Technical Data

Technicure® LC-100

Description:

Technicure LC-100 is an encapsulated modified imidazole designed for one-component epoxy formulations. The product can be used as a sole curing agent or as an accelerator for dicyandiamide, anhydride, dihydrazides and diaminodiphenylsulfone. As an accelerator for anhydride curing agent, the product offers excellent reactivity, long shelf life and high glass transition temperature.

Advantages:

- Excellent low temp reactivity
- Long formulation shelf stability
- High glass transition temperature

Typical Applications:

- One-component paste and film adhesives for auto, aerospace and electronics applications
- Hot-melt pre-pregs
- Composites

Handling Precautions:

Refer to the product Safety Data Sheet

Typical Properties:

Appearance:	Off white to yellow powder
Average Particle Size	10 micron
Melting point:	90 - 100°C

Recommended Use Level
(PHR with EEW=190):
As a DICY and anhydride cure accelerator: 2-8

Typical Formulations (by wt.):

Liquid epoxy resin (EEW=190)	100	100
Technicure D-10[1]	8	0
MTHPA[2]	0	80
Technicure LC-100	3	5
Fumed silica (H 200U)[3]	1	-
Reactivity by DSC[4]		
Onset Temp., °C	120	124
Peak Temp., °C	139	149
Heat of Reaction, J/gm	316	201
Glass Transition Temp[5]., °C		
After 30 minutes cure at 120°C	-	-
After 30 minutes cure at 140°C	141	-
After 120 minutes cure at 150°C	-	140
Shelf stability[6] at 40°C		
	>4 weeks	>3 days

1. Dicyandiamide – Product of ACCI Specialty Materials
2. Methyltetrahydrophthailic anhydride
3. Fumed silica – Product of OCI Company Ltd.
4. 10°C/min. scan rate
5. By DMA
6. Time to double the viscosity

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Supplemental Technical Information:

Two one-package formulations containing Technicure LC-100 and Technicure D-10 (DICY) as shown in Table 1 were studied for reactivity, glass transition temperature, and shelf stability.

Reactivity:

Differential Scanning calorimeter data (Table 1) suggests that onset temperature (indication of reactivity) lowers as a function of increasing loading of LC-100.

Glass Transition Temperature:

Samples of cured formulations were analyzed for glass transition temperature (Tg) by DMA. The scan rate was 10°C/minute starting at 25°C. The results are shown in Table 1. As can be seen, formulations containing LC-100 as DICY accelerator did not provide any noticeable glass transition temperature after 30 minutes cure at 120°C. However the same formulations provided very high glass transition temperature after 30 minutes cure at 140°C regardless of the loading level.

Formulation Shelf Stability:

Twenty-four hours after mixing and degassing, the viscosity of the formulations was measured at 25°C. Thereafter, the formulations were stored at 40°C and their viscosities were measured (after equilibrating to 25°C) every week. Both formulations demonstrated acceptable latency.

Table 1. Formulations (by wt.), reactivity, glass transition temperature and shelf stability

Liquid epoxy resin (EEW=190)	100	100
Technicure D-10	8	8
Technicure LC-100	3	5
Fumed silica (H 200U)	1	1
Reactivity by DSC		
(10°C/min scan rate)		
Onset Temp., °C	120	116
Peak Temp., °C	139	133
Heat of Rection, J/gm	316	369
Glass Transition Temp., °C (by DMA)		
After 30 mins. cure at 120°C	-	-
After 30 mins. cure at 140°C	142	155
Shelf stability at 40°C		
Weeks	>4	>3

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Technicure LC-100 in Epoxy-Anhydride systems:

Technicure LC-100 was evaluated as an anhydride cure accelerator. Table 2 details the model formulations used for the evaluation, all with methyl tetrahydrophthalic anhydride (MTHPA) and a standard liquid epoxy resin (EEW=190). 2-methyl imidazole (2-MI) was used as a control accelerator.

Table 2 summarizes the results on reactivity by DSC, glass transition temperature, and viscosity of formulations upon storage at 40°C in 150 gm. mass. Compared with the 2MI based formulation, the LC-100 based systems demonstrate much lower viscosity increase (better shelf stability). Achieving a more comparable glass transition temperature and reactivity would require a higher loading of Technicure LC-100 without significant impact on viscosity stability. For example, 5 PHR of Technicure LC-100 containing formulation has comparable reactivity and glass transition temperature and significantly increased formulation stability.

Table 2. Formulations (by wt.), reactivity, glass transition temperature, and viscosity of epoxy/anhydride formulations

Liquid epoxy resin (EEW=190)	100	100	100	100
MTHPA	80	80	80	80
Technicure LC-100	0	1	3	5
Resicure 2-MI[1]	1	0	0	0
Reactivity by DSC				
(10°C/min scan rate)				
Onset Temp., °C	125	140	134	124
Peak Temp., °C	151	164	158	149
Heat of Reaction, J/gm	253	113	167	201
Glass Transition Temp[2]., °C				
After 120 mins. cure at 150°C	156	110	131	140
Viscosity at 25°C after storage at 40°C				
Initial, cPs	1300	1280	1320	1400
After 1 day	29800	1600	1680	1840
After 2 days	Gel	1880	2160	2480
After 7 days	---	2640	3000	4480
After 10 days	---	3680	6200	8480

1. Product of ACCI Specialty Materials
2. By DMA

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