

CRYSTIC® 491PA

Tough Isophthalic Resin With Good Chemical Properties

INTRODUCTION

Crystic® 491PA is a versatile pre-accelerated isophthalic unsaturated polyester resin developed for the manufacture of laminates for use in a wide range of manufacture of critical applications where a tough high performance water and chemical resistant resin is required.

APPLICATIONS

Crystic® 491PA is thixotropic and can be applied by either brush or spray equipment and may also be used in the pultrusion process for the production of profile sections. When fully cured and post-cured, **Crystic® 491PA** is resistant to fuel oils and similar chemicals and the low level of residual styrene makes the resin especially suitable for the manufacture of food containers and other applications which require non-toxic, non-tainting laminates. **Crystic® 491PA** can be used with confidence for the fabrication of chemical plant tanks, pipes and containers for fuels, hydrocarbons, glycols and all types of foodstuffs, and potable liquids including drinking water, milk, beer and wine. In addition the resin may be used as a taint-free, chemical-resistant liner for vessels made from other materials, provided that the necessary post-curing procedure can be carried out.

Crystic® 491PA is suitable for the fabrication of high performance boat hulls. It forms a matched boatbuilding resin system when used with **Crystic® Gelcoat 65PA** and is particularly suitable for boats destined for use in warm and tropical waters.

FORMULATION

Crystic® 491PA should be allowed to attain workshop temperature (18°C - 20°C) before use. Stir well by hand, or with a low shear mixer to avoid aeration, and then allow to stand to regain thixotropy. **Crystic® 491PA** requires only the addition of a catalyst to start the curing reaction. The recommended catalyst is Catalyst M (Curox® M200 or Butanox® M50), which should be added at 1% into the resin. Catalyst O (Curox® M100 or Butanox® LPT) will increase the pot life. The catalyst should be thoroughly incorporated into the resin, with a low shear mechanical stirrer where possible.

Crystic® 491PA is formulated for room temperature curing applications. It requires only addition of the correct amount of catalyst to start the curing reaction. The recommended formulations are given in Table 1:

Table 1

Component	Parts by weight
Crystic® 491PA	100
Catalyst M or O	1.0-3.0

Catalyst M is suitable for general purpose use.

Catalyst O is recommended for all applications involving foodstuffs and potable liquids.

N.B. Peroxide catalysts are highly reactive and may decompose with explosive violence, or cause fires, if they come into contact with flammable materials, metals or accelerators. For this reason they must never be stored in metal containers or be mixed directly with accelerators.

The catalyst must be stirred thoroughly into the resin shortly before use. Curing should not be carried out at temperatures below 15°C. Scott Bader (Pty) Ltd. will not be liable for problems caused by use at lower temperatures than recommended. The resin must be allowed to attain workshop temperature (15-30°C) before being formulated for use.

For applications involving foodstuffs and potable liquids it is particularly important to ensure that the catalyst is thoroughly dispersed in the resin. Poorly dispersed catalyst can cause the resin cure unevenly resulting in laminates with undercured areas which are a potential source of tainting.

POT LIFE

The temperature and the amount of Catalyst M or O control the gel time of the resin formulation and can be approximately determined from Table 2.

Table 2: Effects of varying temperature on the pot life of **Crystic® 491PA**.

Catalyst M addition	Temperature °C	Gel time in minutes
2%	15°C	29
2%	20°C	20
2%	25°C	14

The resin, mould and workshop should all be at, or above, 15°C before curing is carried out. Scott Bader (Pty) Ltd. will not be liable for problems caused by use at lower temperatures than recommended.

POST CURING

Satisfactory laminates for many applications can be made from **Crystic® 491PA** by curing at workshop temperature (20°C). However, in order to develop optimum heat and chemical resistance, laminates made with this resins must be post cured. After release from the mould, laminates should be allowed to mature for 24 hours at workshop temperature (20°C). They should then be post cured for a minimum of three hours at 80°C, or 15 hours at 50°C. When laminates are required to withstand temperatures between 50 and 80°C in service, the post curing temperature should always be at least as high as that at which the laminate is required to operate. The post cure is most effective if it is carried out immediately after the 24 hour maturing period. For all applications involving foodstuffs and potable liquids, it is essential to follow the recommendations detailed under 'food containers'.

FOOD CONTAINERS

Mouldings which are to be used with foodstuffs or potable liquids should be cured with Catalyst O. After release from the mould, laminates should be allowed to mature for 24 hours at workshop temperature (20°C). They should then be post cured for a minimum of three hours at 85°C. The post cure is most effective if it is carried out immediately after the 24 hour maturing period. The mouldings must be thoroughly wet-steam cleaned for at least one hour before being put into use. If wet-steam cleaning is not practical, and the moulding is a vessel or of suitable shape, it should be filled with hot water (60-80°C) containing a non-perfumed detergent and left to stand for two hours. It should then be emptied and thoroughly washed in several batches of clean hot water. These precautions are essential to avoid the tainting of foodstuffs or potable liquids. Fabricators are advised to ask Scott Bader for detailed recommendations for specific applications.

CHEMICAL RESISTANCE

Performance figures for GRP laminates made with this resin in more than 200 different chemical environments are contained in Scott Bader Technical Leaflet No. 145.3, "Safe Chemical Containment", available on request.

TANK LINING

Crystic® 491PA can be used to form a chemical resistant lining for tanks and vessels made from a wide variety of materials, provided that the maximum working temperature does not exceed 55°C.

Old and corroded tanks can often be completely refurbished and given a greatly extended life by a GRP lining which will not only repair holes, pits and corroded areas, but can also contribute substantially to the strength and rigidity of the entire structure.

Before lining any type of tank, it is essential that the preparation work detailed below is properly carried out. In addition any holes, dents, ridges or damaged areas should be made good with catalysed **Crystic® 491PA** and a fine dry inert filler, such as silica flour, and mixed to a thick paste. This will give a sound even surface to which the lining may be applied. It is important that the lining is thoroughly consolidated during lamination to avoid the entrapment of air pockets behind it.

The lining should be fully cured by post-curing before being put into service. The following general recommendations are intended only as a guide. In practice procedure may vary according to the contents, condition and size of the tank. Detailed recommendations for specific applications will be made on request.

FERROUS METAL TANKS

The vessel must be thoroughly cleaned and allowed to dry out. It should then be grit-blasted (grade G24 or SA 2½) and a coat of catalysed **Crystic® 491PA** applied immediately as a primer. A layer of 300 g/m² or 450 g/m² chopped strand glass mat should then be applied with catalysed **Crystic® 491PA** followed by a suitable laminate as necessary with a final layer of surface tissue to ensure a resin-rich surface.

GRP AND WOODEN TANKS

The vessel must be thoroughly cleaned and allowed to dry out. It should then be abraded, and wooden vessels should be coated with Accelerator E. A layer of 300 g/m² or 450 g/m² chopped strand glass mat should be applied with catalysed **Crystic® 491PA** followed by a suitable laminate as necessary with a final layer of surface tissue to ensure a resin-rich surface.

CONCRETE TANKS

The vessel must be completely dry and at least 28 days old. It should be wire brushed to remove the laitance ie. the hard consolidated surface layer. It should be thoroughly cleaned and washed with dilute hydrochloric acid (5% solution). The tank should then be washed with several batches of clean water and allowed to dry out. A coat of catalysed **Crystic® 491PA** should then be applied by brush as a primer. A layer of 300 g/m² or 450 g/m² chopped strand mat should be applied with catalysed **Crystic® 491PA** followed by a suitable laminate as necessary with a final layer of surface tissue to ensure a resin-rich surface.

ADDITIVES

Crystic[®] 491PA can be pigmented with up to 5% **Crystic[®] Pigment Paste**. Since the addition of certain pigments may affect the food taint, toxicity and chemical resistant properties of laminates; users should seek advice from our Technical Service Department before making any additions.

TYPICAL PROPERTIES

The following tables give typical properties of **Crystic[®] 491PA** when tested in accordance with BS2782.

Table 3: Typical properties of liquid **Crystic[®] 491PA**.

Property	Units	Nominal value
Appearance		cloudy mauvish
Viscosity @ 25°C Brookfield RVT @ 100rpm	centipoise	425
Thixotropic index	ratio	1.8
Specific gravity @ 25°C		1.06
Acid value	mgKOH/g	19.9
Volatile Content	%	43
Stability in the dark at 20°C	months	3
Geltime @ 25°C using 1% Catalyst M	minutes	25

Table 4: Typical properties of **Crystic[®] 491PA** Fully cured* resin (unfilled casting)

Property	Units	Nominal value
Barcol Hardness (GYZJ 934-1)		45
Deflection Temperature under load † (1.80 MPa)	°C	75
Water Absorption 24hrs @ 23°C	mg	19
Volumetric shrinkage	%	7.5
Tensile Strength	MPa	75
Tensile Modulus	MPa	3500
Elongation at Break	%	3.8

*Curing schedule - 24hrs @ 20°C, 3hrs @ 80°C

†Curing schedule - 24hrs @ 20°C, 5hrs @ 80°C, 3hrs @120°C

STORAGE

Crystic® 491PA should be stored in the dark in suitable, closed containers. It is recommended that the storage temperature should be less than 20°C where practical, but should not exceed 30°C. Ideally, containers should be opened only immediately prior to use. Where they have to be stored outside, it is recommended that drums be kept in a horizontal position to avoid the possible ingress of water. Wherever possible, containers should be stored under cover.

PACKAGING

Crystic® 491PA is supplied in 25kg kegs, 225kg drums, and 1125kg intermediate bulk containers. Bulk supplies can be delivered by road tanker.

HEALTH AND SAFETY

Please see the applicable Material Safety Data Sheets, depending on the curing system used.

Technical Leaflet No. 161.15SA
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Before you use this information, kindly verify that this data sheet is the latest version.

All information is given in good faith but without warranty. We cannot accept responsibility or liability for any damage, loss or patent infringement resulting from the use of this information.



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