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Advanced Materials

RenLam® LY113 / Ren® HY 98

LOW VISCOSITY LAMINATING SYSTEM WITH GOOD THERMAL PERFORMANCE

APPLICATIONS

Composite Tooling, Industrial Composites

PROPERTIES

- Very low viscosity
- Excellent room temperature strength at demould
- Excellent wetting out properties
- Elevated temperature resistance, up to 125 ºC

PROCESSING

- Wet lay-up
- Resin Infusion
- Resin Transfer Moulding (RTM)
- Pressure Moulding

PRODUCT DATA

RenLam® LY 113

Aspect (visual)	Yellowish liquide	
Viscosity at 25 °C (ISO 2555)	500 - 1000**	[mPa s]
Density at 25 °C (ISO 1675)	1.16	[g/cm^3]

Ren® HY 98

Aspect (visual)	clear yellowish	
Viscosity at 25 °C (ISO 2555)	15 - 30**	[mPa s]
Density at 25 °C (ISO 1675)	0.92	[g/cm^3]

STORAGE

Provided that RenLam® LY 113 and Ren® HY 98 are stored in a dry place in their original, properly closed containers at the storage temperatures mentioned in the MSDS they will have the shelf lives indicated on the labels.
Partly emptied containers should be closed immediately after use.

** *Specified data are on a regular basis analysed. Data which is described in this document as 'typical' is not analysed on a regular basis and is given for information purposes only. Data values are not guaranteed or warranted unless if specifically mentioned.*

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TYPICAL SYSTEM DATA

PROCESSING DATA

MIX RATIO

Components	*Parts by weight*	*Parts by volume*
RenLam LY 113	100	100
Ren HY 98	30	38

The components must be weighed accurately and mixed thoroughly to obtain optimal properties. The sides and bottom of mixing vessels must be included in the mixing process. Large mix quantities will show considerable exotherm, leading to short potlives. Preferably mix smaller quantities or divide large mixes into smaller containers.

INITIAL MIX VISCOSITY

(ISO 12058-1)

[°C]	*[mPa s]*
at 25	300 - 320

POT LIFE

(Tecam, 500 ml, 65 % RH)

[°C]	*[min]*
at 25	90 - 100

GEL TIME

(Hot plate)

[°C]	*[min]*
at 25	175 - 185
at 40	100 - 105
at 60	42 - 47
at 80	18 - 20
at 100	5 - 6
at 120	2 - 3

The values shown are for small amounts of pure resin/hardener mix. In composite structures the gel time can differ significantly from the given values depending on the fibre content and the laminate thickness.

TYPICAL CURE CYCLES

24 hours 23 °C + 8 h 80 °C
or 24 hours 23 °C + 4 h 120 °C

The optimum cure cycle has to be determined case by case depending on the processing and the economic requirements.

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PROPERTIES OF THE CURED, NEAT FORMULATION

GLASS TRANSITION TEMPERATURE (T_G) (ISO 11357-2 DSC, 10 K/MIN)	*Cure:*	*T_G) [°C]*
	24 h 23 °C	50 - 55
	24 h 23°C + 8 h 40°C	60 - 65
	24 h 23°C + 8 h 50°C	70 - 75
	24 h 23°C + 8 h 60°C	77 - 82
	24 h 23°C + 8 h 80°C	95 - 100
	24 h 23°C + 1 h 100°C	96 - 102
	24 h 23°C + 4 h 100°C	102 - 108
	24 h 23°C + 4 h 120°C	120 - 125

TENSILE TEST (ISO 527)		*Cure:*	*7 days 23°C*	*8 h 80 °C*	*4 h 120 °C*
	Tensile strength	[MPa]	62 - 70	81 - 82	77 - 79
	Elongation at tensile strength	[%]	2.0 - 2.7	5.2 - 5.6	5.0 - 5.8
	Ultimate strength	[MPa]	60 - 68	75 - 79	77 - 79
	Ultimate elongation	[%]	2.0 - 3.0	5.8 - 7.0	5.0 - 5.8
	Tensile modulus	[MPa]	3300 - 3400	3000 - 3100	2900 - 3000

FLEXURAL TEST (ISO 178)		*Cure:*	*7 days 23°C*	*8 h 80 °C*	*4 h 120 °C*
	Flexural strength	[MPa]	114 - 117	127 - 131	127 - 130
	Elongation at flexural strength	[%]	4.0 - 4.6	6.2 - 6.5	7.0 - 7.6
	Ultimate strength	[MPa]	110 - 114	120 - 127	121 - 127
	Ultimate elongation	[%]	4.0 - 5.0	7.0 - 8.5	7.0 - 7.8
	Flexural modulus	[MPa]	3400 - 3500	3100 - 3200	3000 - 3100

FRACTURE PROPERTIES BEND NOTCH TEST (ISO 13586)		*Cure:*	*7 days 23°C*	*8 h 80 °C*	*4 h 120 °C*
	Fracture toughness K_{1C}	[MPa√m]	0.9 - 1.2	0.7 - 0.8	0.8 - 0.85
	Fracture energy G_{1C}	[J/m^2]	320 - 350	170 - 180	220 - 250

WATER ABSORPTION (ISO 62)	*Immersion:*	*Cure:*	*7 days 23°C*	*8 h 80 °C*	*4 h 120 °C*
	4 days H_2O 23 °C	[%]	0.30 - 0.35	0.30 - 0.35	0.30 - 0.35
	10 days H_2O 23 °C	[%]	0.50 - 0.55	0.45 - 0.50	0.50 - 0.55
	30 min H_2O 100 °C	[%]	0.35 - 0.40	0.40 - 0.45	0.30 - 0.35
	60 min H_2O 100 °C	[%]	0.60 - 0.65	0.55 - 0.65	0.45 - 0.50

COEFFICIENT OF LINEAR THERMAL EXPANSION (DIN 53 752)		*Cure:*	*7 days 23°C*	*8 h 80 °C*	*4 h 120 °C*
	Mean value up to 80 °C	[10^{-6}/K]	65 - 70	65 - 67	63 -65

POISON'S RATIO	[ν]	0.35

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PROPERTIES OF THE CURED, REINFORCED FORMULATION

INTERLAMINAR SHEAR STRENGTH (ASTM D 2344)

Short beam: E-glass unidirectional specimen, thickness t = 3.2 mm
Fibre volume content: 60 %

Cure:	*8 h 80*	*4 h 120*
[MPa]	51 - 54	55 - 59

HANDLING PRECAUTIONS

Personal hygiene

Safety precautions at workplace	
protective clothing	yes
gloves	essential
arm protectors	recommended when skin contact likely
goggles/safety glasses	yes
Skin protection	
before starting work	Apply barrier cream to exposed skin
after washing	Apply barrier or nourishing cream
Cleansing of contaminated skin	
	Dab off with absorbent paper, wash with warm water and alkali-free soap, then dry with disposable towels. Do not use solvents
Disposal of spillage	
	Soak up with sawdust or cotton waste and deposit in plastic-lined bin
Ventilation	
of workshop	Renew air 3 to 5 times an hour
of workplaces	Exhaust fans. Operatives should avoid inhaling vapours

FIRST AID

Contamination of the *eyes* by resin, hardener or mix should be treated immediately by flushing with clean, running water for 10 to 15 minutes. A doctor should then be consulted.

Material smeared or splashed on the *skin* should be dabbed off, and the contaminated area then washed and treated with a cleansing cream (see above). A doctor should be consulted in the event of severe irritation or burns. Contaminated clothing should be changed immediately.

Anyone taken ill after *inhaling* vapours should be moved out of doors immediately.

In all cases of doubt call for medical assistance.

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