MaxiGRATE™ MaxiRAIL™ MaxiSTRUCT® MaxiLADDER™

Resins & Chemical Resistance

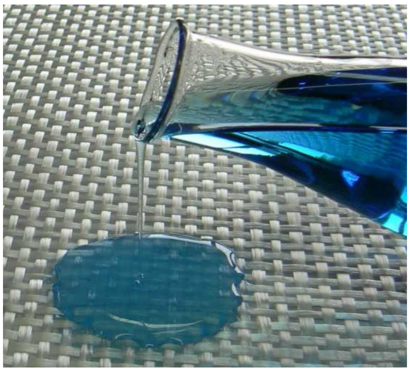
Composites are a combination of fibre reinforcement and a resin matrix. The resin system holds everything together, and transfers mechanical loads through the fibres to the rest of the structure. In addition to binding the composite structure together, it protects from impact, abrasion, corrosion, other environmental factors and rough handling. Resin systems come in a variety of chemical families, with the most commonly used types explained below.

Polyester overview (Orthophthalic, Isophthalic)

Unsaturated polyester resins are the simplest, most economical resin systems that are easiest to prepare and show good performance. They are manufactured by the condensation polymerization of various diols (alcohols) and dibasic acids (e.g. maleic anhydride or fumaric acid) to give esters, a very viscous liquid that is then dissolved in styrene, a reactive monomer. Styrene lowers the viscosity to a level suitable for impregnation or lamination. Generally, polyesters exhibit reasonable thermal stability, chemical resistance, and processability characteristics. Standard Polyesters can be found in most general fibreglass components, but are also widely accepted in power generation and transmission markets, general marine, civil construction, and recreational sectors. Let's look at some Polyesters…

Orthophthalic

Also referred to as Ortho or General Purpose Polyester (GP), and was the original polyester developed. It has the lowest cost and is still very widely used in FRP industry. It is commonly used in applications where high mechanical properties, corrosion resistance, and thermal stability are not required - like basic moulded FRP Gratings. Although the upper temperature limit is only 50°C, it performs satisfactory in water and sea water. It is normally not recommended for use in contact with chemicals.



Isophthalic

Often referred to as Iso, it is improved polyester. It has a slightly higher cost, improved strength, thermal stability (55°C) and mild resistance to corrosion conditions. Improved resistance to water permeation has prompted its use as a gel barrier coat in marine applications. Improved chemical resistance has led them to extensive use in moulded gratings, underground petroleum tanks and pultruded structural profiles. They are also used in salty and mildly acidic environments.

Vinyl Ester

Even further improved polyester, it is bisphenol chlorinated, or a combination of polyester and epoxy. Its curing, handling and processing characteristics are those of polyester, and it exhibits higher test results in corrosion temperature resistance and strength and has higher cost. Modifications of the molecule have produced even higher properties. We recommend Vinyl Ester materials for any chemical processing areas, and for structures that require additional strength.

Phenolic

Phenolic resin is a reaction of phenol and formaldehyde. It can be cured via heat and pressure, without the use of catalysts or curing agents. It is one of the oldest thermosetting resins available. Cured phenolic resins are fire resistant without the use of mineral fillers or fire retardant additives. Phenolic composites have excellent high-temperature properties, and if properly formulated and cured, they can form carbon to carbon composites with outstanding temperature resistance. Phenolics are also unique in their chemical resistance. Disadvantages of these resins include high curing temperatures and pressures, longer curing times than polyesters, and limited colour range. The use of phenolic resins in composites is growing, primarily due to regulative legislation on flame spread, smoke generation, and smoke toxicity. It is used extensively in automobiles, appliances, electronics, and on off-shore oil and gas platforms.

Composite Engineering Chemical Resistance Chart - Resin Types				
Chemical	Isophthalic - Fire Retardant		Vinyl Ester - Fire Retardant	
	Concentration %	Temperature °C	Concentration %	Temperature °C
Acetic Acid	50	50	50	85
Acetone	N/R	N/R	N/R	N/R
Aluminium Salts	ALL	70	ALL	90
Ammonium Chloride	ALL	70	ALL	85
Ammonium Hydroxide	N/R	N/R	20	38
Ammonium Carbonate	N/R	N/R	ALL	65
Ammonium Bicarbonate	15	50	ALL	50
Ammonium Nitrate	ALL	70	ALL	85
Benzene	N/R	N/R	N/R	N/R
Benzine Sulfonic Acid	25	45	ALL	90
Benzoic Acid	ALL	65	ALL	90
Calcium Hydroxide	25	65	35	85
Calcium Hypochlorite	ALL	65	ALL	85
Calcium Salts	ALL	65	ALL	90
Calcium Nitrate	ALL	85	ALL	90
Carbonic Acid	ALL	50	ALL	85
Carbon Tetrachloride	N/R	N/R	100	60
Chlorine Dioxide	N/R	N/R	ALL	60
Chlorine Water	ALL	25	ALL	50
Chromic Acid	10	60	10	85
Citric Acid	ALL	65	ALL	85
Copper Cyanide Plating	N/R	N/R	ALL	85
Copper Salts	ALL	65	ALL	85
Ethanol	50	N/R	50	30
Ethyl Acetate	N/R	N/R	N/R	N/R
Ferric Chloride	100	65	100	85
Ferric Salts	ALL	65	ALL	85
Glycerine	100	65	100	90
Heptane	100	40	100	50
Hydrobromic Acid	50	50	50	50
Hydrochloric Acid	37	25	37	35
Hydrocyanic Acid	ALL	65	ALL	85
Hydrogen Peroxide	10	25	30	25
Hydrochlorous Acid	10	30	20	65
Lactic Acid	ALL	75	ALL	90
Lead Acetate	ALL	75	ALL	90
Lead Chloride	ALL	60	ALL	90
Lead Nitrate	ALL	65	ALL	90
Lime Slurry	ALL	65	ALL	85
Magnesium Salts	ALL	65	ALL	85
Maleic Acid	100	65	100	85
Mercury Chloride	100	65	100	85
Nickel Salts	ALL	75	ALL	90
Nitric Acid	N/R	N/R	20	40
Perchloric Acid	N/R	N/R	30	30
Phosphoric Acid	100	50	100	90
Potassium Salts	ALL	65	ALL	85
Phthalic Acid	N/R	N/R	ALL	85
Silver Nitrate	100	65	100	85
Sodium Hypochlorite	N/R	N/R	10	65
Sodium Salts	ALL	25	ALL	40
Stannic Chloride	ALL	70	ALL	90
Styrene	N/R	N/R	N/R	N/R
Sulphuric Acid	50	N/R	50	85
Sulphuric Acid	25	25	25	90
Tartaric Acid	ALL	75	ALL	90
Trisodium Phosphate	N/R	N/R	ALL	65
Urea	ALL	25	ALL	60
Vinegar	100	75	100	90
Water, distilled	100	75	100	90
Water, sea	ALL	75	ALL	90
Zinc Salts	100	65	100	85

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