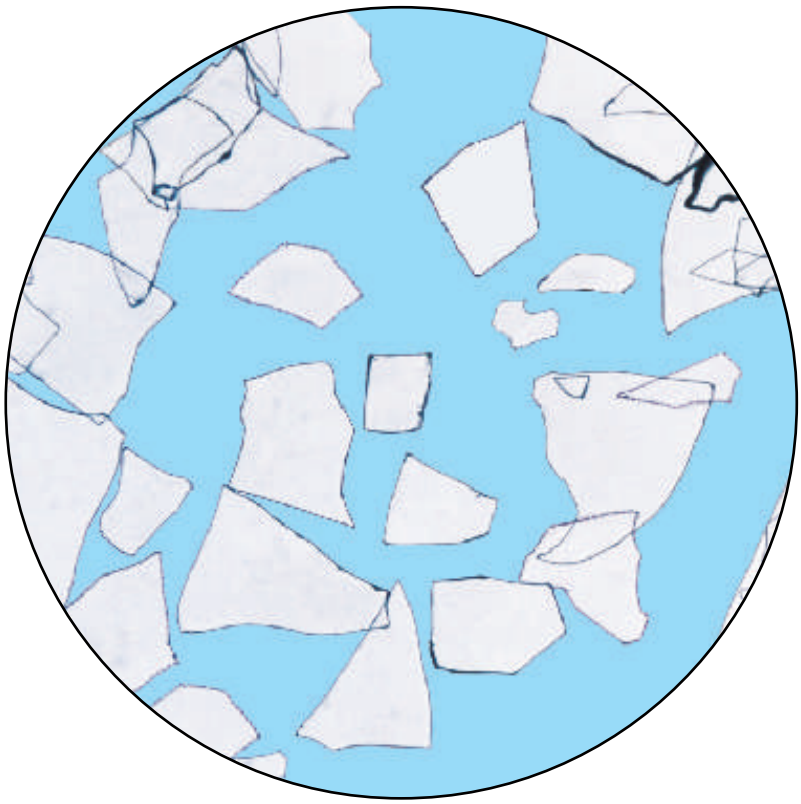
Microglas® Glass Flake

for use in anti-corrosion coatings



EUROPE

Microglas® Glass Flake

Microglas® Glass Flake is a C glass platelet, approximately 5㎛ thick and 10 ~ 4,000㎛ wide. The good chemical resistance of borosilicate C glass makes Microglas® Glass Flake ideal for use in vinyl ester, epoxy, acrylic paints and acrylic coatings as a barrier against corrosive attack by chemicals and moisture.

Manufactured by Nippon Glass Fiber Co. Ltd., Tsu, Japan.

Classification of Microglas® Glass Flake

Type		Non-Surface treatment			Surface treatment	
Product code		RCF-600	RCF-160	RCF-015	RCF-160T	RCF-160N
Glass Composition		C-glass				
Specific gravity		2.5				
Thickness (㎛)		Ave. 5±2				
Particle Size Distribution	>1700 ㎛	0	0	0	0	0
	1700~300	80 or more	10 or less	12 or less	10 or less	10 or less
	300~150		65 or more		65 or more	65 or more
	150~45	20 or less				
	<45 ㎛		25 or less	88 or more	25 or less	25 or less
Loss on ignition(%)		–			0.15 ± 0.10	0.15 ± 0.10
Surface Treatment agent		–			Epoxysilane	Acrylsilane

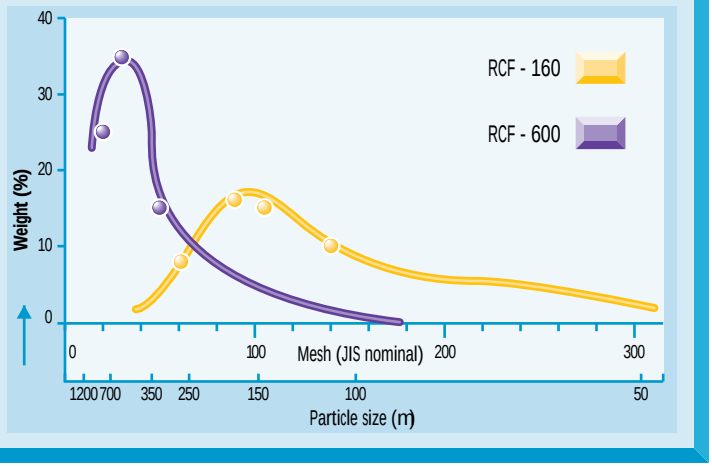
Identification of Microglas® Glass Flake

R C ——— C glass
F ——— Glass flake
600 ——— Particle size (Nominal)
N ——— Type of surface treatment

Surface Treatment	Resin
G Vinylsilane	Vinyl ester
N Acrylsilane	Plastics
A Aminosilane	Acrylic
T Epoxysilane	Epoxy

***Microglas® Glass Flake** is available in a range of surface treatments to suit different resins.*

Particle size distribution and bulk density



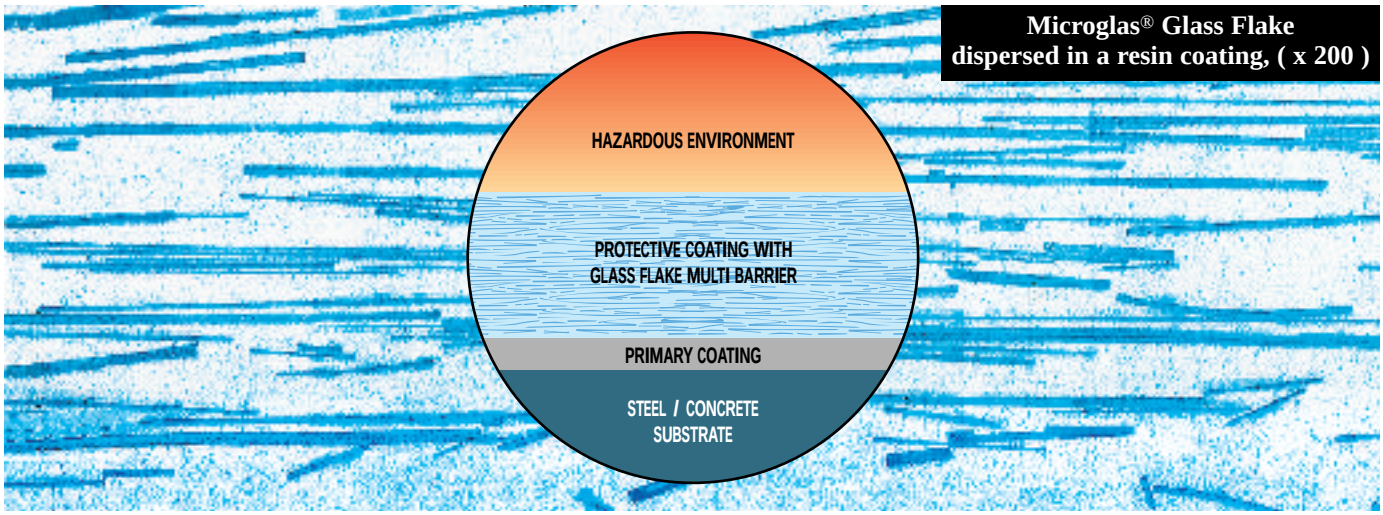
	Bulk density (g / cc)	Bulk density after shaking (g / cc)
RCF-600	0.20	0.30
RCF-160	0.40	0.65
RCF-015	0.75	1.15

The finer the grade of Microglas® Glass Flake, the greater the bulk density.

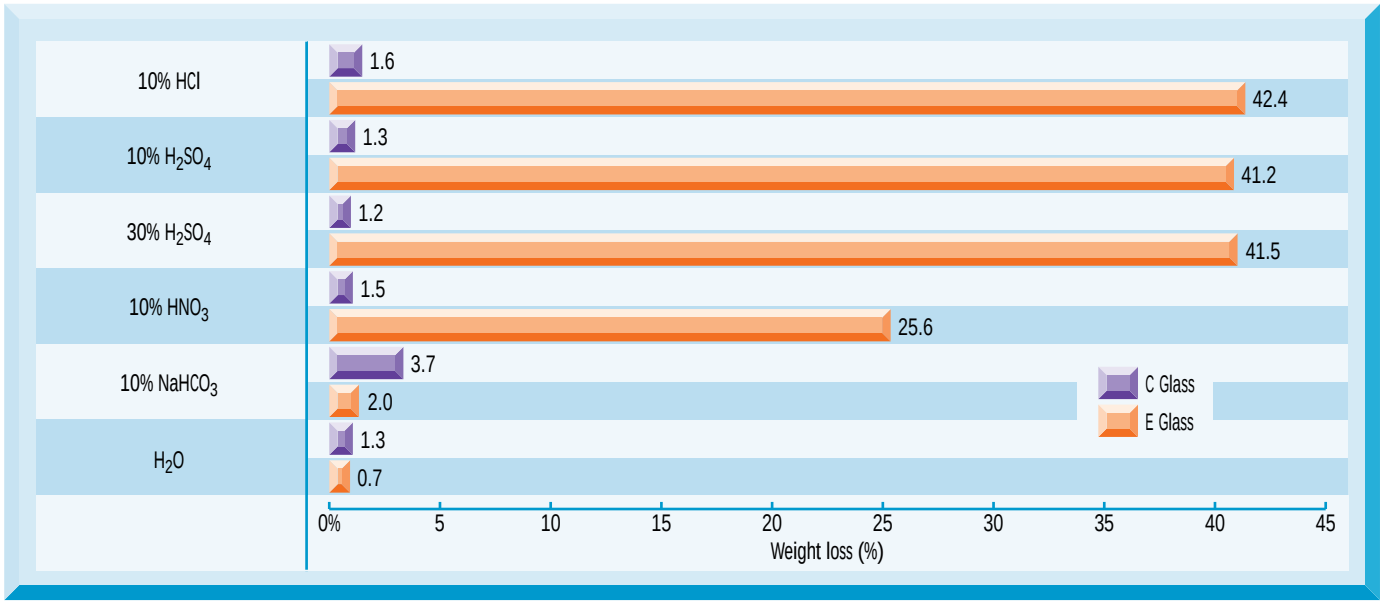
Glass Composition

Type of glass	SiO_2	Al_2O_3	CaO	MgO	B_2O_3	Na_2O+K_2O	ZnO
C glass (%)	65~72	1~7	4~11	0~5	0~8	9~13	0~6
E glass (%)	52~56	12~16	16~25	0~6	5~13	0·0.8	–––

Advantages of Microglas® Glass Flake



- ***Extended life of protective coating.*** Glass flakes dispersed through the coating prevent the ingress of water vapour and chemical solutions.
- ***Prevention of cracking and peeling.*** Glass Flakes provide a thermal stabilisation layer in the protective coating and greatly reduces the risk of cracking and peeling of the coating due to thermal shock.
- ***Improved wear resistance.*** Glass flakes increase the hardness of epoxy and polyester resin coatings, giving higher resistance to surface wear.
- ***Chemical resistance.*** C glass has greater resistance to chemical attack, compared to other types of glass, as shown below.



Comparative weight loss of C and E glass when immersed in chemical solution at 80° C for 24 hours.

Microglas® Glass Flake – in anti-corrosion coatings

The performance of an anti-corrosion coating can be altered significantly by the content and flake size of Microglas® Glass Flake and by the surface treatment.

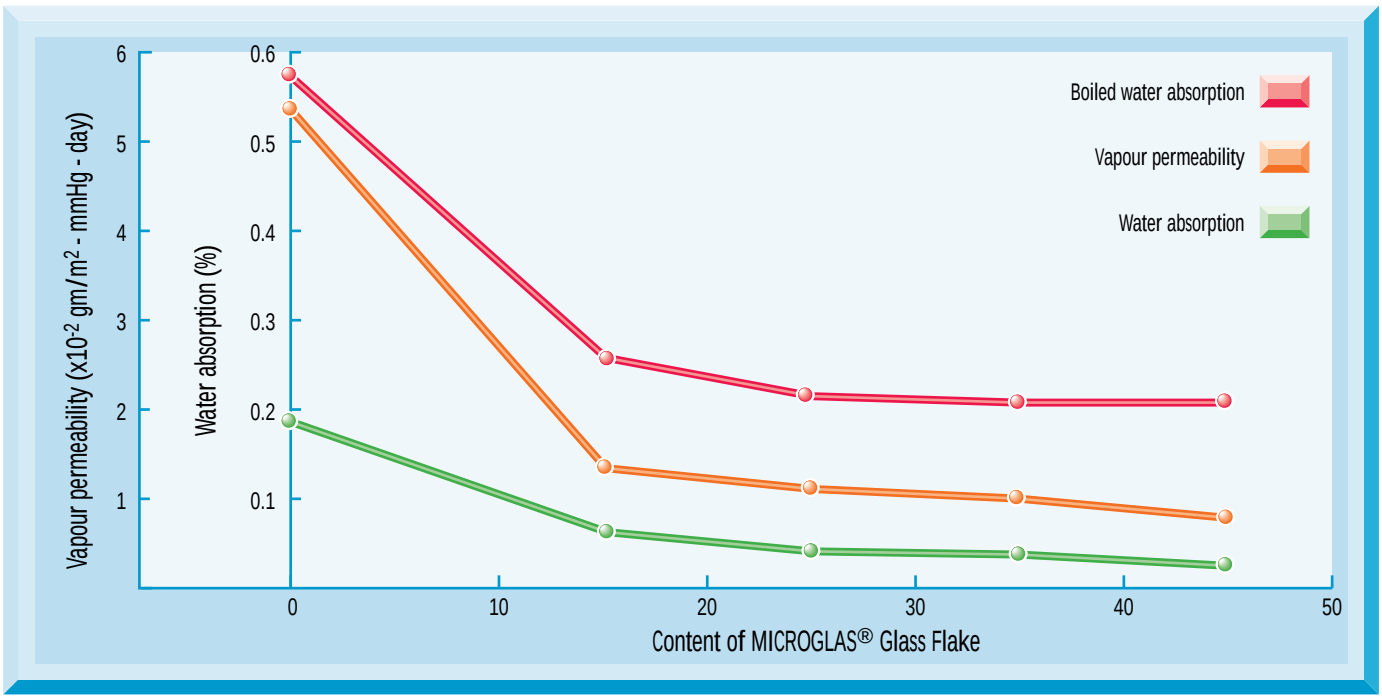
Flake Content

The ratio of Microglas® Glass Flake content in a coating is clearly correlated with corrosion resistance. Water absorption and vapour permeability of a coating decrease sharply with increasing content of Microglas® Glass Flake.

Flake ratio	Water absorption %	Vapour permeability (gm/m^2 mmHg day)	Boiled Water absorption (%)	Bulk density	Porosity (%)	Flexural strength (kg / mm^2)
0%	0.19	5.63×10^{-2}	0.57	1.14	0	10.6
25%	0.06	1.73×10^{-2}	0.23	1.30	1.5	8.3
45%	0.03	0.82×10^{-2}	0.23	1.44	5.3	11.0

Microglas ®Glass Flake : RCF-600 Resin : Vinyl ester

Water Absorption

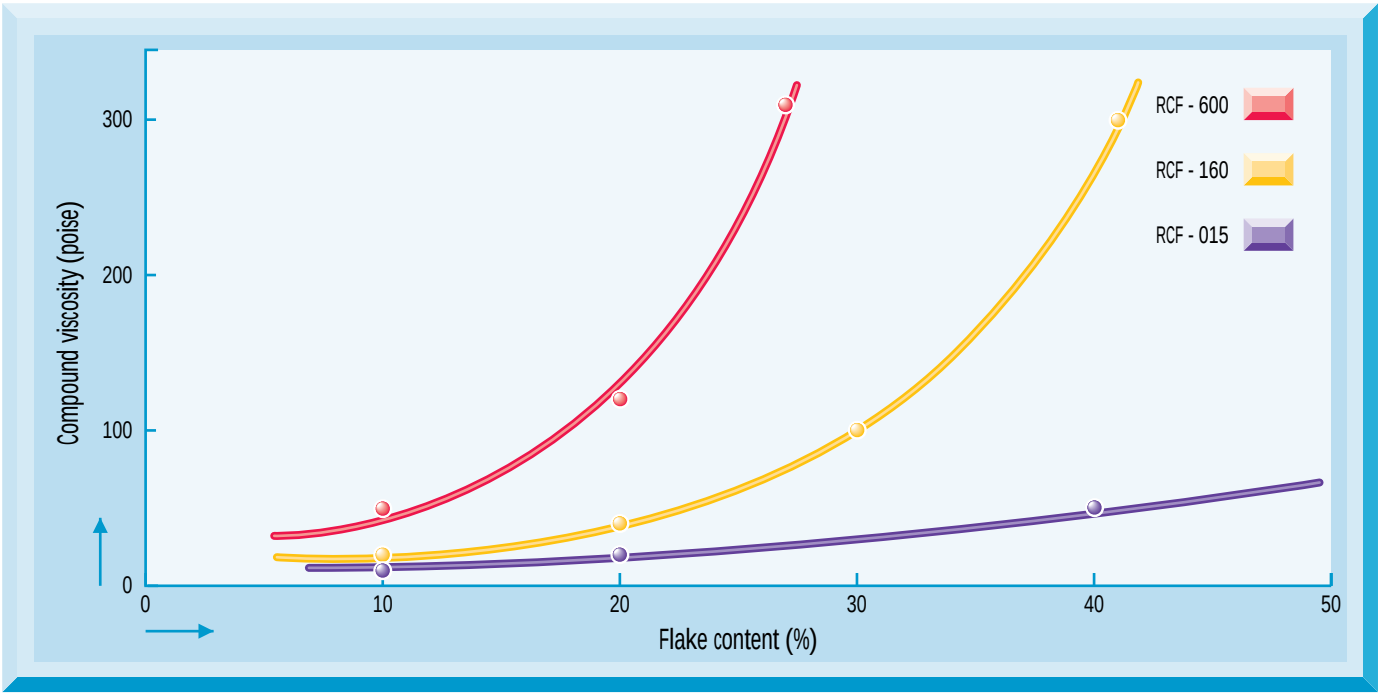


Content of MICROGLAS® Glass Flake	Barcol Hardness
Resin only	32
20 wt%	46
30 wt%	48

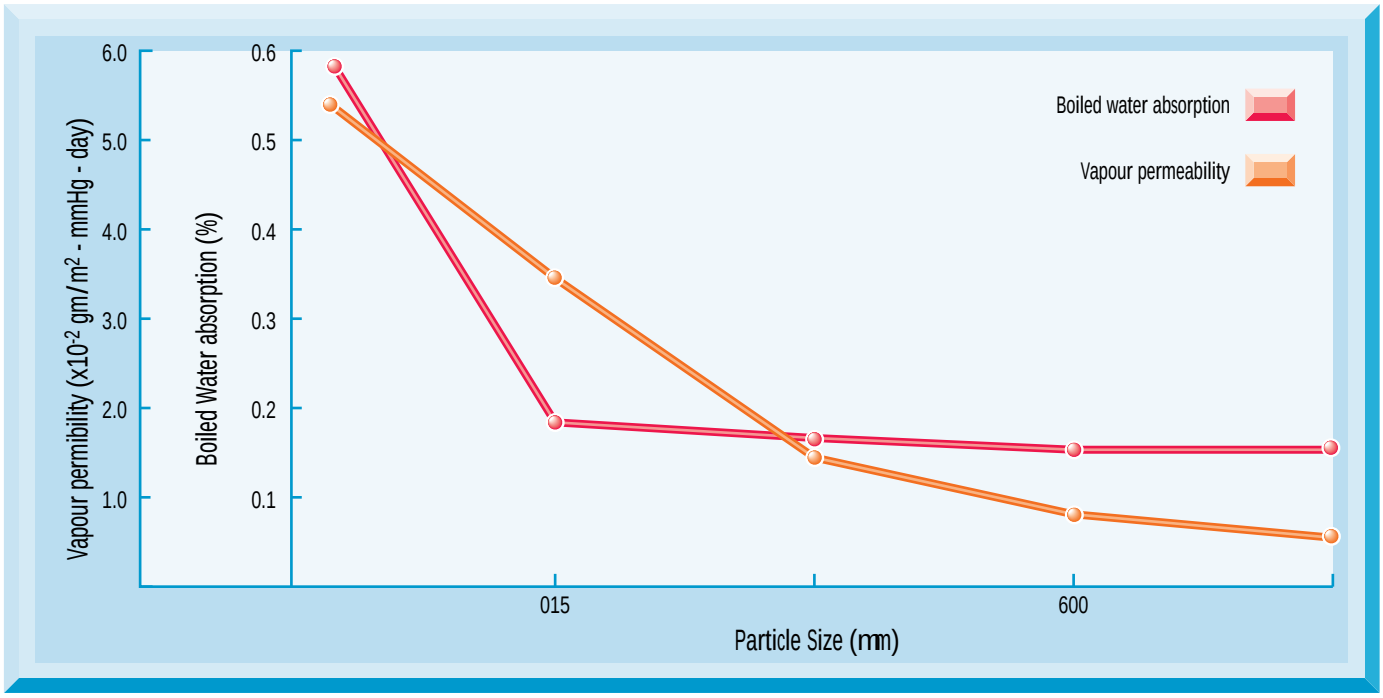
Microglas ®Glass Flake improves surface hardness and gives better abrasion resistance.

Flake Size

The viscosity of resin compounds is affected by content and glass flake size. Viscosity has a direct bearing on workability of the coating, the removal of air, sag resistance, surface appearance; and ultimately, the performance of the coating. The right proportion of glass flake in the resin compound is critical. The larger the glass flake size, the more difficult it is to remove air during application of the coating. Alternatively, larger glass flakes significantly reduce vapour permeability.



Relationship between glass flake content and compound viscosity.



Relationship of glass flake size to vapour permeability and boiled water absorption.

Grade	Flake content (wt %)	Coating thickness (mm)	Ave. dispersion coefficient (sq. cm / Hr)
RCF - 600	30	0.57	6.43×10^{-6}
RCF - 160	30	0.60	1.52×10^{-5}
RCF - 015	30	0.63	5.4×10^{-5}

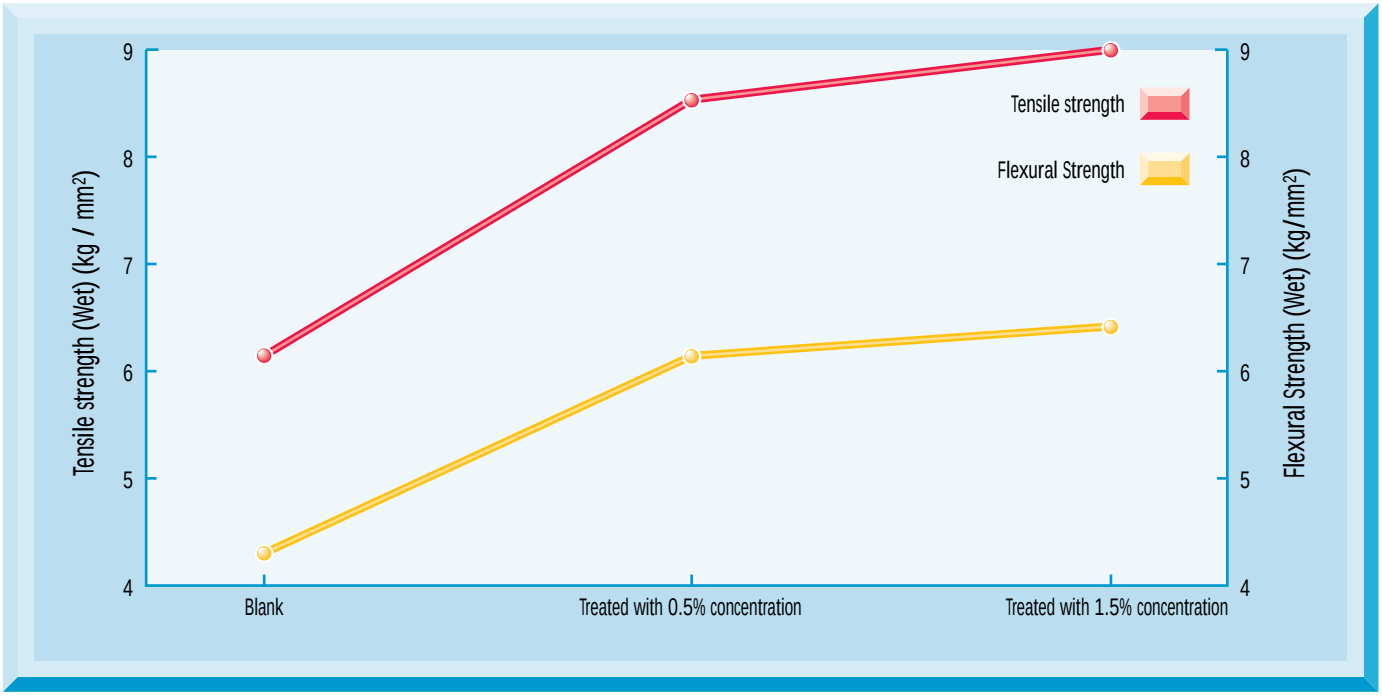
Relationship between glass flake size and average dispersion coefficient.

Test method: One-side dipping method, distilled water at 40∝C

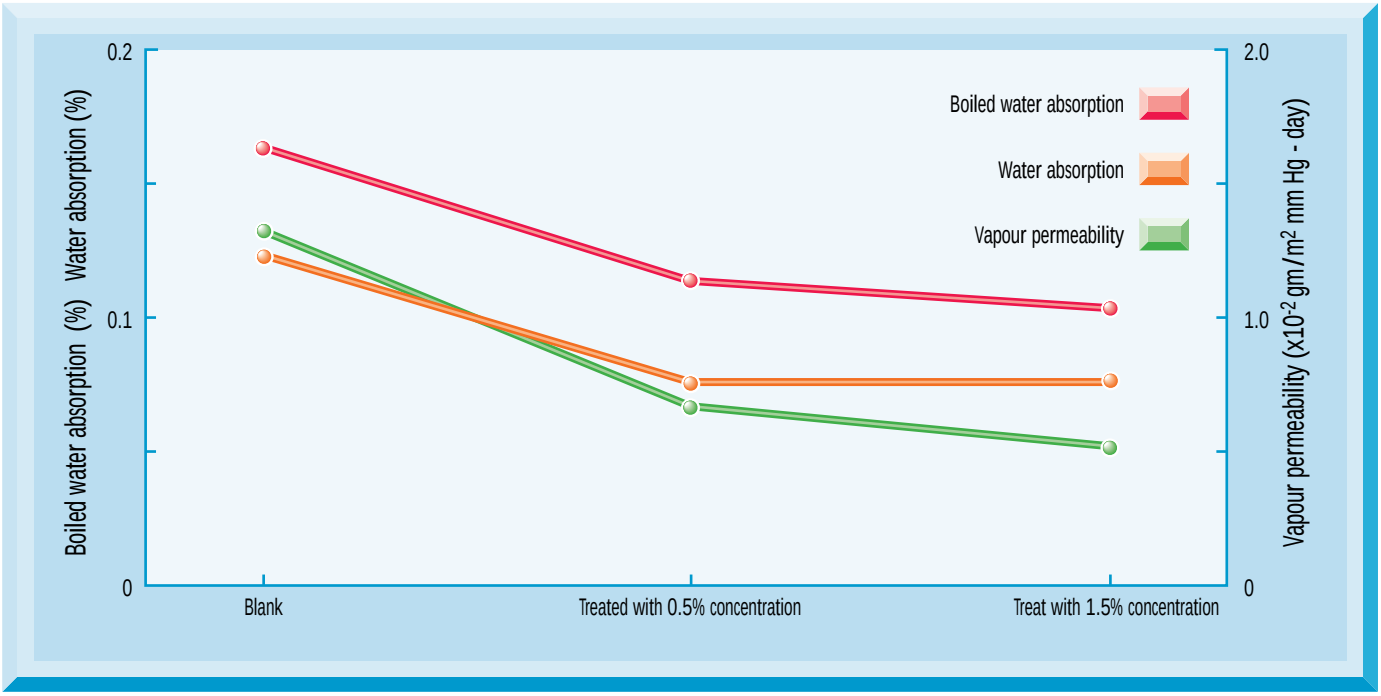
The change in weight of a steel substrate test sample, with a certain coating thickness is measured hourly by the 'one-side' dipping method; and the average dispersion coefficients of different grades of Microglas® Glass Flake are obtained. The larger the glass flake, the smaller the average dispersion coefficient. That is to say, larger glass flakes slow down the invasion of the steel substrate by chemical solutions.

Surface Treatment.

The surface treatment of Microglas® glass flake with a coupling agent, gives better bonding between the glass flakes and the resin, resulting in better corrosion resistance.



The effect of surface treatment on tensile and flexural strength
Microglas® Glass Flake, grade RCF-600, with vinylester resin. Glass flake content : 36.6 ~ 38.8%; Porosity : 2.8 ~ 3.5%.



The effect of surface treatment on water absorption and vapour permeability.

Used in Oil refineries and Petrochemical plants

Microglas® Glass Flake : The lining process

Recommended process for the application of a resin/glass flake compound:

- **Preparation of the substrate:** Any uneven joints should be ground flat and sandblasted. If sandblasting is not appropriate, any other rust removing process is sufficient.

  In the case of a concrete substrate, holes should be filled. The surface should be sandblasted or ground flat, dried thoroughly, and washed with an acid solution if necessary.

  The finished surface roughness should be within the range of 50 ~ 100um.

- **Primary coating:** It is usual for the priming coat to be the same resin as that to be used for the main coating. It is recommended that the priming coat be applied with brush, roller or airless spray, to a thickness of 30 ~ 40um.

- **Secondary coating:** The secondary coating, containing the glass flake, is normally applied to a thickness of 700 ~ 1000um; however thicknesses up to 2mm should be applied in very corrosive environments. Application is normally by trowel or similar.

  A typical Microglas® Glass Flake to resin loading is 24 ~ 30% by weight. After the secondary coat has hardened, a further coat of 200 ~ 350um thickness can be applied if required.

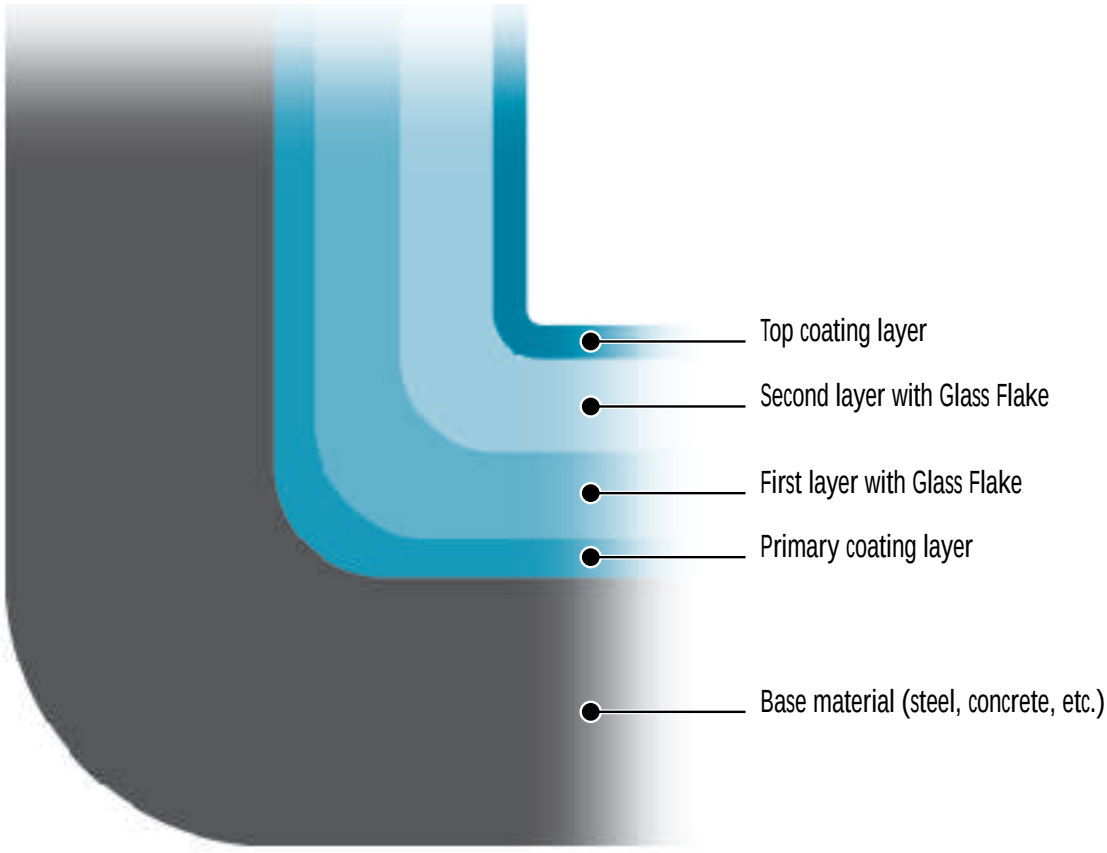
- **Top coating:** A final finishing coat is applied, if necessary.

- **Inspection:** The coating surface should be checked for the presence of surface roughness, air bubbles or any foreign matter.

  Pinhole test: The presence of pin-holes in the coating should be checked with a pin-hole detector.

  Thickness: An electronic thickness gauge should be used to check that the coating thickness is within specification.

  Hardness: Hardness of the coating surface should be checked with a Barcol hardness tester.



Microglas® Glass Flake : The lining process

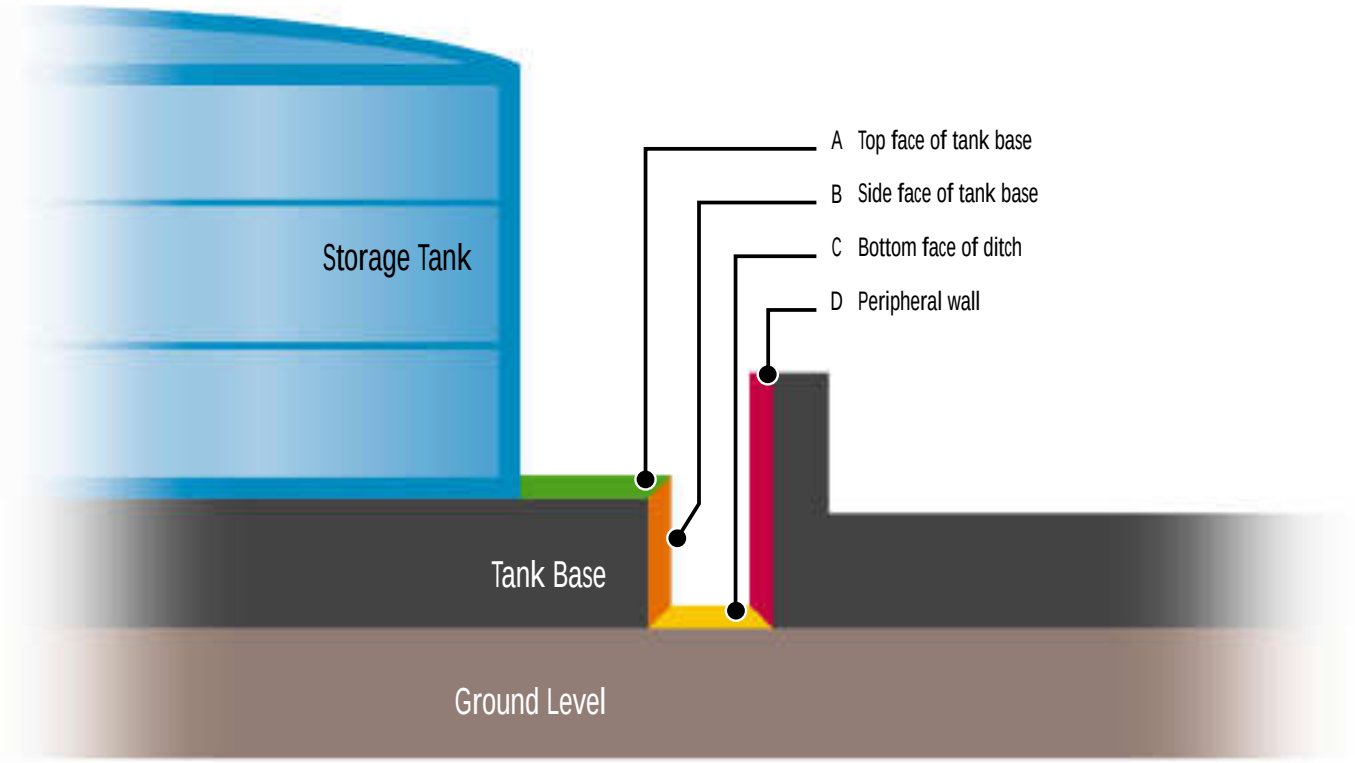
Example: A Microglas® Glass Flake coating has been proven successful in the surface treatment of the peripheral concrete works of an hydrochloric acid tank.

The coating compound was comprised of vinyl ester resin (100 parts), cobalt naphthenate (0.5 part) and hardner (1.0 part).

Microglas® Glass Flake, grade RCF-600 was mixed with the resin in different proportions, for the various concrete surfaces to be treated.

The concrete surfaces were washed and dried.

The application was by trowel and air-removal roller.



	Section	First Layer	Second Layer	Third Layer
A	Top face of tank base	15wt%	35wt%	30wt%
B	Side face of tank base	15	35	–
C	Bottom face of ditch	20	30	–
D	Peripheral wall	20	35	–

Microglas® Glass Flake content for each surface treatment.

Applications for Microglas Glass Flake/resin coatings

Fields	Application
Anti-corrosion apparatus in chemical plants	Dye, petroleum chemistry, pharmacy, cleaning agent, chlorine, soda, paper pulp
Marine constructions and harbour facilities	Bridge building, wharves, sluices.
Large diameter marine pipes	Inner lining of marine cooling pipes.
Petroleum tanks	Bottom plate lining (partially, welded, rivetted spots) lower side walls.
Pollution control facilities	Waste gas and liquid processing, stack gas desulphurisation, water treatment, stacks and ducts
Plating metal industries	Plating and acid flushing baths.
Boilers and water tanks	Linings on tank interiors.
Food industries	Fermentation tanks, reservoirs, floor linings.
Transportation	Road tankers, containers and vessels.
Fisheries	Fish tanks, storage.
Livestock	Pig and poultry farms, silos.

Used in offshore environments

Packaging

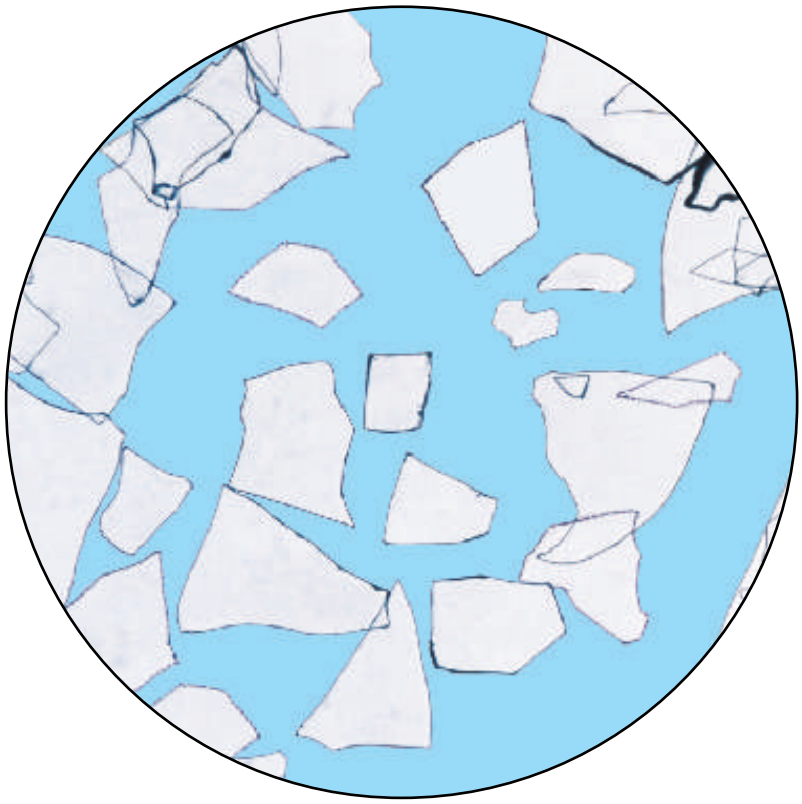
Microglas® Glass Flake is supplied in moisture proof paper bags, each containing 20 kgs nett weight.

For bulk shipments, the bags of glass flake are palletised and further protected by cardboard and polythene wrapping. The overall dimensions of a fully loaded pallet are 1100 x 1160 x 1020mm high

Pallet Loadings				
Glass Flake RCF - 160	:	30	x	20 kg bags (600 kg total nett weight)
Glass Flake RCF - 600	:	14	x	20 kg bags (280 kg total nett weight)
Glass Flake RCF - 015	:	48	x	20 kg bags (960 kg total nett weight)

Shipping container loadings, nett weights		
	20' Container	40' Container
Glass Flake RCF - 160	12 tonnes	-
Glass Flake RCF - 600	5.6 tonnes	11.2 tonnes
Glass Flake RCF - 015	19.2 tonnes	-

Flake



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