

# CRYSTIC<sup>®</sup> 406PA

## Low Styrene Emission and Low Exotherm Polyester Resin

### Introduction

Crystic 406PA is a pre-accelerated, thixotropic orthophthalic unsaturated polyester resin, with low styrene emission. Its rapid impregnation of glass fibre reinforcements, and low exotherm temperature, make it ideal for multi-layer laminates, in spray or hand lay applications.

Crystic 406PA exhibits reduced exothermic heat on curing. This makes it suitable for the construction of thicker laminates where exothermic heat build up may distort the moulding or cause excessive shrinkage.

### Applications

Crystic 406PA is recommended for the manufacture of boat hulls, vehicle bodies and industrial mouldings.

### Approvals

Crystic 406PA is approved by Lloyd's Register of Shipping for use in the construction of craft under their survey.

### Formulation

Crystic 406PA 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 406PA requires only the addition of a catalyst to start the curing reaction. The recommended catalyst for normal conditions is Andonox<sup>®</sup> KP9. Catalyst Norox<sup>®</sup> MEKP-925H will increase the pot life under hot conditions. The catalyst should be thoroughly incorporated into the resin, with a low shear mechanical stirrer where possible.

Crystic 406PA 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:** Recommended formulations for room temperature curing of Crystic 406PA.

Component	Parts by weight
Crystic 406PA	100
Andonox <sup>®</sup> KP9 or Norox <sup>®</sup> MEKP-925H	1 to 3

### Pot Life

The ambient temperature and the amount of Andonox<sup>®</sup> KP9 or Norox<sup>®</sup> MEKP-925H control the gel time of the formulation. This can be approximately determined from Table 2, which shows the gel times of various formulations of Crystic 406PA.

**Table 2:** Gel times in minutes for Crystic 406PA

■ = combination not recommended.

Catalyst type		Andonox <sup>®</sup> KP9				Norox <sup>®</sup> MEKP-925H		
Catalyst addition		2.5%	2.0%	1.5%	1.0%	2.0%	1.5%	1.0%
Temperature	35°C	■	■	■	8.5	7	9	15
	25°C	■	10	13	18.5	■	■	■
	15°C	13	16	22	■	■	■	■

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 before being formulated for use. 20°C is recommended.

***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.***

#### Additives

The addition of certain pigments, fillers or extra styrene may adversely affect the properties of Crystic 406PA. Users should seek advice from our Technical Service Department before making any additions.

#### Post Curing

Satisfactory laminates for many applications can be made from Crystic 406PA 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.

#### Typical Properties

The following tables give typical properties of Crystic 406PA when tested in accordance with BS 2782.

**Table 3:** Typical properties of liquid and fully cured Crystic 406PA

Property	Units	Liquid Resin
Appearance		Pinkish mauve
Viscosity at 25°C Brookfield RVT at 100rpm	centipoise	650
Thixotropic Index	Ratio	2.0
Specific Gravity at 25°C		1.10
Volatile Content	%	36
Acid Value	mg KOH/g	18.5
Stability at 20°C	months	3
Geltime at 25°C using 1% Andonox® KP9 catalyst	minutes	18.5
Property	Units	Fully cured* resin (unfilled casting)
Barcol Hardness (Model GYZJ 934-1)		45
Deflection Temperature under load † (1.80 MPa)	°C	62
Water Absorption 24 hours at 23°C	mg	14
Tensile Strength	Mpa	54
Tensile Modulus	Mpa	3700
Elongation at Break	%	1.7
Specific Gravity at 25°C		1.20
Volumetric Shrinkage	%	8.35

\* 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

**Table 4:** Typical interfacial properties of a Crystic 406PA chopped strand mat laminate

Property	Units	Test Method	Normal *	Resin-rich**
Unnotched Charpy impact strength	kJ/m <sup>2</sup>	ISO 179	72	70
Single lap shear strength	MPa	BS 4994 Appendix C	3.8	3.9
Short beam shear strength	MPa	BS 2782 Method 341A	22 (18.6†)	21 (19.4†)
Fracture surface energy	J/m <sup>2</sup>	Scott Bader Test	350	300

\* 24hrs delay between 2 lay-ups of 2 x 450 g/m<sup>2</sup> chopped strand mat

\*\* 2 x 450 g/m<sup>2</sup> CSM. Allowed to gel. Then 700 g/m<sup>2</sup> pure resin interface. Then 24hrs delay. Then 2 x 450 g/m<sup>2</sup> CSM.

† Data obtained using 5 days delay instead of 24hrs

### Storage

Crystic 406PA 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.

### Packaging

Crystic 406PA 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.

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