VERAC 7110

SHCP 7110 is a brand of Bisphenol-A vinyl ester resin manufactured by Singapore-based SHCP & is currently distributed in SA by Resin SA.

Below please find a summary comprising mechanical & physical properties, as well as details pertaining to the actual work & the way this resin handles itself during fabrication.

The resin is designed to work with a curing system void of DMA - this was made possible by controlling the intrinsic reactivity of the resin through the Cobalt salts (as in most VER's) & extra active Oxygen (unlike any other VER); in essence the role the OMA may have played in the cross-linking mechanism was taken over by the slightly higher content of active Oxygen. This is why, the SHCP 7110 uses catalysts with higher active Oxygen content such as Curox M-302 or Butanox-MS0 or Luperox-Kl, where the active Oxygen content is on average 9%. The additional Oygen 'impresses' the Cobalt salt most efficiently in the generation of free radicals, the 'components' responsible for the cross linking development

Notwithstanding the intense foam developed in the first few seconds following the catalyst addition, the foam dissipates completely within a minute or two, depending on the level of catalyst used i.e. 1,5% approximately 1 minute. The foam has no lingering effect on the 'column' of resin, to the point where the resin cures completely air-bubble free. Evidence of that: cured casting resulting from the geltime tests are translucent & easy to observe & asses with the naked eye. This is particularly important as there is no requirement to employ BYK additives to address air-bubbles due to foaming. Important characteristic given the detrimental effect air-bubbles have in GRP laminates for under pressure vessels/ equipment or polymer concrete

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The curing process that follows subsequent to gelation is characterized by:

Very low exothermic temperatures - the casting resulting from the geltime test does not develop very high temperatures even in the first stages of curing (post gelation) therefore there are no cracks in the thick casting - as seen in other VER's; the absence of cracks is also indicative of absence of microcracks that, otherwise, might occur during curing. This info is valuable for laminates employed in corrosion &, very importantly, in the construction of vessels under pressure, as well as in work done in polymer concrete

The absence of 'fumes' released during the initial & middle stages of the curing process - not only that it reduces the toxicity of the curing resin but, even more importantly, this is a very clear indication that there is almost no styrene 'wasted' through these fumes, hence the styrene is kept inside the system to fulfil its intended purpose: participate to the cross-linking process. Therefore, it can be safe to anticipate a high cross-linking density developed at room temperature which, in turn, manifests in physical/mechanical properties developed close to their full potential, at room temperature. Therefore, post curing might not be as essential - if at all required! - as it is in other VER's &, given the difficulties experienced by the SA fabricators in achieving the minimum conditions required for a minimal post-curing i.e. minimum BOC for 1 hour/mm thickness (almost impossible for work on site!) this becomes a true & very practical advantage.

Given the low exothermic during the curing process, the resin regains room temperature & cures almost tack free in a very short space of time. This is most advantageous when secondary bonding is required as it shortens the 'waiting' period required for other VER's, while the laminate must be allowed sufficient breathing time for the exothermic to dissipate before additional work can be done on it; also, the window of tackiness manifests much faster such that the optimum tacky finish required for an efficient & successful secondary bonding is available much quicker, thus shortening the production cycles (less 'waiting' in between operations); however, should that window of opportunity for secondary bonding be missed i.e. the laminate was allowed to rest for too long & the surface is already tack free, the secondary bonding can be carried out unabated once the surface preparation was done like with any other product i.e. light sanding to revive & reactivate the laminate.

The resin has an excellent wet-out, manifested in fast wetting of fibreglass matting or continuous roving, without leading to excessive usage - as is sometimes seen in hand-lay-up [HLU] when anxious laminators tend to use more resin to 'speed' up the wetting process.

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ANALYSIS

Determination of extractives from Vinyl ester resins materials using solvents simulating types of food and beverages conforming to US Food and Drug Administration requirements. The extractable of the Vinyl ester complies to the limit of the Code of Federal Regulations (CFR Title 21, Pt 177.2420). Heat distortion temperature is 103 C. Verac 7100 has acceptance to class E glass, woven and chopped strand mat. Verac 7110 is FDA approved and does not contain DMA.

VERAC 7100 - TEST

TEST	UNIT	RESULTS	LIMIT
Net chloroform – soluble extractives (D.I. – Water, 120°F, 24 hours)	mg/in^2	0.05	0.1
Net chloroform – soluble extractives (N – Heptane, 70°F, 30 minutes)	mg/in^2	0.09	0.1
Net chloroform – soluble extractives (8% Alcohol 120°F, 24 hours)	mg/in^2	0.08	0.1
Net chloroform – soluble extractives (50% Alcohol, 120°F, 24 hours)	mg/in^2	0.05	0.1

All situations cannot be foreseen, no warranty is expressed or implied. Users are recommended to do their own tests to determine suitability and applicability for their requirements.

LIQUID VERAC 7110 - PROPERTIES

TEST ITEMS	TEST METHOD	RESULT
Appearance	JIS K 6901	Viscous Liquid
Viscosity (Ps/30°C)	JIS K 6901	4 – 5
Specific Gravity (30°C)	JIS K 6901	1.048
Gel Time (Minute/30°C)	JIS K 6901	20 – 35
Monomer Content (%)	ISO 3251 – 1974	45 ± 2
Mineral Content (%)	DIN 1645 – 1976	Max. 0.05
Linear Curing Shrinkage (%)	ASTM D2566 – 69)	1.9 – 2.1

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Chemical	Conc. (%)	Usable Temperature (^{O}C)
Ferric chloride	all	90
Ferric nitrate	all	90
Ferric sulfate	all	90
Ferrous chloride	all	90
Ferrous nitrate	all	90
Ferrous sulfate	all	90
Formaldehyde	37	70
Formic acid	all	50
Gasoline	100	50
Gluconic acid	25	85
	50	70
Glycerine	100	90
Heptane	100	90
Hydrobromine acid	25	85
	50	70
Hydrochloric acid	10	80
	20	80
Hydrochlorous acid	10	100
	20	70
	50	70
Hydrocyanic acid	10	85
Hydrofluosilic acid	25	70
Hydroflurboric acid	all	85
Hydrofluric acid	10	70
	15	40
Hydrogen peroxide	30	60
JIS No2. Insulation oil	100	90
Kerosene	100	50
Lactic acid	all	90
Lead acetate, sodium acetate	all	90
Levulinic acid	all	90
Linseed oil	100	90
MaQnesium carbonate	all	85
Magnesium chloride	all	90
MaQnesium sulfate	all	90
Maleic acid	all	90
Mercuric chloride	all	90
Mercurous chloride	all	90
Naphtha	100	90
Naphthalene	100	90
Nickel chloride	all	90
Nickel nitrate	all	90
Nickel sulfate	all	90
Nitric acid	5	70
Nitric acid	20	60
Nitrogen oxide	-	85
Oleic acid	all	90
Ortho-benzoyl benzoic acid	all	90
Oxalic acid	all	90

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However, owing to difficulities in presenting information applicable to all situation, no warranty is expressed or implied and users are recommended to carry out their own tests to determine the applicability of the above information and the suitability of SHCP resin for their particular requirements.

TEST ITEMS	TEST METHOD	RESULT
Density	ASTM C905 – 01	1.033 g/cm^3
Barcol Hardness	ASTM D2583 – 07	39 BHC
Heat Distortion Temperature	ATSM D648	103°C
Glass Transition Temperature	ASTM E1356 – 03	103°C
Water Absorption	ISO / R 62 – 1980	Max. 80mg
Elongation	ASTM D638	5 – 6 %
Tensile Strength	ASTM D638	75Mpa^2
Tensile Modulus	ASTM D638	3.49Gpa
Flexural Strength	ASTM D790	135Mpa
Flexural Modulus	ASTM D790	3.09Gpa

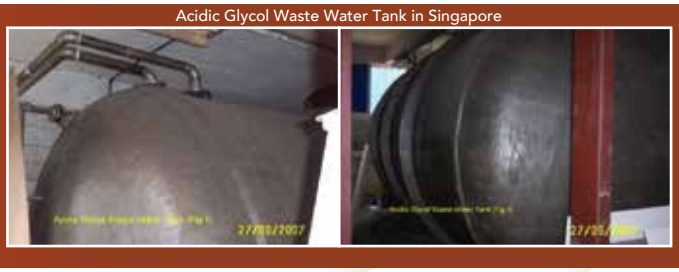
STORAGE

Store Verac 7110 in a cool, preferably air-conditioned, dark room below 25°C. Stability deteriorates markedly at higher temperatures, especially in sunlight. Use within three months. Verac 7110 is packed in steel drums, 200kg net weight.

FRP Piping Project in Indonesia

Copper Refinery Project in South Africa

Acidic Glycol Waste Water Tank in Singapore



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