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(12)

(KR)
(A)

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2002 10 26

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(87) 2001 07 05

(30) 19962814.9 1999 12 23 (DE)

(71) 55116

(72) 65830 - - - 20

60529 97

60486 가 3

(74)

(54)

(MAO)

(MAO)

(

, WO - 96/23005, DE - A 19804970, DE - A 19744102, DE - A 19757540)

가

3

가

가

a)

b)

|
M¹ R¹ R² R³

(, M¹ V ,
R¹, R² R³ , C₁ - C₂₀ - , C₁ - C₂₀ - , C₆ - C₄₀ - , C
6 - C₄₀ - , C₇ - C₄₀ - , C₇ - C₄₀ - , R¹, R² R³
3 R¹, R² 3 C₂ - C₂₀ , N, N - , N, N - , N, N - 2,4,6 -
가 , , , , , , , , , , , , , , , , , , , ,
, , , , , , , , , , , , , , , , , , , , ,
- N, N - , , , , (p -) , , , , () , , , , , , ,
, () , , () , , () , , () , , () , , ,
() , , () , , (n -) , , () , , () , , () , , ,
, N, N - , N - - N - , N, N - () (2,4,6 -
() , , () , , (i -)),

(c) ,

(d) II 가

||
R_a⁴ M² (- O - M² R_b⁵)_c

(, R⁴ R⁵ , C₁ - C₄₀ - , C₆ - C₂₀ - , C₆ - C₂₀ - , C₁ - C₄₀ , C₁ - C₂₀ - , C₁ - C₂₀
- , C₁ - C₁₀ - , C₆ - C₂₀ - , C₇ - C
40 - , C₇ - C₄₀ - , C₇ - C₄₀ - , R⁴ - OSiR₃ (, R
, R⁵ ,
M² , III ,
a, b c 0, 1, 2 3 , a + b + c 0 ,),

e) III 가

|||
[M³ R⁶]_e

(, M³ I, II III ,
R⁶ , C₁ - C₄₀ , C₁ - C₂₀ - , C₆ - C₄₀ - , C₇
- C₄₀ - C₇ - C₄₀ - ,
d 1 3 ,
e 1 4)

R¹, R² R³, , C₁ - C₂₀ -, C₁ - C₂₀ -, C₆ - C₄₀ -, C
 6 - C₄₀ -, C₇ - C₄₀ -, C₇ - C₄₀ -, R¹, R² R³, 2 3, C
 R¹, R² R³ 가 C₂ - C₂₀ -, R¹, R² R³, P, O, S
 N / 2 20
 I 가 , R¹, R² R³,
 .
 | ,
 .
 N,N - , N,N -
 - p - , N,N - - p - , N,N -
 , N,N - , N,N - , N,N - , N,N - , N,N - , N,N -
 , N,N - , N,N - , N - , N - , N - , N - , N -
 tert - , N' - - N,N - , N - , N - , N - , N - , N -
 , N - , N - - 1 - , N - - 2 - , N - , N - , N - ,
 .
 .
 N,N - , N,N - - 2 - , N,N - , N,N - - 2 - , N,N -
 - 3 - , N,N - - 2 - , N,N - - 3 - , N,N - - 2 - , N,N - - 3 - , N,N -
 N,N - - 2 - , N,N - - 3 - , N,N - - 2 - , N,N - - 3 - , N,N -
 , N,N - - 4 - , N,N - - 2 - , N,N - , N,N - - 2 - , N,N - - 2 -
 , N,N - - 3 - , N,N - - 4 - , N,N - - 2 - , N,N - - 3 - , N,N -
 , N,N - - 4 - , N,N - - 5 - , N,N - - 2 - , N,N - - 3 - , N,N -
 - 3 - , N,N - - 2 - , N,N - , N,N - - 2 - , N,N - - 3 - , N,N -
 , N,N - , N,N - - 2 - , N,N - - 3 - , N,N - , N,N -
 .
 .
 N,N - - 4 - , N,N - - 2 - , N,N - - 3 - , N,N - - 4 -
 , N,N - - 5 - , N,N - - 6 - , N,N - - 2 - , N,N - - 3 - , N,N -
 - 3 - , N,N - - 4 - , N,N - - 2 - , N,N - - 2 - , N,N - - 3 - , N,N -
 N,N - , N,N - - 2 - , N,N - - 3 - , N,N - - 2 - , N,N - - 3 - , N,N -
 , N,N - - 2 - , N,N - - 3 - , N,N - - 2 - , N,N - - 3 - , N,N -
 , N,N - - 3 - , N,N - - 4 - , N,N - - 2 - , N,N - - 3 - , N,N -
 - , N,N - - 2 - , N,N - - 3 - , N,N - - 2 - , N,N - - 4 - , N,N -
 2 - , N,N - - 3 - , N,N - - 4 - , N,N - - 2 - , N,N - - 5 - , N,
 N - - 2 - , N,N - - 3 - , N,N - - 2 - , N,N - - 3 - , N,N -
 , N,N - , N,N - - 2 - , N,N - - 3 - , N,N - - 2 - , N,N - - 3 -
 , N,N - - 4 - , N,N - - 2 - , N,N - - 3 - , N,N - - 4 - , N,N -
 , N,N - - 5 - , N,N - - 6 - , N,N - - 2 - , N,N - - 3 - , N,N -
 - 3 - , N,N - - 4 - , N,N - - 2 - , N,N - - 3 - , N,N - - 4 - , N,N -
 , N,N - , N - - N - - 2 - , N - - N - - 3 - , N - - N - - 2 - , N -
 - N - , N - - N - - 3 - , N - - N - , N - - N - - 2 - , N - - N - - 2 -
 - N - , N - - N - - 3 - , N - - N - , N - - N - - 2 - , N - - N - - 2 -

, N - - N - - 3 - , N - - N - - 2 - , N - - N - - 3 - , N -
- N - - 4 - , N - - N - - 2 - , N - - N - - , N -
- N - - 2 - , N - - N - - 3 - ,

N - - N - - 4 - , N - - N - - 2 - , N - - N - - 3 - , N -
 - N - - 4 - , N - - N - - 5 - , N - - N - - 2 - , N - - N -
 - - 3 - , N - - N - - 2 - , N - - N - - , N - - N - - 3 -
 - , N - - N - - 4 - , N - - N - - 2 - , N - - N - - 3 - , N -
 - N - - 4 - , N - - N - - 5 - , N - - N - - 6 - , N - -
 N - - 2 - , N - - N - - 3 - , N - - N - - 4 - , N - - N -
 - 2 - , N - - N - , N - - N - - , N - - N - - , N -
 , N - (2 -) , N - () , N - (2 -) , N - (3 -)
) , N - (2 -) , N - (3 -) , N - (2 -) , N - (3 -) , N -
 (2 -) , N - (3 -) , N - (2 -) , N - (3 -) , N -
 (4 -) , N - (2 -) , N - , N - (2 -) , N - (2 -) , N -
 (3 -) , N - (4 -) , N - (5 -) , N - (2 -) , N - (3 -) ,
 N - (4 -) , N - (2 -) , N - (5 -) , N - (2 -) , N - (3 -)
) , N - (2 -) , N - () , N - () , N - ()

$$N - \dots, N - (2 - \dots), N - (3 - \dots),$$

, N - , N - , N - , N - , N - , N - tert -
 , N' - - N,N - , N - , N - , N - , N - , N - , N -
 , N - - 1 - , N - - 2 - , N - .

, , , , ,
 , , , , ,
 CaCO₃, MgO, ZrO₂, TiO₂, B₂O₃, CaO, ZnO, ThO₂, Na₂CO₃, K₂CO₃,
 MgCl₂, Na₂SO₄, Al₂(SO₄)₃, BaSO₄, KNO₃, Mg(NO₃)₂, Al(NO₃)₃, Na₂O, K₂O, Li₂O
 , / Mg-Al

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 , , , , ,
 , , , , ,

10 1000 m²/g,
 0 μm, 5 350 μm,
 150 500 m²/g
 10 200 μm

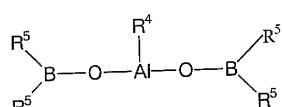
가 0.5 4.0 ml/g,
 () 가
 (opening) .
 2 50 nm

/

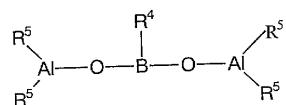
II 가
 . M² 가 II
 .

II
 2
 가
 가
 (d)
 IV V 가
 .

IV



V

R⁴ R⁵

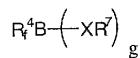
II

VII / VIII

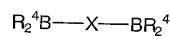
IX 가 가

VI /

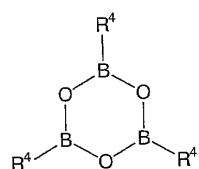
VI



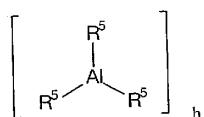
VII



VIII



IX



, R⁷
C₇ - C₄₀ -, 가, C₁ - C₄₀, II, C₁ - C₂₀ -, , C₆ - C₂₀ -, , C₇ - C₄₀ -

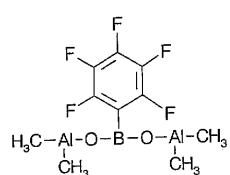
X
C₁ - C₂₀ -, VI
C₁ - C₂₀ -, NR, R
C₁ - C₂₀ -,

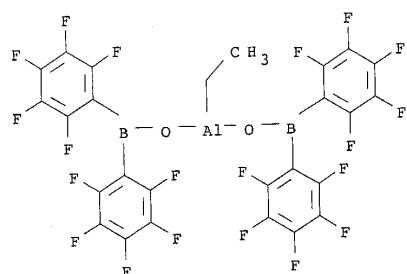
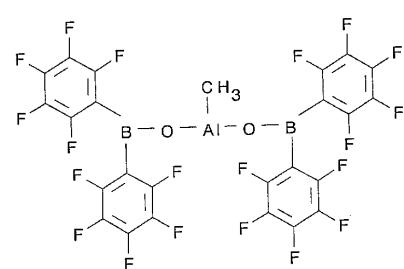
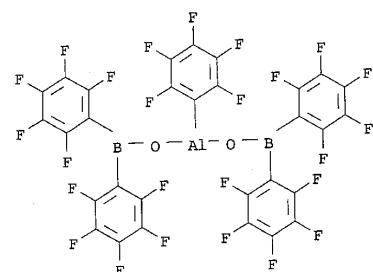
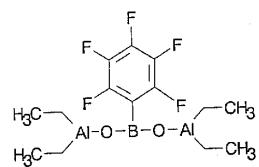
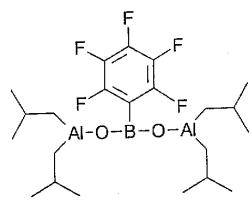
f 0 3 ,

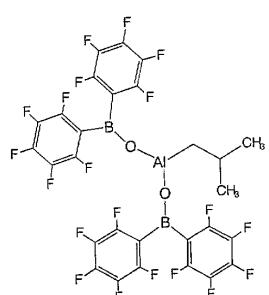
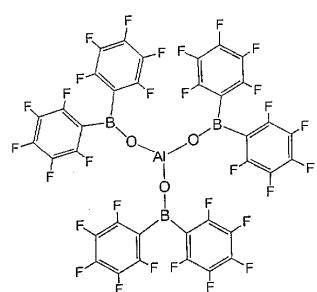
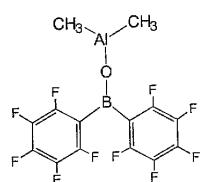
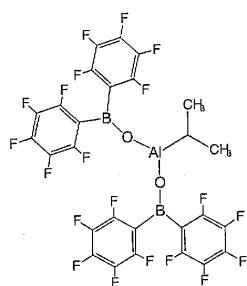
g 0 3 , f + g 0 ,

h 1 10 .

가 IV V .



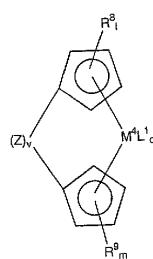




가 가 .
 III IV 가 . [D.H. McConville et al, Macromolecules, 1996, 29, 5241] [D. H. McConville et al, J. Am. Chem. Soc., 1996, 118, 10008]
 VIII (, Ni²⁺ Pd²⁺) . [Brookhart et al, J. Am. Chem. Soc. 1995, 117, 6414] [Brookhart et al, J. Am. Chem. Soc., 1996, 118, 267]
 . , [Brookhart et al, J. Am. Chem. Soc. 1998, 120, 4049] [Gibson et al, Chem. Commun., 1998, 849]
 VIII 2,6 - () .
 가 . 가 .
 22486 가 . WO 98/

X 가 가

X



, M⁴ III , IV , V VI , Ti, Zr Hf

R^8 , SiR₃ (R , C₁ - C
 40 , C₁ - C₂₀ - , C₁ - C₁₀ - , C₁ - C₁₀ - , C₆ - C₂₀ - , C₆ - C₁₀ -
 , C₆ - C₁₀ - , C₂ - C₁₀ - , C₇ - C₄₀ - , C₇ - C₄₀ - C₈ - C₄₀ -)
 , R⁸ C₁ - C₃₀ - , C₁ - C₂₅ - , t - , , ,₂ - C₂₅ -
 , C₃ - C₁₅ - , C₆ - C₂₄ - , C₄ - C₂₄ - , , , C₇ - C₃₀ - , C₅ - C₃₀ -
 , C₅ - C₃₀ - , C₇ - C₃₀ - , C₅ - C₃₀ - , C₁ - C₂₅ - ,
 C₆ - C₂₄ - , C₇ - C₃₀ - , C₇ - C₃₀ - C₁ - C₁₂ - , 2
 R⁸ , R⁸ 가 C₄ - C₂₄
 ()

R⁹ , SiR₃ (R , C₁ - C
 40 , C₁ - C₂₀ - , C₁ - C₁₀ - , C₁ - C₁₀ - , C₆ - C₁₄ - , C₆ - C₁₀ -
 , C₆ - C₁₀ - , C₂ - C₁₀ - , C₇ - C₄₀ - , C₇ - C₄₀ - C₈ - C₄₀ -)
 , R⁹ C₁ - C₃₀ - , C₁ - C₂₅ - , t - , C₂ - C₂₅
 - , C₃ - C₁₅ - , C₆ - C₂₄ - , C₅ - C₂₄ - , C₇ - C₃₀ - , C₇ - C -
 30 - , C₇ - C₃₀ - , C₁ - C₂₅ - , C₆ - C₂₄ - , C₇ - C₃₀ - ,
 C₇ - C₃₀ - C₁ - C₁₂ - , 2 R⁹ , R⁹
 가 C₄ - C₂₄ ()

| v=0 5 , v=1 4 ,

$$m \quad v=0 \qquad \qquad 5 \qquad , \quad v=1 \qquad \qquad 4 \qquad ,$$

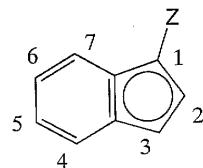
L¹, C₁ - C₁₀ -, OR¹², SR¹², OSiR¹²₃, SiR¹¹₃, PR¹¹₂, NR¹¹₂, R¹¹, C₆ - C₁₀ -, C₁ - C₁₀ -, C₁ - C₁₀ -, C₆ - C₂₀ -, C₆ - C₂₀ -, C₇ - C₂₀ -, C₇ - C₂₀ -, C₆ - C₂₀ -, L¹, 2,2,2 -

$$0 \quad 1 \quad 4 \quad , \quad 2 \quad ,$$

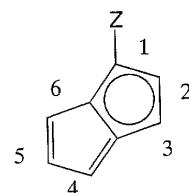
Z 2 가 , v 0 1 .

Z $MR^{10} R^{11}$ (, M , , , , R¹⁰ R¹¹ ,
 $C_1 - C_{20}$ - , $C_1 - C_{10}$ - , $C_6 - C_{14}$ -)가 . Z CH_2, CH_2
 $CH_2, CH(CH_3)CH_2, CH(C_4H_9)C(CH_3)_2, C(CH_3)_2, (CH_3)_2Si, (CH_3)_2Ge, (CH_3)_2Sn, (C_6H_5)_2Si, (C_6H_5)($
 $CH_3)Si, (C_6H_5)_2Ge, (C_6H_5)_2Sn, (CH_2)_4Si, CH_2Si(CH_3)_2, o-C_6H_4$ 2,2' - $(C_6H_4)_2$.
Z R^8 / R^9 .

XIa



XIb



7 [XIa XIb] 2 , 4 , 2,4 , 2,4,5 , 2,4,6 , 2,4,
 2,4,5,6 C₁ - C₂₀ C₁ - C₁₀ C₆ - C₂₀

X 가

가

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(2 -)

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(2 - - 4 - (2 -))

(2 - - 4 -)

(2 - - 4 - t -)

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(2 - - 4 -)
(2 - - 4,5 -)
(2 - - 4,6 -)
(2 - - 4,5 -)
(2,4,6 -)
(2,5,6 -)
(2,4,7 -)
(2 - - 5 -)
(2 - - 5 - t -)
() (2 - - 4 -)
() (2 - - 4,6 -)
() (2 - - 4 -)
() (2 - - 4,5 -)
() (2 - - 4,5 - ())
() (2 - - 4,5 - ())
() (2 - - 4 - -)
() (2 -)
() (2 - - 5 -)
1,2 - (2 - - 4 -)
1,4 - (2 - - 4 -)
1,2 - (2 - - 4,6 -)

1,4 - (2 - - 4 -)
 1,4 - (2 - - 4,5 -)
 1,2 - (2 - - 4,5 -)
 1,2 - (2,4,7 -)
 1,2 - (2 -)
 1,4 - (2 -)
 [4 - (5 -) - 4,6,6 - - (5 - 4,5 -)]
 [4 - (5 - 3' -) - 4,6,6 - (5 - 4,5 -)]
 [4 - (5 - 3' -) - 4,6,6 - (5 - 4,5 -)]
 [4 - (5 -) - 4,7,7 - (5 - 4,5,6,7 -)]
 [4 - (5 -) - 4,7,7 - (5 - 4,5,6,7 -)]
 [4 - (5 -) - 4,7,7 - (5 - 4,5,6,7 -)]
 [4 - (5 - 3' = - tert -) - 4,7,7 - (5 - 4,5,6,7 -)]
 [4 - (5 - 3' = -) - 4,7,7 - (5 - 4,5,6,7 -)]
 [4 - (5 - 3' = -) - 2 - - 4,7,7 - (5 - 4,5,6,7 -)]
 [4 - (5 - 3' = - tert -) - 4,7,7 - (5 - 4,5,6,7 -)]
 (tert -)(- 5 -)
 (tert -)(- 5 -) - 1,2 -
 ()(- 5 -) - 1,2 -
 (tert -)(2,4 - - 2,4 - - 1 -)
 (n -)

(2 - - 4 - (4' -)
(2 - - 4 - (4' -)
(2 - - 4 - (4' -)
(2 - - 4 - (4' -)
(2 - - 4 - (4' - tert -))
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(2 - - 4 - (4' - n -))
(2 - - 4 - (4' - n -))
(2 - - 4 - (4' -))
(2 - - 4 - (4' - sec -))
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(2 - - 4 - (4' - sec -))
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(2 - n - - 4 - ())
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 (2 - n - - 4 - (4' -))
 (2 - n - - 4 - (4' -))
 (2 - n - - 4 - (4' - sec -))
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 (2 - - 4 -))
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 (2 - - 4 - (4' - sec -))
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(2 - n - - 4 - (4' - tert -))

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(2 - - 4 - (4' - tert -))

" 7| , .

(2,4 - - tert -)

(2,6 - - tert -)

(3,5 - - tert -)

(2,6 - - sec -)

(2,4 - -)

(2,3 - -)

(2,5 - -)

(2,6 - -)

(3,4 - -)

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(2 -)

(3 -)

(4 -)

(2 -)

(3 -)

(4 -)

(2 - sec -)

(2 - tert -)

(3 - tert -)

(4 - sec -)

(4 - tert -)

(2 - - 5 -)

(4 - - 3 -)

(5 - - 2 -)

(5 - - 3 -)

(2,4 - - (2 - - 2 -))

(2,6 - - - tert - - - 4 -)

(4 -)

(1 -)

(2 -)

(2 -)

(tert -)

(N -)

(2 - tert -)

(tert -)

$$(- - -)$$

|| 가 |
III 가 , X ,

	X		III	가
,	,	X	III	가
,	,	X	III	가
100:1	10^{-4} :1	1:1	10^{-2} :1	
II 가		가		X
III 가		가	X	가
X	X	10 g:1 μ mol	10^{-2} g:1 μ mol	
100:1	10^{-4} :1,	(가	가
		1:1	10^{-2} :1)
		- 40	110	, - 10

Figure 1 is a scatter plot with a linear regression line. The x-axis is labeled "Al" and has values 0.1, 5, 0, 100, 0, 100, 0.1, and 24. The y-axis is labeled "mmol/m³" and has values 10^{-8} , 10^{-7} , 10^{-6} , 10^{-5} , 10^{-4} , 10^{-3} , and 10^{-2} . The data points show a strong positive linear correlation.

Al (kg/m³)	mmol/m³
0.1	10^{-8}
5	10^{-7}
0	10^{-6}
100	10^{-5}
0	10^{-4}
100	10^{-3}
0.1	10^{-2}
24	10^{-2}

, , , , , .
가 .
(main) , (group)

(Schlenk)
(desiccant)

1: ()

I 2.1 g (RT) 가 1 () 2M, 20 mmol) 10 ml (10 mmol) 15 40 ml - 10 , 50 m - 10 1 G4 (0.1M)

2: [()]

I 6.92 g (2M, 10 mmol) 5 ml 45 ml . - 10 , 50 m
 0.5 () (20 mmol) 15 가 . - 10
 . , (RT) 가 1 . G4
 . , [()] (AI 0.1M)

2A: [()]

6.92 g ((2M, 10 mmol) 5 ml 45 ml . 25 , 50 ml
 () (20 mmol) 15 . 가 . 25 1
 G4 . , ([()
] (Al 0.1M) .

3: () ()

I 6.92 g (2M, 10 mmol) 5 ml 40 ml . - 10 , 50 m
 15 () (20 mmol) 5.12 g () (10 mmol)
 가 . - 10 0.5 , (RT) 가 1
 .
 G4 . ,

4: ()

SiO₂ (PQ MS3030, 10 mbar, 10 0, 140) 2 g 30 ml N,N -
 0.6 ml 가 0, 1, 50 ml
 가 . , 3 . , , , 3.3 g

5: [()]

SiO₂ (PQ MS3030, 10 mbar, 10 , 140) 2 g 30 ml N,N -
 0.48 ml 가 0 , 2 40 ml
 가 . , 3 . , , , 4.01 g

6·3

SiO_2 (PQ MS3030, 10 mbar, 10 °C, 140 °C) 2 g 30 ml N,N-
0.48 ml 가 0 , 3 40 ml
가 . , 3 . , , , 4.5 g

7-1

4 (10 μ mol) 0.01 ml 가 . 1 , 3 ml 5.8 mg , (2 - - 4 -) (TMA)(2 M, 20 μ mol) 0.5 g 가 .

8; 2

ol) TMA(5 ml 7 mg 2M, 40 μ mol) 0.02 ml 40 . , 5 (10 μ m
g 가 . 1 , . 0.44

9; 3

6 0.2 g 3 ml 3.3 mg (2 -
) (5 μmol) 가 . 1 , - 4 - (4' - tert

10: 1

2L
(TIBA)(20%) 3 ml 가 , 15 1.5L
1 20 ml 15 ml . 60
가 , 1 (PP) 160 g

28 kg PP/ g x h

11: 2

12: 3

2L
) 3 ml 가 , 15 , 1.5L TIBA(20%
 , 15 ml . 60 가 , 3 20 ml 1
 . (PP) 145 g
44 kg PP/ q x h

(57)

1.

(a)

(b) 1

[1]

M¹ R¹ R² R³

R^1, R^2, R^3 , $C_1 - C_{20}$ -, $C_1 - C_{20}$ -, $C_6 - C_{40}$ -, C
 $_6 - C_{40}$ -, R^1, R^2, R^3 , $C_7 - C_{40}$ -, $C_7 - C_{40}$ -, R^1, R^2, R^3 , 2 , 3
 가 , , , , , , , , , , , , , , , , , , , ,
 , , , , , , , , , , , , , , , , , , , ,
 - N,N - , , , , , (p -) , , , , , , , , ,
 () , , () , , () , , () , , () , ,
 () , , () , , (n -) , , () , , () , ,
 , N,N - , N - - N - , N,N - () (2,4,6 -
 () , , () , , (i -) , , , , , , , , ,
)

(c) ,

(d) II 가

[II]

$$R_a^4 M^2 (-O - M^2 R_b^5)_c$$

$(, R^4, R^5$, R^5 , $C_1 - C_{40}$, $R^4 - OSiR_3$ (,
 M^2 , III , ,
 $a, b, c = 0, 1, 2, 3, a + b + c = 0$,)

2.

1 , (e) III 가 .

[III]

$$[M^3 R_d^6]_e$$

$(, M^3$, I, II, III , ,
 R^6 , $C_1 - C_{40}$,
 $d = 1, 3$,
 $e = 1, 4$,)

3.

1 2 , I R^1, R^2 R^3 , , 2 20
 / P, O, S N

4.

1 3 , 가

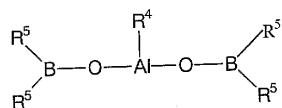
5.

1 4 , M^2 가 II 가

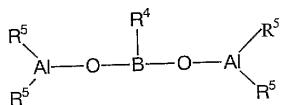
6.

1 5 , IV / V 가

[IV]



[V]



(, R^4 R^5 , , , $C_1 - C_{40}$, R^4 - $OSiR_3$
 , R , R^5)

7.

a)

,

b) I

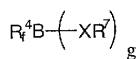
[I]

 $M^1 R^1 R^2 R^3$ (, M^1 V ,

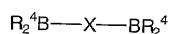
(c)

(d) VI / VII / VIII
가

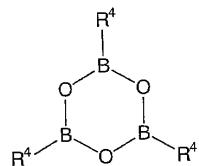
[VI]



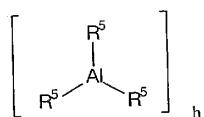
[VII]



[VIII]



[IX]



(, R⁷ , C₁ - C₄₀ , C₁ - C₂₀ - , C₆ - C₂₀ - , C₇ - C₄₀ -
 C₇ - C₄₀ - , R⁴ R⁵ , R⁵ , C₁ - C₄₀ , R⁴ - OSiR₃ (,
 R X VI NR , R C₁ - C₂₀ - , C₁ - C₂₀ - , C₁ - C₂₀ - ,
 f 0 3 , f + g 0 ,
 g 0 3 ,
 h 1 10)

8.

1 7

9.

1 7