

CRYSTIC 491 & 491PA

Introduction

Crystics 491 and 491 PA are thixotropic, isophthalic polyester resins with good water and chemical resistant properties.

Applications

Crystics 491 and 491PA were developed for use in a wide range of critical applications which require toughness combined with water and chemical resistance. They are versatile resins suitable for the fabrication of high performance boat hulls destined for use in warm or tropical areas, and form a matched performance system when used with Crystic Gelcoat 65PA. They are also suitable for the manufacture of chemical plant, tanks, pipes and chemical containers.

Crystics 491 and 491PA can be brush or spray applied, and may also be used in the pultrusion process.

Features and Benefits

Crystics 491 and 491PA have a low level of residual styrene which enables the production of non-toxic, non-tainting laminates. This makes them especially suitable for the manufacture of vessels to contain food and potable liquids including drinking water, milk, wines and spirits.

Approvals

Crystics 491PA is approved by Lloyd's Register of Shipping for use in the construction of craft under their survey.

Crystic 491PA has also received approval from l'Institute d'Analyses et d'Essais du Centre Ouest, Poitiers, for vessels to contain wines and spirits up to 50% alcohol content, and from the British Industrial Biological Research Association for large scale containers for food and potable liquids.

In conjunction with Crystic Gelcoat 65PA, Crystic 491PA is approved under the Water Byelaws Scheme for use in contact with potable water.

Crystic 491 is approved by Wine Laboratories Ltd., for vessels to contain wines and sherries up to 25% alcohol content. It is also approved to DTD 5537 and DTD5549 Class MA and EA respectively.

Product Characteristics

FORMULATION

Both resins should be allowed to attain workshop temperature (18°C-20°C) before use. Crystic 491PA needs only the addition of a catalyst to start the curing reaction. For general mouldings, the recommended catalyst is Catalyst M (or Butanox M50) but for applications involving foodstuffs and potable liquids, the recommended catalyst is Catalyst O (or Interlox LA3). The catalyst should be added at 2% into the resin and thoroughly dispersed, shortly before use.

Crystic 491 requires the addition of a catalyst and an accelerator to start the curing reaction. For general mouldings the recommended catalyst is Catalyst M (or Butanox M50) but for applications involving foodstuffs and potable liquids, the recommended catalyst is Catalyst O (or Interlox LA3). The catalyst should be added at 2% into the resin and thoroughly dispersed. Shortly before use, the correct amount of Accelerator E should be stirred into the catalysed resin.

N.B. *Catalyst and accelerator must not be mixed directly together since they can react with explosive violence.*

The geltimes of Crystics 491 and 491PA can be approximately determined from the tables below:-

POT LIFE

TABLE I - Crystic 491PA

Parts of Catalyst to 100 parts Resin	2% Catalyst M	2% Catalyst O
Pot life in Minutes at 15°C	27	56
Pot life in Minutes at 20°C	18	28
Pot life in Minutes at 25°C	12	18

TABLE II - Crystic 491

Parts of Accelerator E to 100 Parts of Catalysed Crystic 491 (Catalyst M)	1.0	2.0	3.0	4.0
Pot life at 15°C	35	23	16	12
Pot life at 20°C	26	19	13	10
Pot life at 25°C	18	14	10	8

The resins, mould and workshop should all be at, or above, 15°C before curing is carried out.

ADDITIVES

Crystic 491 and 491PA may be pigmented by the addition of up to 5% of Crystic Pigment Paste. The addition of certain pigments, fillers or extra styrene may adversely affect the food taint, toxicity and chemical resistant properties of laminates so, for critical applications, customers should satisfy themselves that any additions made will give the performance required.

TYPICAL PROPERTIES

The following tables give typical properties of Crystics 491 and 491PA when tested in accordance with BS 2782.

Property		Liquid Resin	
		491	491PA
Appearance		Cloudy	Cloudy, pinkish
Viscosity at 25°C 37.35 sec ⁻¹	poise	5.0	6.5
Viscosity at 25°C 4500 sec ⁻¹	poise	4.0	3.3
Specific Gravity at 25°C		1.11	1.11
Volatile Content	%	40	42
Acid Value	mg KOH/g	18	18
Geltime at 25°C using 2% Catalyst M (orButanox M50)	minutes	-	12
Geltime at 25°C using 2% Catalyst M and 4% Accelerator E	minutes	9	-

Property		Fully Cured* Resin (unfilled casting)	
		491	491PA
Barcol Hardness (Model GYZJ 934-1)		45	43
Deflection Temperature under load † (1.80 MPa)	°C	75	77
Water Absorption 24 hours at 23°C	mg	19	17
Tensile Strength	MPa	75.0	77.0
Tensile Modulus	MPa	3500	3500
Elongation at Break	%	3.8	4.0
Specific Gravity at 25°C		1.2	1.2

* Curing Schedule - 24 hrs at 20°C, 3 hrs at 80°C

† Curing Schedule - 24 hrs at 20°C, 5 hrs at 80°C, 3 hrs at 120°C

Property		C.S.M** Laminate	
		491	491PA
Glass Content	%	32	32
Tensile Strength	MPa	121	121
Tensile Modulus	MPa	7600	7600
Elongation at Break	%	2.1	2.2
Flexural Strength	MPa	214	218
Flexural Modulus	MPa	7300	7200

** Made with 4 layers 450g/m² PB CSM

Curing schedule - 24hrs at 20°C, 16hrs at 40°C



Scott Bader Company Limited
Ilaston, Wellingborough,
Northamptonshire NN29 7RL
Telephone: +44 (0) 1933 663100
Facsimile: +44 (0) 1933 666139
www.scottbader.com



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Post Curing

Satisfactory laminates for many applications can be made from Crystics 491 and Crystic 491PA by curing at workshop temperature (20°C). For optimum properties and long term performance, however, laminates should be post cured before being put into service. The laminate should be allowed to cure for 24 hours at 20°C, and then be oven cured for 3 hours at 80°C, or 16 hours at 40°C.

Mouldings which are to be used with foodstuffs should be allowed to cure for 24 hours at 20°C and then be oven cured for a minimum of 3 hours at 85°C. They should be thoroughly wet - steam cleaned for at least one hour prior to use. If wet steam cleaning is not practical, suitably shaped mouldings can be filled with hot water (60°C-80°C) containing non-perfumed detergent. After 2 hours, they should be emptied and thoroughly rinsed with several batches of clean, hot water. These precautions are essential to avoid the tainting of foodstuffs.

Chemical Resistance

Performance figures for fully cured Crystic 491PA laminates, in more than 200 chemical environments, are shown in Technical leaflet No. 145 "Safe Chemical Containment".

Storage

Crystics 491 and 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.

Packaging

Crystics 491 and 491PA are supplied in 25kg and 200kg containers.

Health & Safety

Please see separate Material Safety Data Sheets.