
Studies on the epoxy resins of stone cultural properties

金思惠 · 金順寬 · 金昌石 · 洪正基 · 姜大一 · 李命熹

Sa Dug Kim, Soon Kwan Kim, Chang Suk Kim, Jung Ki Hong, Dai Il Kang and Myong

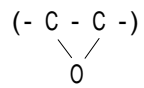
Hee Lee

ABSTRACT

We tested to obtain the excellent Epoxy resins on the property of matter. Existing Epoxy resins is tested to regulate the viscosity, color and hardening time etc. Benzen-ring structure of Bisphenol A type (AY 103) is replaced by Hydrogenated B.P.A type. And hardener is replaced by Polyoxyalkylene Amine. So we are developed into the two resins(L-30, L-40).

To know if this Epoxy resins was fitted to repairing and restoration of stone cultural properties. Three kinds of Epoxy resins (AY 103, L-30, L-40) are tested on the artificial weathering test, freezing-melting test, exposure test etc. As a result of test, L-30 is less the discoloration than that of other Epoxy resins and was superior to the excellent property of matter.

1.



가

가.

가

(, , ,)

가

가

()

가

가

가

(C-O-C)

(-

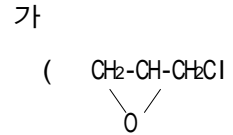
OH)

(U.V)

() (yellowish)

2.

2
A(C₁₅H₁₆O₂ : Bisphenol)

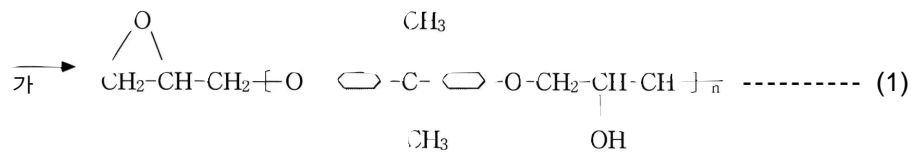
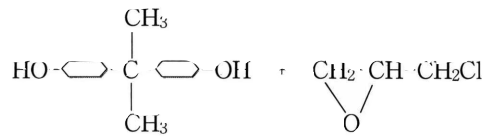


: Epichlorohydrin)

가

(Polyamide Amine)

가



(yellowish)

Bisphenol A

(Hydrogenated B.P.A)

(Amine)

(Basicity)가

CO₂가

(Amine)

4

(Polyoxy alkylene Amine)

5

2

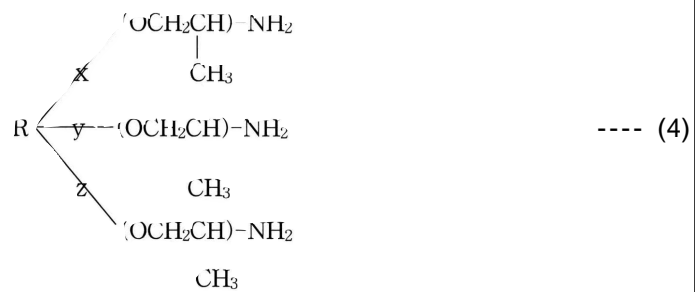
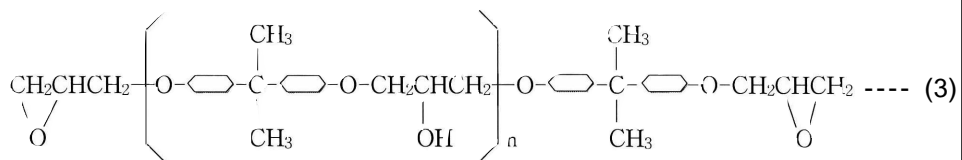
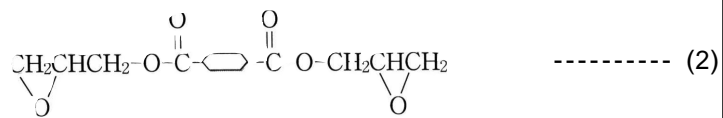
(L-30, L-40)

L-

30(2),

L-40(3),

(4)



가 (, ,)

(AY 103) 2 (L-30, L-40)

1. 가. AY 103, L-30, L-40 3 (3) 2.5cm × 7cm × 0.7cm 5 , 3 , () 24 (Talc), (Por-rok), 가 , () () . AY 103, L-30, L-40 3 (5) 4cm × 4cm × 2cm 2 (4cm × 3cm=12cm²) , 9 . Table 1 , 26 30 가 .

Table 1.

		(:)		
AY 03	HY 956	100 : 18	1	
L 30	Regular	100 : 50	4	
	Fast	100 : 70	2	
L 40	Regular	100 : 35	3	
	Fast	100 : 40	1	

2.

가.

1)

()

KS KSM-5000-1990 3231

ATLAS Model Ci65A, (xenon weather-

ometer) 340nm Xenon arc

150 2 1 102

340nm Xenon arc , 18

Xenon arc , 60±3 , 50% ,

0.35W/m²

50 ,

(Minolta Model CR-200, Chroma Meter)

KS A 0063 Lab (E)

. Lab (E)

$$E = \sqrt{(L)^2 + (a)^2 + (b)^2}$$

E

- 0 0.5 : 가 가

- 0.5 1.5 : 가 가

- 1.5 3.0 : 가 가

- 3.0 :

L 2 , a b

(Chromacheckness)

2) (가)

가

가

(SO₂)

ATLAS

Model GE-15, 가

(Gas Exposure Cabinet)

150

가

2ppm,

45 , 65%

50

3)

(Low Temp ' Humidity Chamber)

, -20

3

20

3

20

10

4)

()

()

6

4cm × 4cm × 2cm

3 (5)

2

,
 .
 (INSTRON Model 4204)
 , 1.0mm/min
 , () .

$$= P/A \text{ (kg/cm}^2\text{)}$$
 (P: (kg), A: (cm²))

3.
 가.
 1) ()
 (E) Table 2 . Table 2 AY
 103 E 23.67 L-30 3.59 6 , L-40 10.12 2.3
 , AY 103
 , L-30, L-40 .

Bisphenol A
 (Hydrogenated B.P.A) L-30
 . L-40 AY 103 가
 10.12 가 .
 가 가

Table 2. (E)

	AY 103 + HY 956				L 30				L 40				
	-	T	P	M	-	T	P	M	-	T	P	M	
	23.67	16.09	10.24	3.99	3.59	4.26	3.55	3.27	10.12	4.60	4.48	2.76	
	25.89	8.86	13.97	6.60	4.55	6.37	9.00	6.95	10.58	4.79	7.35	4.42	

E

가 가

2)

Table 3 . Table 3

1 가

가

Table 3. (E)

	AY 103 + HY 956				L 30				L 40				
	-	T	P	M	-	T	P	M	-	T	P	M	
	0.92	0.73	0.91	0.72	0.61	0.52	0.49	0.83	0.78	0.46	0.72	0.83	
	1.00	0.92	0.63	0.76	0.76	0.75	0.72	0.70	0.59	0.60	0.79	0.71	

3)

Table 4 . Table 4

3 가 가

Table 4. (E)

	AY 103 + HY 956				L 30				L 40				
	-	T	P	M	-	T	P	M	-	T	P	M	
	2.45	0.61	1.71	1.11	1.61	1.75	2.34	1.54	1.76	2.03	2.14	1.09	
	2.14	1.95	2.58	1.19	2.33	0.94	1.43	0.92	0.77	0.76	0.91	1.67	

4) .

1 Table 5 . Table 5

AY 103 E 20.5 L-30 3.2 6 , L-40 8.41

2.3 , AY 103 ,

, L-30, L-40

Bisphenol A AY 103

Hydrogenated B.P.A L-30

. 1

가

E

가 가

Table 5 1

가 . . ,

Table 5. (E) : 1

	AY 103 + HY 956				L 30				L 40				
	-	T	P	M	-	T	P	M	-	T	P	M	
	20.5	8.70	18.8	16.5	3.20	3.41	9.75	9.05	8.41	1.64	11.2	10.0	
	24.5	9.04	10.6	6.41	6.95	1.18	9.63	5.53	14.1	1.24	18.7	4.82	
	0.68	1.25	0.86	1.08	0.80	0.62	0.74	0.68	0.75	0.56	0.64	0.78	
	1.05	0.55	1.14	0.99	0.80	0.65	0.54	0.70	0.73	0.47	0.70	0.71	

Table 6

120 130kg/cm² (L 40 Regular 100kg/cm²)

AY 103 67.65kg/cm² 3 1

, 2 L-30 114.7kg/cm²

가 100%

AY 103 38.89kg/cm², L-30 31.18kg/cm², L-40

34.93kg/cm² 가

L-30 ,

가

L-30 (Fast) ,

Regular 가

Table 6. (:kg/cm²)

	AY 103	L 30	L 40	
	HY 956	Regular	Fast	Regular
	127.1	130.8	123.6	96.83
	67.65	114.7	69.75	86.71
	38.89	31.18	12.55	34.93
				30.98

()

100%

0%

가

(, , ,) ,

Bisphenol A
(Hydrogenated

B.P.A)

(Polyoxy alkylene Amine) 2 (L-30, L-40)

2 (L-30, L-40) (AY 103)

1) AY 103 E 23.7 L-30 3.59 6 ,
L-40 10.1 2.3 , AY 103
, L-30, L-40

2)

가

3) AY 103 E 20.5 L-30 3.2 6 , L-40 8.41 2.3
, AY 103
, L-30, L-40

가

4) 120 130kg/cm² (L-40
Regular 100kg/cm²)

AY 103
67.65kg/cm² 3 1 , 2
. L-30 114.7kg/cm² 가
100%
AY 103 38.89kg/cm², L-30 31.18kg/cm², L-40
34.93kg/cm² 가
L-30 , L-40 Fast
가
()



Photo. 1



Photo 2.

()



Photo 3.

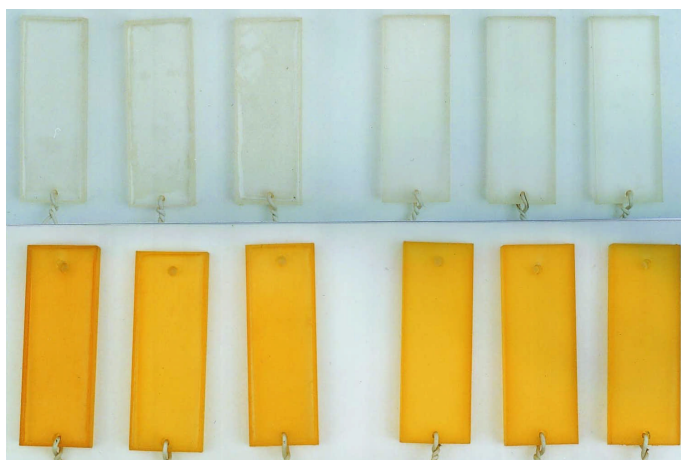


Photo 4.

() •
()

1. , , 1989,
 2. , , 1994, (),
 , (), 1983, 4 ,
 1 , , 1991, 12 ,
 2 , 10 , 1996,
 17 ,
 3. , (weather-ometer), 1992, M.C. Corporation
 4. L-30, L-40 , 1998,
 5. , , 1980,
 6. , 1989,
 7. , 1998, M&P
 8. , , 1988,
-