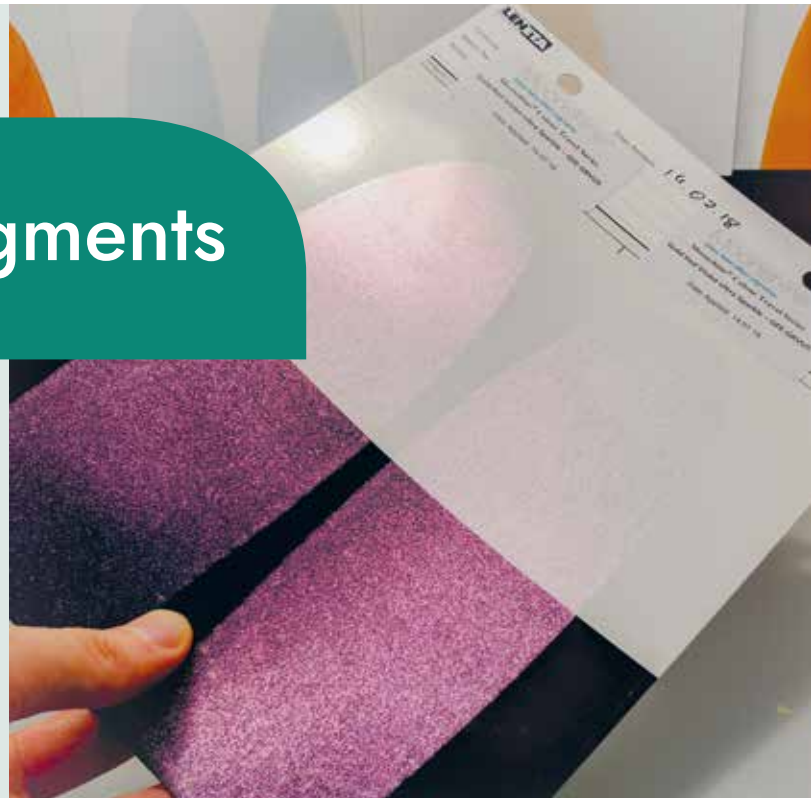
Optically clear mechanical reinforcement

Glassflake provides reinforcement to a wide range of plastics, from commodity products such as food packaging, through to high performance plastics for the medical, electronics and automotive sectors. The morphology of the flake offers excellent isotropic reinforcement to a range of systems, due to its high surface area. The composition of the glass can also provide improvements to the fire performance of plastics, acting as a fire retardant and reducing toxic smoke generation. The optical nature of glassflake as a clear material, with a neutral mass colour tone, allows the flake to be used in a range of systems where aesthetics are key.

Pigments

Exceptionally consistent optical performance

Glassflake, commonly known as borosilicate, is the ideal effect pigment substrate due to the neutral mass tone and smooth surface, combined with the highly planar dimensions. These pearlescent pigments find end use in industrial applications in plastics and coatings, through to consumer products in inks and cosmetics. While special effect pigments typically originate from coating glassflake with metal oxides, a pure silver coating onto the glassflake surface provides a lower cost filler to provide conductivity to a system.



Overview of core products

Glassflake produces a wide range of materials, each distinguished by the glass composition, as well as the flake thickness and diameter

Unmilled
Avg. 160µm

Milled
Avg. 120µm

Micronised
Avg. 30µm

ECR Glassflake - Exceptional chemical resistance & low heavy metals				
GF750 Series	Thickness 5±1µm	GF750	GF750M	GF007
GF300 Series	Thickness 2.3-3.3µm	GF300	GF300M	GF003
GF100 Series	Thickness 1.0-1.3µm	GF100	GF100M	GF001

C Glassflake - Good corrosion resistance				
GF750C Series	Thickness 5±2µm	GF750C	GF750MC	GF007C

E Glassflake - High inherent mechanical & dielectric strength				
GF750E Series	Thickness 5±2µm	GF750E	GF750ME	GF007E
GF100E Series	Thickness 1.0-1.3µm	GF100E	GF100ME	GF001E

Nanoflake - Unique glassflake thicknesses for leading performance				
GF750nm Series	Thickness 750nm	GF750nm	GF750nmM	GF007nm
GF500nm Series	Thickness 500nm	GF500nm	GF500nmM	GF005nm
GF350nm Series	Thickness 350nm	GF350nm	GF350nmM	GF003nm

NB Nominal thickness values provided

Specialist

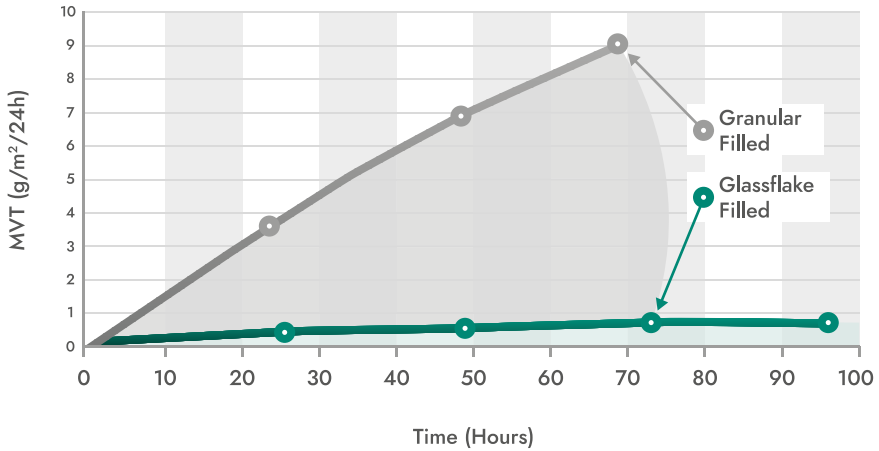
Glassflake remains a leader in global research projects, which continue to identify performance benefits offered by glassflake in a range of specialist applications

Product Range

Glassflake is available with the standard surface treatments shown below:

Surface Treatment	Typical Resins
Amino Silane	Polyamide, Phenolic, PET
Vinyl Silane	Polyester, Polyether
Epoxy Silane	Epoxy, PU, SBR
Acryl Silane	PE, PP, PS

Difference in Moisture Vapour Transmission (MVT) Between Granular and Flake Glass Filler



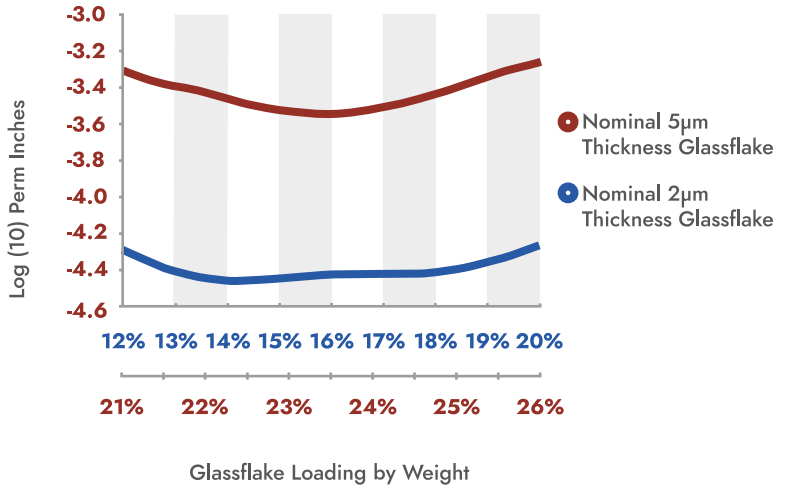
Glassflake has an inherent leafing behaviour, causing it to naturally lie parallel to the substrate surface

Performance Benefits

The stacking and overlapping of high aspect ratio flakes creates an incomplete barrier of impermeable glass in the coating, creating a 'tortuous path' around each of the flakes for any permeating vapour to travel to the substrate.

The spun method of manufacture allows for the production of thinner grades of glassflake. Use of the thinner flake increases the number of glassflake layers formed within the film, hence increasing the length of the tortuous path. The rate of permeation can be reduced further, often by an order of magnitude, while often requiring a lower loading level of glassflake. The use of thinner flake also allows the retention of a high aspect ratio flake, even when there is a requirement to significantly reduce the particle diameter, for example with a thin film coating.

Effect of Glassflake Thickness on Moisture Vapour Transmission



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