

()

Studies on the consolidant and water-repellent
of stone cultural properties

嚴斗成 · 金思憲 · 洪正基 · 姜大一 · 李命憲

Doo Sung Eom, Sa Dug Kim, Jung Ki Hong, Dai Il Kang and Myong Hee Lee

ABSTRACT

We studied to select the best consolidant and water-repellent synthesis resins on the weathering caused by many factors (temperature variation, ultraviolet light, moisture, salt etc.) for using internal or external of stone cultural properties. The specimen [granite(Pochon-suk), granite(Hwangdung-suk), tuff(in Kyong-ju)] was treated by Wacker OH, Wacker OH 100, Wacker 290L, D.W.R, SS-101 and tested in the five kinds of test and analyzed.

After all test, D.W.R is the excellent results on the measuring of the property of matter. Especially, water-repellent efficiency is the best.

가 , , , 가
가 55%, 33%
가

Wacker OH, Wacker OH 100, Wacker
290L, D.W.R, SS-101
5

1.

, , , ,

가 ,

.
, , , ,

가 .

가

가 .

가 가 .
(), (), ()

○ () : 92

- 3cm × 3cm × 3cm : (4) × (7)
× (3) = 84

- 4cm × 4cm × 2cm : (4) × (1)
× (2) = 8

○ () : 68

- 3cm × 3cm × 3cm : (4) × (5)
× (3) = 60

- 4cm × 4cm × 2cm : (4) × (1)
× (2) = 8

○ : 72

- 3cm × 3cm × 3cm : (4) × (6)
× (3) = 72

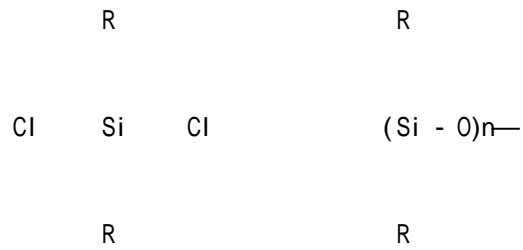
2.

가 가 가 가 .
 , 가
 ,
 가 .

Wacker 290L, Wacker OH, Wacker OH 100, D.W.R, SS-101

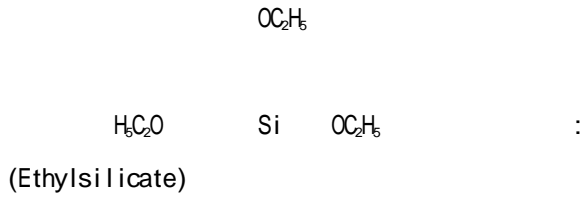
가) Wacker 290L()

/ (Silane/Siloxane)



(Dichlorodialkylsilane) (Polydialkylsiloxane)

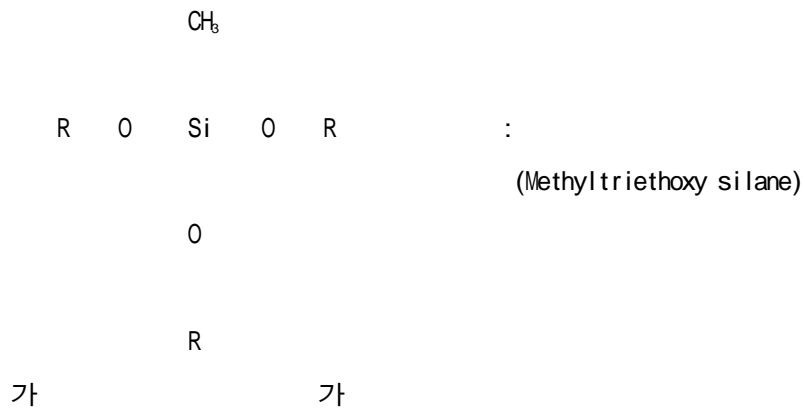
) Wacker Stone strengthener OH, Wacker Stone strengthener OH 100()
 (Monomeric) (Oligmeric)



가
(Silicic acid gel)

Wacker OH 75%(wt%) Solvent 100%(wt%)
 Wacker OH 100 25%(wt%), Wacker OH 100
 Wacker OH

) SS-101 ()
 (Methyltriethoxy silane)
 가 .



) D.W.R()

가 (Organopolysiloxane)

R

R (Si - O)n R :
(Polysiloxane)

R

1.

가) : 105

24

) : 105 ° C 24
3

) : MINOLTA Model No. CR-200

, L, a, b L*, a*, b*

E . (L 100, 0

a, b Chromachekness)

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

E

Table 1

Table 1. E

	E
	0 - 0.5
	0.5 - 1.5
	1.5 - 3.0
	3.0 - 6.0

) :

2.

Wacker OH, Wacker OH 100, D.W.R, SS-101 24

7 60 3 .

Wacker OH, Wacker OH 100 Wacker 290L

7 60 3

3.

가)

10% Sodium sulfate 24

60 21 3

. 10 .

) -

5 105 18

2 -20 2 , 105 2 10

), ()
KSM-5000-1990 3231 , Atlas Electric Devices
Model Ci 65A . 2 1 102
340nm Xenon Arc
18 Xenon Arc
150 , 60±3 , 50%
150 가 , ,
)
48
20 3 20 3 20
)

1.

Wacker OH, Wacker OH 100 D.W.R 10% Sodium
sulfate , Wacker OH Wacker OH 100
, D.W.R
Wacker OH, Wacker OH
100 , D.W.R

Table 2

Wacker OH 100, Wacker OH, D.W.R
96%, 94%, 14% , Wacker OH 100, Wacker OH, D.W.R
64%, 69%, 8%
Wacker OH 100, Wacker OH, D.W.R

Table 2.

			(%)	()
			10.4	
	Wacker OH		9.76	94%
	D.W.R		1.50	14%
	Wacker OH 100	, ,	10.0	96%
			0.36	
	Wacker OH	,	0.25	69%
	D.W.R		0.03	8%
	Wacker OH 100		0.23	64%
			0.32	
	Wacker OH		0.19	59%
	D.W.R		0.02	6%
	Wacker OH 100		0.18	56%

56%, 59%, 6% , D.W.R 가 .

Wacker OH, Wacker OH 100

, D.W.R

가 .

2. ()

, Table 3

Wacker OH > Wacker OH 100 > D.W.R > SS-101 ,

Wacker OH > Wacker OH 100 > D.W.R > SS-101 .

SS-101 E 1.38 3.42

, Wacker OH, Wacker OH 100, D.W.R

Wacker OH, Wacker OH 100

Table 4, Fig. 1

SS-101 > Wacker OH > D.W.R

, Wacker OH Wacker OH 100 .

Wacker OH , Wacker OH 100, D.W.R, SS-101

40%, 41%, 11%, 56%

Wacker OH,

Wacker OH 100, D.W.R, SS-101

50%, 50%, 3%,

73%

Wacker OH , Wacker OH 100, D.W.R, SS-101

46%, 46%, 4%, 54%

, D.W.R

가 .

D.W.R

가 가

가 ,

Wacker OH Wacker OH 100

50%

SS-101

가

Wacker OH, Wacker OH 100, SS-101

D.W.R

Table 3.

	(E)				
	Wacker OH	D.W.R	Wacker OH 100	SS-101	
	8.29	3.44	7.64	1.55	
	8.49	4.25	7.78	3.42	
	5.95	5.83	9.64	1.38	

Table 4.

		(%)							
		1	4	24	3	5	7	9	
		2.92	4.99	7.67	7.87	7.90	8.00	8.02	
	Wacker OH	0.21	0.46	1.26	1.79	2.53	3.09	3.21	40%
	D.W.R	0.08	0.17	0.41	0.56	0.73	0.88	0.90	11%
	Wacker OH 100	0.21	0.48	1.37	1.90	2.69	3.18	3.26	41%
	SS-101	2.03	3.39	3.97	4.10	4.17	4.42	4.46	56%
		0.18	0.21	0.30	0.30	0.30	0.30	0.30	
	Wacker OH	0.03	0.07	0.10	0.12	0.13	0.14	0.15	50%
	D.W.R	0.00	0.00	0.01	0.01	0.01	0.01	0.01	3%
	Wacker OH 100	0.03	0.08	0.11	0.13	0.14	0.15	0.15	50%
	SS-101	0.10	0.16	0.18	0.19	0.21	0.22	0.22	73%
		0.17	0.21	0.23	0.25	0.26	0.26	0.26	
	Wacker OH	0.01	0.07	0.08	0.08	0.09	0.09	0.12	46%
	D.W.R	0.00	0.00	0.00	0.01	0.01	0.01	0.01	4%
	Wacker OH 100	0.03	0.07	0.10	0.10	0.10	0.11	0.12	46%
	SS-101	0.10	0.11	0.11	0.11	0.12	0.13	0.14	54%

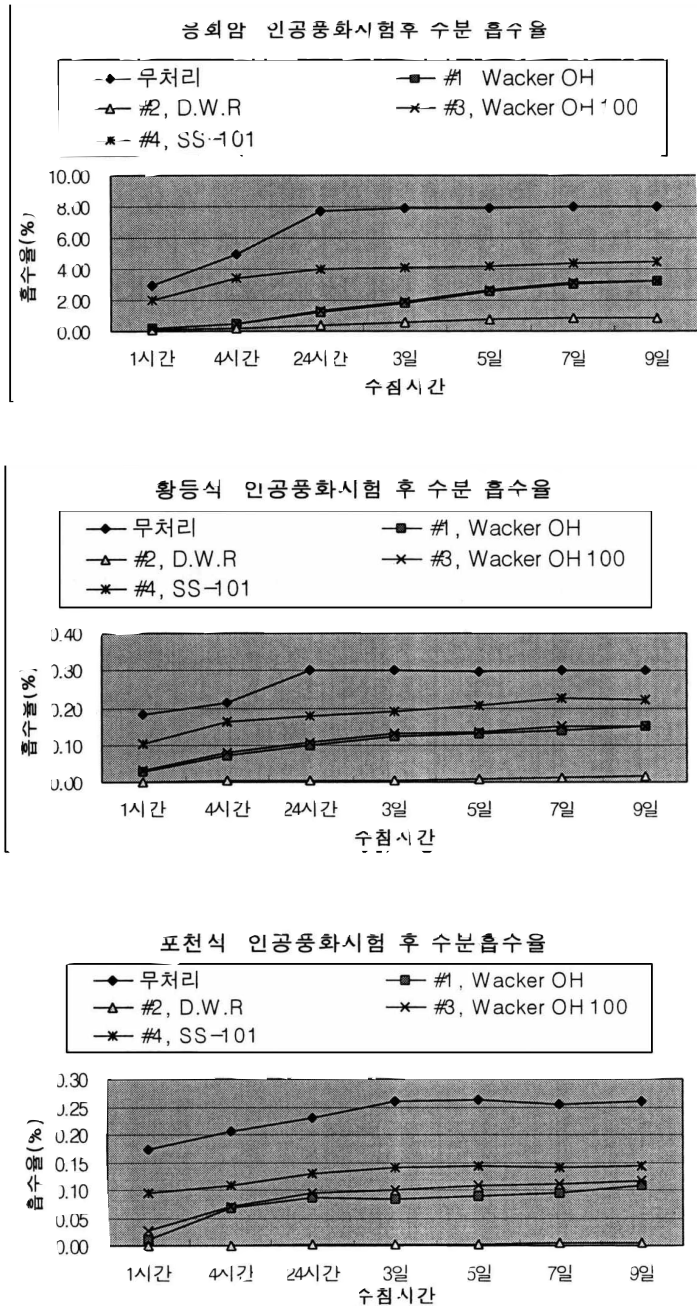


Fig. 1.

3. -
-

Table 5 D.W.R > Wacker OH 100 >
Wacker OH , D.W.R, Wacker OH, Wacker OH 100
가 , Wacker OH, Wacker OH 100

Table 6, Fig. 2

Wacker OH 100 > Wacker OH > D.W.R , D.W.R
4%
Wacker OH, Wacker OH 100
78%, 83%

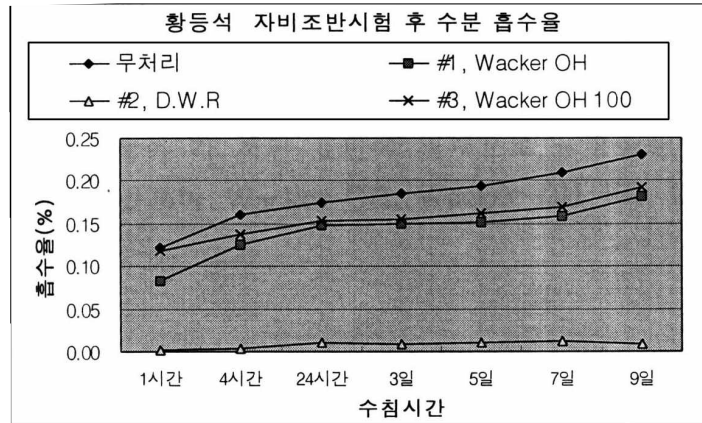
Table 5.

	(E)			
	Wacker OH	D.W.R	Wacker OH 100	
	4.37	8.16	5.69	

Table 6.

		(%)							
		1	4	24	3	5	7	9	
		0.12	0.16	0.17	0.18	0.19	0.21	0.23	
	Wacker OH	0.08	0.12	0.15	0.15	0.15	0.16	0.18	78%
	D.W.R	0.00	0.00	0.01	0.01	0.01	0.01	0.01	4%
	Wacker OH 100	0.12	0.14	0.15	0.15	0.16	0.17	0.19	83%

Fig. 2.



4.

, Table 7, Fig.

3

Wacker OH 100 > Wacker OH > D.W.R

D.W.R

가 가

, Wacker OH, Wacker OH 100

66%

D.W.R

Table 7.

		(%)							
		1	4	24	3	5	7	9	
		0.20	0.22	0.30	0.33	0.33	0.34	0.35	
	Wacker OH	0.06	0.17	0.21	0.22	0.22	0.24	0.23	66%
	D.W.R	0.00	0.00	0.01	0.02	0.01	0.01	0.01	3%
	Wacker OH 100	0.11	0.17	0.20	0.23	0.21	0.23	0.23	66%

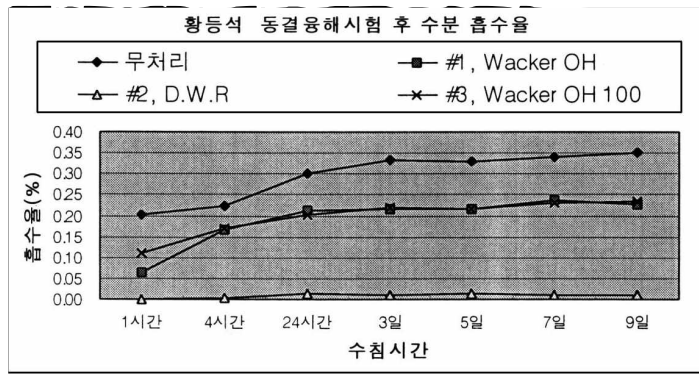


Fig. 3.

5.

Wacker OH, Wacker OH 100, D.W.R, SS-101

Wacker OH,

Wacker OH 100, D.W.R, SS-101

D.W.R Wacker OH, Wacker OH 100, SS-101

(, - ,)

· (E)가 , , 가
· , 가
· 가
가 가 , 가
· 가 , 가
·

()

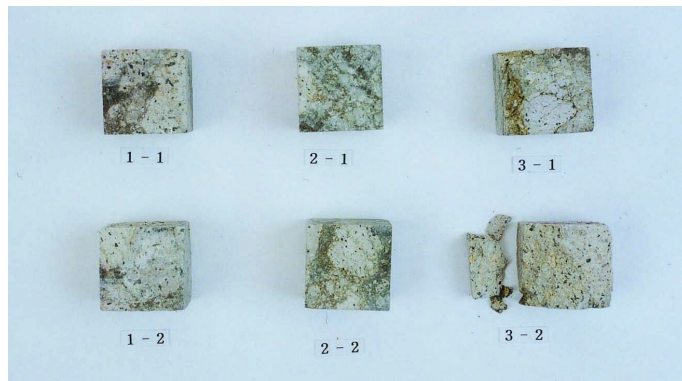
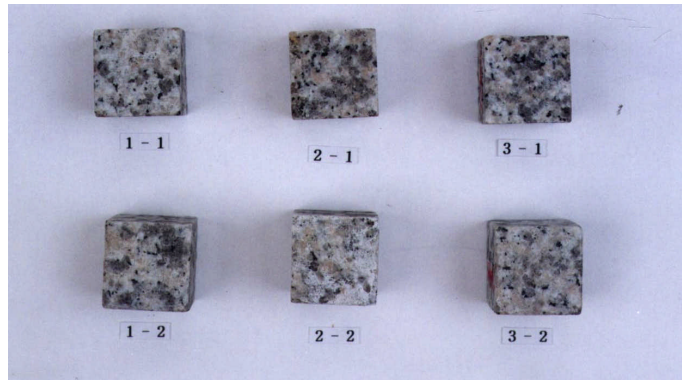
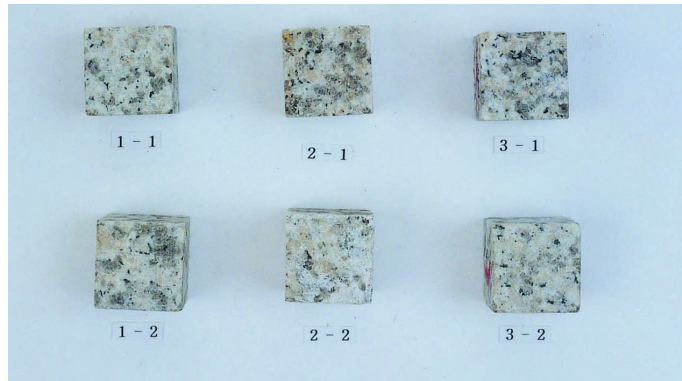


Photo 1.

()



Photo 2.
()

1. 8th International Congress on Deterioration and Conservation of
Stone, 1996, Berlin, Germany

2. 3 , , 1992, 25 ,

3. , 가, 1999

4. , (weather-ometer), 1992, M.C.Corporation

5. 1 , 1989,

6. 2 , , 1989,

7. , , 1980,

8. ,

9. ,