

KISTI

(2002.11)

*

(KISTI)

가

(3 , 4)

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3

1.

1.1

1.2 PM

1.2.1

1.2.2

1.2.3

1.3

1.3.1

1.3.2

2.

2.1

2.2 PM

2.2.1

2.2.2

2.2.3

2.3

2.3.1

2.3.2

4

< 3- 1>

< 3- 2>

< 3- 3>

< 3- 4> 5,552,469 /

< 3- 5> Amcol International Corp.

< 3- 6> Magnetic Nanocomposite

< 3- 7>

- < 3- 1>
- < 3- 2>
- < 3- 3>
- < 3- 4>
- < 3- 5>
- < 3- 6>
- < 3- 7>
- < 3- 8> Nanocomposite
- < 3- 9> 5
- < 3- 10> 3
- < 3- 11>
- < 3- 12> -
- < 3- 13>
- < 3- 14>
- < 3- 15>
- < 3- 16>
- < 3- 17> Diamond- like Nanocomposite

3

(Patent Map)

가

가

, Nanocomposite)

(KIPASS)

(www.delphion.com)

(PIAS 2.1)

1.

1.1

2002.10.09

가

DB

“ *”(

* wildcard

)

78

(PIAS)

/ PM

2

가

78

30

(IPC)가

1.2 PM

가

, , , , , , , , ,

가

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1.2.1

, .

< 3- 1 >



3-1

, 1990

(membrane)

1999

가

가 . 5

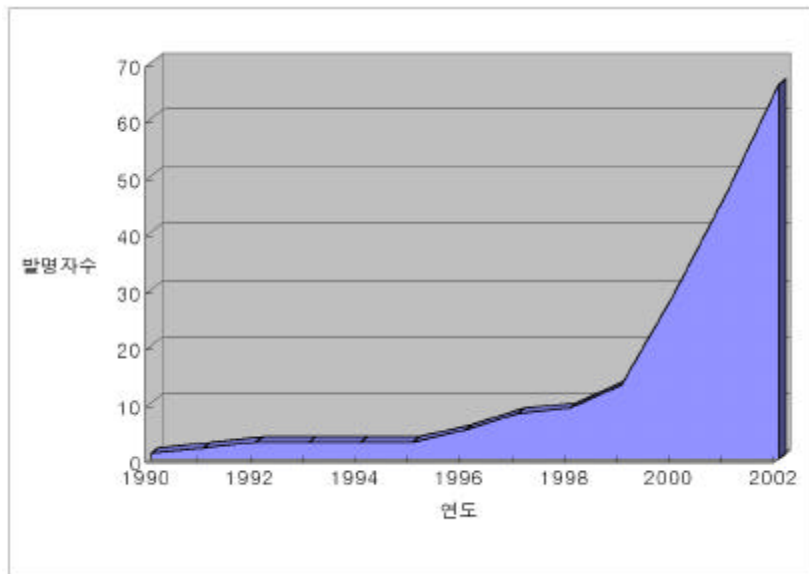
, , , , , , , , ,

가 가 3

2001

가 , 1996 가 가 가

< 3-2 >

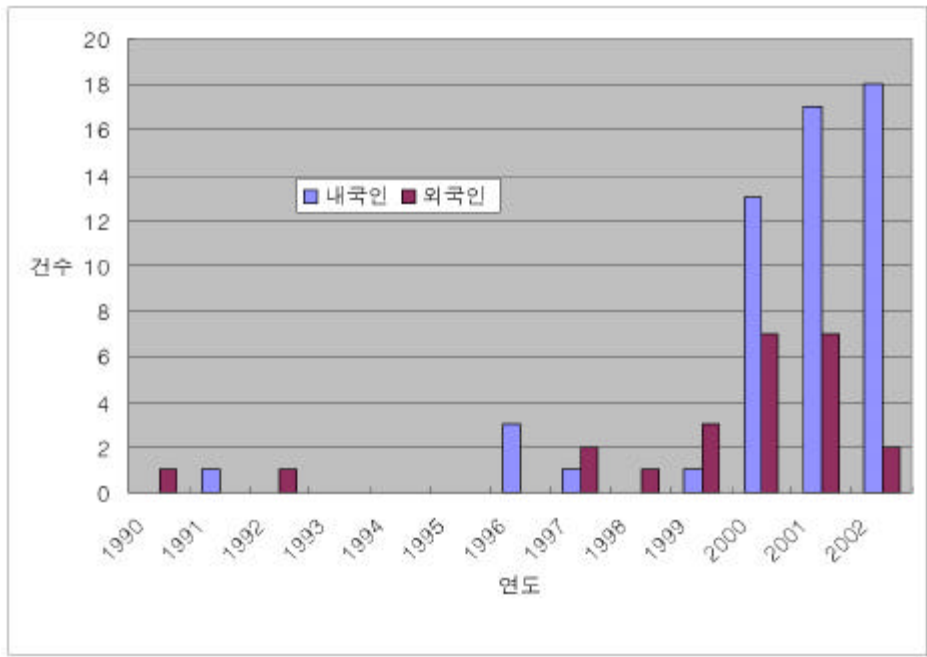


78 , 54 , 24

70% . 1999

가 가 Clay

< 3-3 >



1.2.2

, 9% 8%
6% , ,
44%
/가 가

()

가

가

1.2.3

, 1997

C08

가

C04

1991

1996

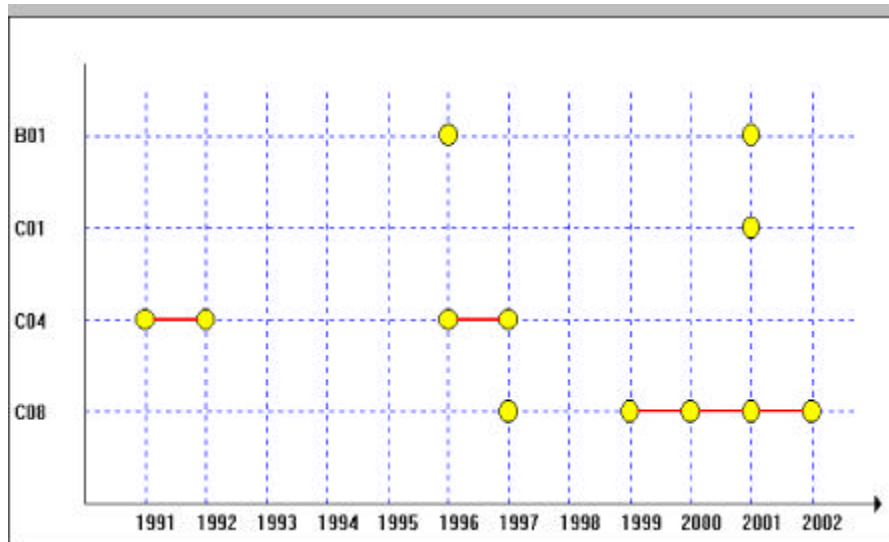
3-7

1

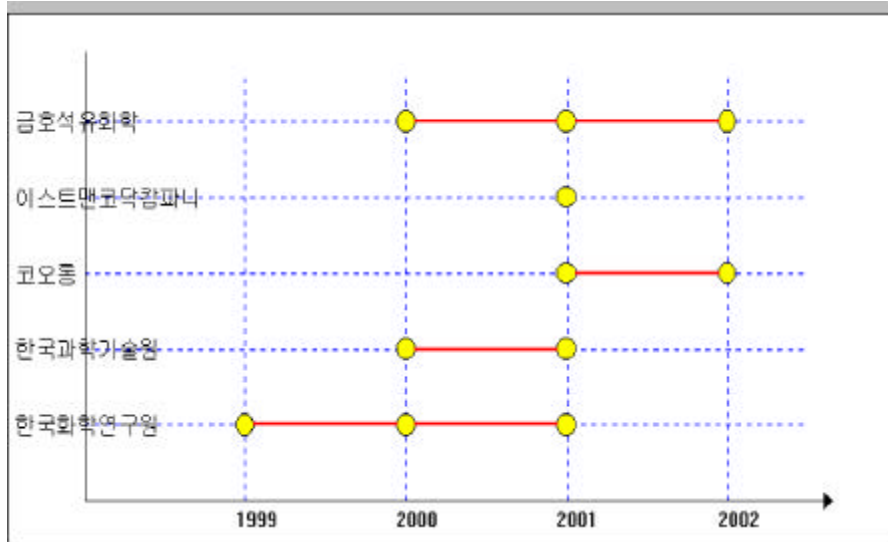
2001

6

< 3- 6 >



< 3-7 >



78 , 가
가
30

1.3

Clay , 가
가

1.3.1

(equivalent

spherical diameter) 2 μ m

(platelet)

가

(phyllosilicate)

(smectite)(

(vermiculite)

()

(Beall)

5,552,469

가 ()

(/ / /)

)

5,760,121

(intercalate)

5,910,523

(a),

(stack)

(b),

-

(c)

-

-

(d)

2002-25973)

2001-24924 , 2001-101734)

(

,

(

가

.

1.3.2

,

가

,

(intercalated nanocomposite)

(exfoliated nanocomposite)

가 , (aspect ratio : 50
0 1000) 가 2:1 (smectite)
1nm ,
가 Na⁺
가 Na⁺ Ca²⁺
가 1nm , 6 18
(,)
, Na⁺
가 2 3nm 가 ,
가 .
, ,
, 가 , , ,
가 . 1987
Toyota 6
가 100 가
가 가
가 .
가 ,
가 ,

· , , ,

,

1997

Toyota

가

· Toyota

, 가

가

· 가 ,

6

가

가

Na-

· Clay

, 가 .

3-1

· Clay, MMT

Layered Silicate

,

. 30

6

,

Toyota,

.

< 3- 1>

10-1997-7006328			100A 가 가 가
10-2001-12708		가	100g 30 ~ 250meq. ,
10-2001-76519	/		가
10-2001-77251			
10-2001-100279			
10-2001-33981		가	
10-2002-19693			, 가
10-2002-50493			
10-2002-50892			

2.

2.1

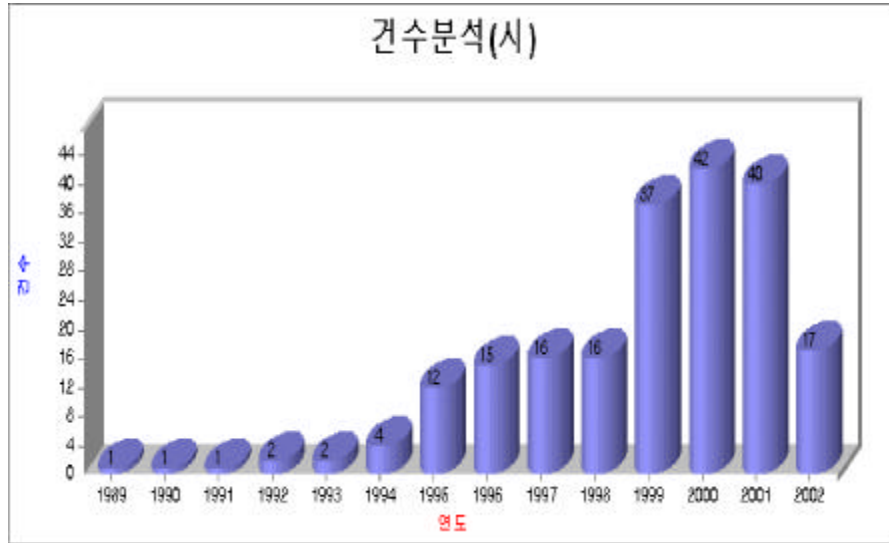
2002.11.5
(www.delphion.com) . Title,
Abstract Claims Field “nanocomposite” 206
가 (PIAS) / PM

2.2 PM

2.2.1

Nanocomposite , 1995
가 1998 가, 1999
2 . 2000
 , 가
2002 17
2002 11

< 3- 8> Nanocomposite



가 274

, 23 , 7 2

3-9 , 5

Amcol International Corp(20), Xerox Corp.(10), Eastman Kodak Co.(7), Eastman Chemical Co.(5), Institut fur Neue Materialien gem. GmbH(5) 3

3-10 Amcol polymer/ clay nanocomposite

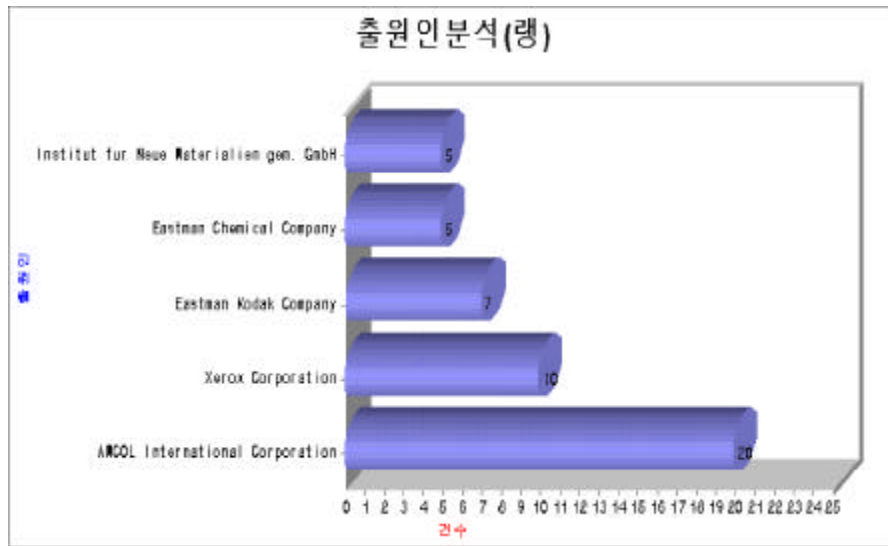
, Xerox mica-type nanocomposite

ferrofluids suspension of nanocomposite

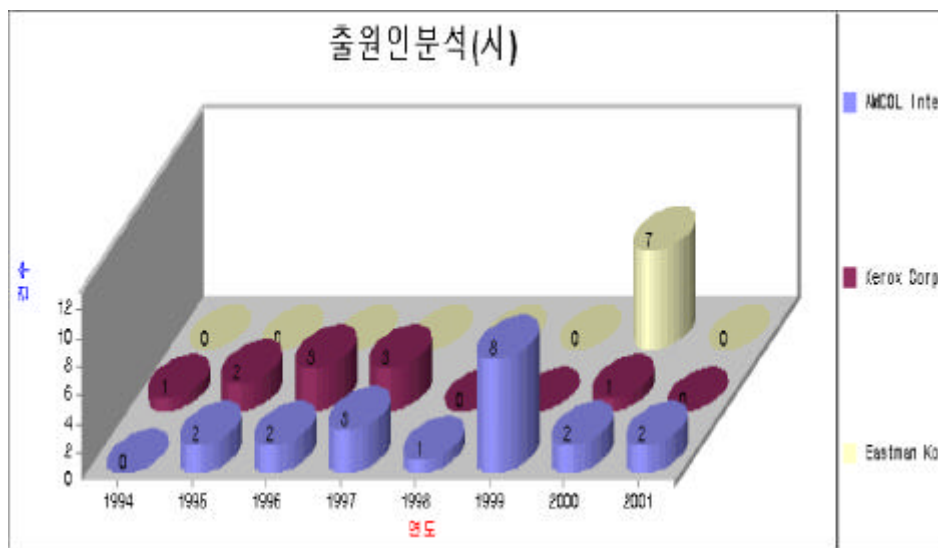
. Eastman Kodak 2000

가 polymer nanocomposite 7 .

< 3- 9> 5



< 3- 10> 3



3-2

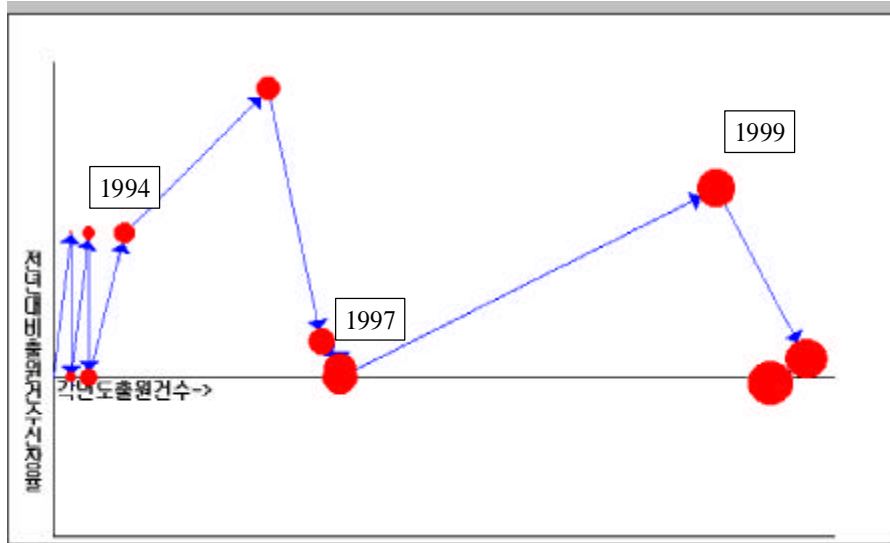
Beall, Gary W.; Lan, Tie; Border, John, Lan, Tie
 Amcol International Corp. Eastman Chemical Co.

Beall, Gary W.	Amcol International Corp.	1995-1999	8
Border, John	Eastman Kodak Co.	2000-2000	5
	None	2002-2002	2
Lan, Tie	Amcol International Corp.	1999-2001	11
	Eastman Chemical Co.	1999-1999	1
	None	2000-2001	4
McGovern, Michael R.	Eastman Kodak Co.	2000-2000	5
	None	2000-2002	2
Ziolo, Ronald F.	Xerox Corp.	1995-1997	7

2.2.2

, , , ,
 X Y
 (-)/
 () .

< 3- 11 >



가

1994

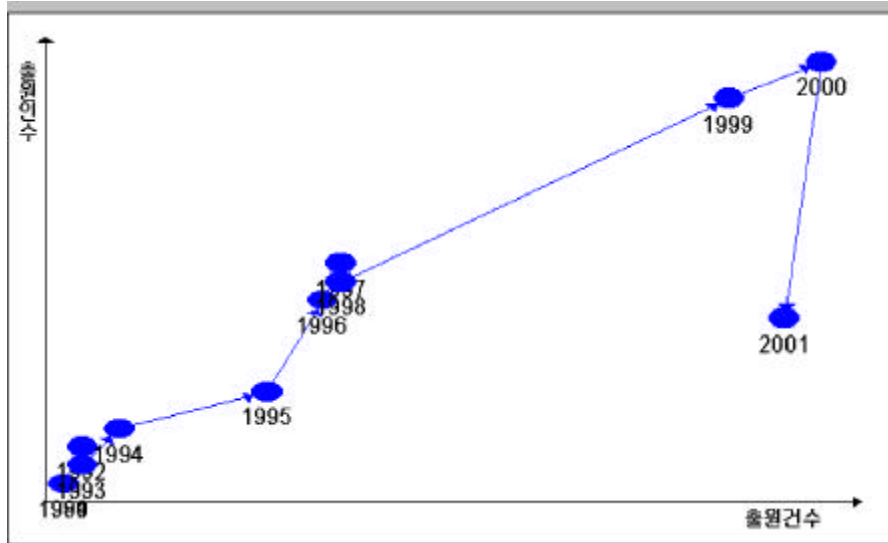
. 1997

가

1999

3-12

, 2001

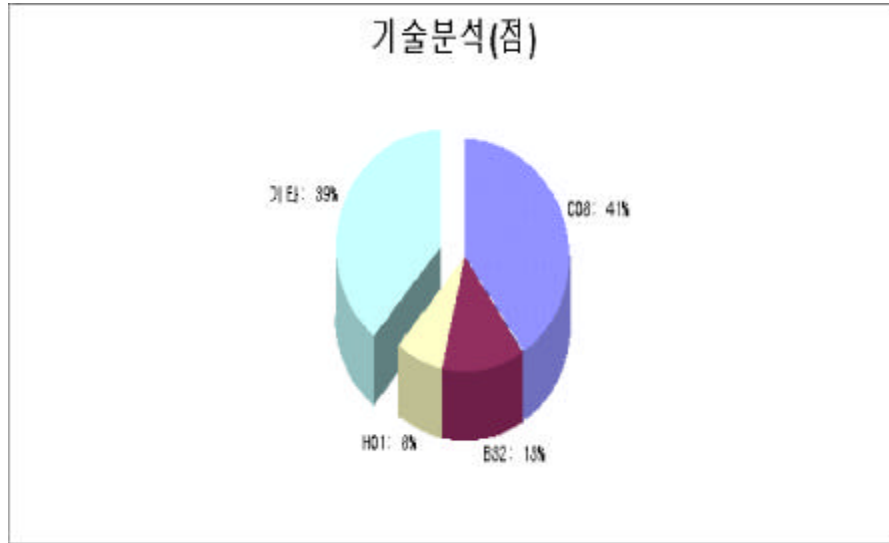


2.2.3

Nanocomposite

(IPC)

, C08 가 41% 가
 B32 가 13%, H01 가 8% .
 B05, B01, G01, C04, A61, C01, B29가
 , 가
 . IPC “ (6)”



C08 C08K, C08J, C08L, C08F, C08G, C08C

, C08K가 가
Clay Amcol Internaional Corp.가
C08F C08G

10

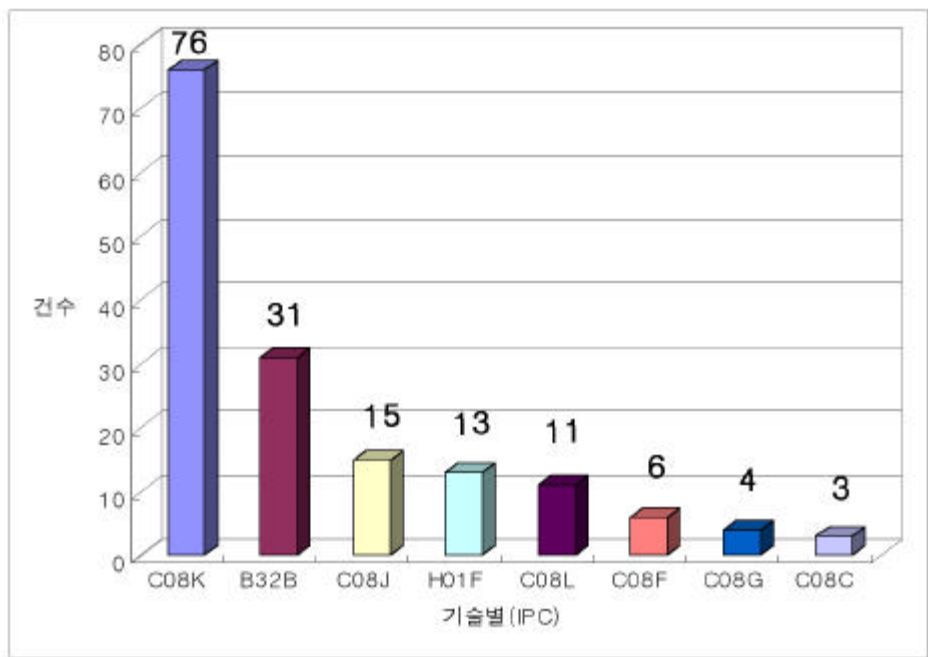
. B32B

polymer/ clay nanocomposite, Fuser member of electrostatographic printing,
Organic/ inorganic nanocomposite, Oxygen barrier laminate of liquid
packing, thermoplastic film structure, Diamond-like nanocomposite coating

H01F

, Sumitomo Special Metals Co.

< 3- 14>



1

가 2 IPC

< 3-3 >

IPC	C08	B32	H01	B05	B01	G01	C04	A61	C01	B29
C08	97	4	0	0	2	1	0	2	1	1
B32	4	31	0	2	0	0	0	0	0	5
H01	0	0	18	0	0	1	0	0	0	0
B05	0	2	0	10	0	0	0	0	0	0
B01	2	0	0	0	7	0	0	0	0	0
G01	1	0	1	0	0	7	0	0	0	0
C04	0	0	0	0	0	0	6	0	0	0
A61	2	0	0	0	0	0	0	5	0	0
C01	1	0	0	0	0	0	0	0	5	0
B29	1	5	0	0	0	0	0	0	0	5

3-3 C04

가 0

가

C08

B32가 4 , B01 2 , A61 2 , B29가 1

IPC

가

. B32 C08가 4 , B05가 2 , B29가 5

1990

가

가

3-15

가

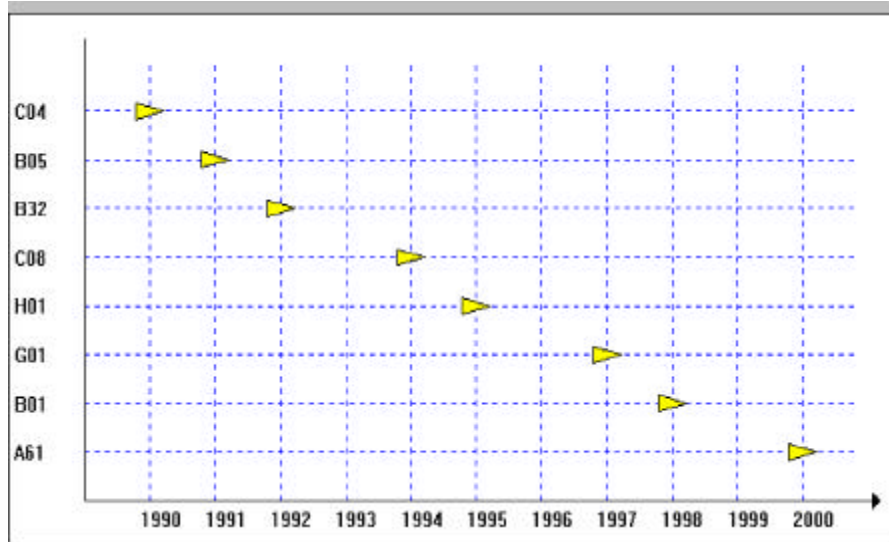
. 가

Silicated Polymer Nanocomposite(C08) 1994

가

(C04) 1990

< 3- 15 >



, clay

가

4

1994

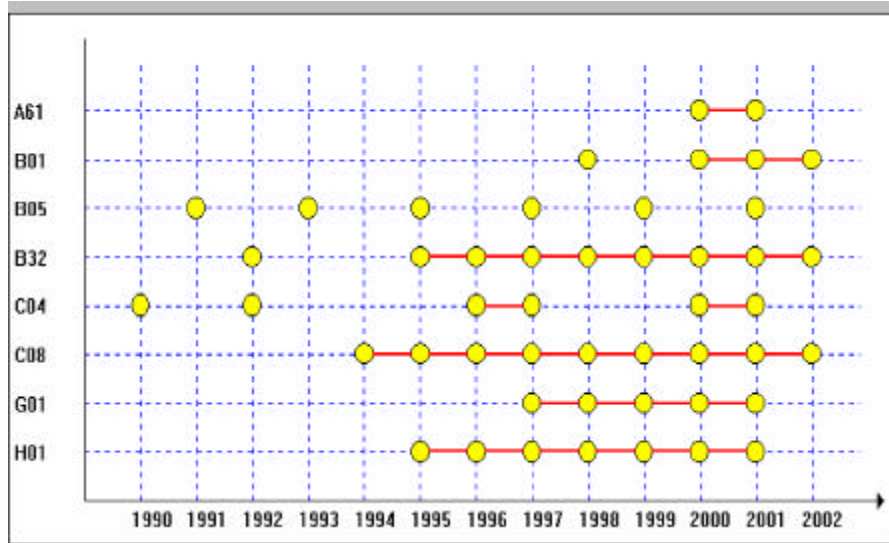
가

, 1995

(H01)

(B01)

(A61)



2.3

가

가

2.3.1

(1) Polymer/ Clay Nanocomposite

Polymer/ clay nanocomposite

가 Amcol International Corp.

Intercalates/ Exfoliates

US 5,552,469

Xerox Corp mica-type layered silicate

, AlliedSignal Inc. organo metallic exfoliated particulate

Southern Clay Claytec

Inc가

Amcol

< 3- 4> 5,552,469 /

Amcol International Corp.	22	-
Eastman Chemcial Co.	6	-
Hoechst Trespaphan GmbH	5	-
PPG Industries Inc.	3	-
Eastman Kodak Co.	3	-
Xerox Corporation	2	-
Claytec, Inc.	2	-
General Electric Co.	2	-
Southern Clay Products	1	-
Dow Chemical Co.	1	-
Triton Systems, Inc.	1	-
Toyota	-	6
Ube Industries Ltd.	-	5
W.R. Grace & Co.-Conn	-	2
E.C.C. America Inc.	-	2
American Colloid Co.	-	2
Cornell Research Foundation Inc.	-	2
Standard Oil Co.	-	2
AlliedSignal Inc.	-	1

US 5,552,469 63 ,
Amcol International Corp.가 22 Eastman Chemical
Co., Hoechst Trespaphan GmbH / 가
 , Amcol
 . 33
Toyota 6 , Ube Industries Ltd.가 5 ,
 . Layered silicate Clay
 .

< 3- 5> Amcol International Corp.

Patent Number	Publication Date	Title
US6462122	10/ 08/ 2002	Intercalates formed with polypropylene/ maleic anhydride-modified polypropylene intercalants
US6407155	06/ 18/ 2002	Intercalates formed via coupling agent-reaction and onium ion-intercalation pre-treatment of layered material for polymer intercalation
US6391449	05/ 21/ 2002	Polymer/ clay intercalates, exfoliates, and nanocomposites comprising a clay mixture and a process for making same
US6376591	04/ 23/ 2002	High barrier amorphous polyamide-clay intercalates, exfoliates, and nanocomposite and a process for preparing same
US6262162	07/ 17/ 2001	Layered compositions with multi-charged onium ions as exchange cations, and their application to prepare monomer, oligomer, and polymer intercalates and nanocomposites prepared with the layered compositions of the intercalates
US6232388	05/ 15/ 2001	Intercalates formed by co-intercalation of onium ion spacing/ coupling agents and monomer, oligomer or polymer MXD6 nylon intercalants and nanocomposites prepared with the intercalates
US5849830	12/ 15/ 1998	Intercalates and exfoliates formed with N-alkenyl amides and/ or acrylate-functional pyrrolidone and allylic monomers, oligomers and copolymers and composite materials containing same
US5844032	12/ 01/ 1998	Intercalates and exfoliates formed with non-EVOH monomers, oligomers and polymers; and EVOH composite materials containing same
US5698624	12/ 16/ 1997	Exfoliated layered materials and nanocomposites comprising matrix polymers and said exfoliated layered materials formed with water-insoluble oligomers and polymers
US5552469	09/ 03/ 1996	Intercalates and exfoliates formed with oligomers and polymers and composite materials containing same

(2) Magnetic Nanocomposite

60% 가

10

가

0 1

가

가

가

가

가

가

가

가

Nebraska

Mingjun Yu

8-20

-

가

가

가

가

100 Gigabit

가

10

가

Sumitomo Special

Metals Co., Santoku Corp., Shin-Etsu Chemical Co., Ltd.

(14T

)

Fe-B-Nb-(Cu)

6m

가

가 5nm

bcc-Fe

가

Fe-Nb-B-N

< 3- 6> Magnetic Nanocomposite

Patent Number	Assignee	Title
US6261385	Shin-Etsu Chemical Co., Ltd.	Magnetically anisotropic rare earth-based nanocomposite permanent magnet
US6471786	Sumitomo Special Metals Co.	Method for preparing nanocomposite magnet powder and method for producing nanocomposite magnet
US6302972	Sumitomo Special Metals Co.	Nanocomposite magnet material and method for producing nanocomposite magnet
US6352599	Santoku Corporation	High performance iron-rare earth-boron-refractory-cobalt nanocomposite
US6332933	Santoku Corporation	Iron-rare earth-boron-refractory metal magnetic nanocomposites

(3)

, dendrimer (Silver)
 (6,224,898 ,
 2000-22012 A1), nanostructured ceramic
 (6,270,347 , 2002-115742A1)

(4)

(DLC) 가

가

가

(Diamond-like nanocomposite)
Refractory Technologies, Inc.가

Advanced

5,786,068 , 5,718,976 , 5,728,465

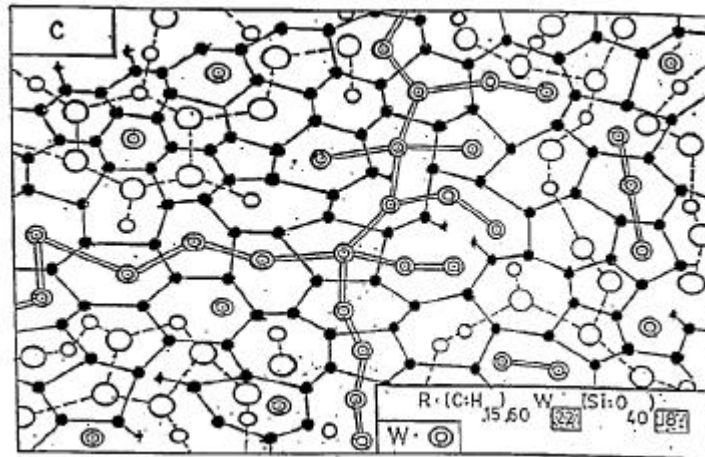
1998

(

99-63955)

가

< 3- 17> Diamond- like Nanocomposite



2.3.2

Polymer/ Clay Nanocomposite가 가

Amcol

Internaional Corp.

Claytec Inc.

AlliedSignal

Inc.

가

가

1

3-7

US6017632	Claytec, Inc., East Lansing, MI	1. A hybrid organic-inorganic composite material containing a cured polymer and particles of a layered inorganic composition having galleries between the layers, the galleries containing the cured polymer, wherein the layered inorganic composition has cation exchange sites occupied by H+ protons and a remainder of the sites being occupied by inorganic ions other than the H+ protons which sites are protonated prior to curing of the polymer, wherein the ratio by weight of cured polymer to the layered inorganic composition is between about 200:1 and 1:100 and wherein an average separation between the layers corresponds to a height of the galleries of about 0.4 to 300 nm.
US5514734	AlliedSignal Inc., Morris Township, Morris County, NJ	1. A composite material comprising a polymer matrix comprising a polymer, said matrix having layered or fibrillar particles uniformly dispersed therein, wherein the interlayer or interfibril distances is equal to or greater than about 50 A, the average thickness of said platelet particles is equal to or less than about 50 A where the maximum thickness is equal to or less than about 100 A and the average diameter of said fibrils is equal to or less than about 100 A where the maximum diameter is equal to or less than about 200 A, wherein the length to diameter ratio of said fibril is equal to or greater than about 10 to about 1, said particles having organo metallic species bonded thereto, said bonded species selected from the group consisting of organo silanes, organo titanates, and organo zirconates and having one or more moieties bonded to at least one polymer in said polymer matrix, or said bonded species having one or more moieties which promote intermingling with at least one polymer in said polymer matrix or a combination of said species.
US6262162	AMCOL International Corporation, Arlington Heights, IL	1. A surface-modified smectite clay comprising stacked layers of smectite clay silicate platelets having at the platelet internal surfaces, a multi-charged onium ion selected from the group consisting of di-ammonium , di-sulfonium, di-oxonium; ammonium/phosphonium; ammonium/ sulfonium; ammonium/ oxonium; phosphonium/ -sulfonium; phosphonium/ oxonium; sulfonium/ oxonium; and mixtures thereof, intercalated and ion-exchanged in place of multiple interlayer cations.
US2001- 0848965 ()	Southern Clay Products, Inc.	1. In the method for preparing a nanocomposite by the steps of intercalating a smectite clay with a quaternary ammonium ion , and exfoliating the intercalated clay into a polymer matrix; the improvement enabling augmented exfoliation, comprising: edge treating the smectite clay with negatively charged organic molecules prior to said exfoliation.

0272279) smectite clay .
Southern Clay Products, Inc. 2001.5.4 2001-0848965

1
smectite clay with
ammonium ion intercalating .

Amcol International Corp.

가 가

Southern Clay vs. United

Catalysts , 가
. Southern Clay가 4,664,842
claim 가 United

Catalysts Southern Clay 가 “ Organoclays” 2
(4,664,842 , 5,110,501) \$78,000,000

Southern Clay . Issue가
4,664,842 1985 9 3 1987 5 12

“ Process for manufacturing organoclays
having enhanced properties ” smectite-type clay alkyl
oganophilic clays gelling properties

Southern Clay organoclay
(5,663,111 , 5,780,376),
bentonite (5,266,538 , 5,391,228)

Southern Clay

가

(,

organoclay)

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가

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, 가

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21

(NT)

(BT),

(IT)

가

가

가

가

가

(OLS)

polymer

Nano

가

Amcol International Corp.

가

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 , 10
,
, , 2001 2000
84% 가 2 2700
. " "
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가 , ,
. 가
, 가
가 . 가
/ , / , / ,
가
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1. , “ ”, 2002.12.
2. , “ 가 ”, 2001
3. , (IPC) CD 7 6
4. 野中, , , 49, 11, 2001
5. , “Polymer nanocomposite ”,
()
6. , “ ”, 273 ,
2002.4.
7. K.Yasue, S.Katahira, M.Yoshikawa, “In Situ Polymerization Route to Nylon 6-Clay nanocomposites”, 1997
8. Alivisatos, A. P., Science 1996, 271, p933.
9. Chawla, K. K., Composite materials, Springer-verlag, New york, 1987.
10. Chen, C.-C., Herhold, A. B., Johnson, C. S., Alivisatos, A. P., Science 1997, 276, p398.
11. C. W. Francis, "Adsorption of Polyvinylpyrrolidone on Reference Clay Minerals", Soil Science, vol. 115, No. 1, 1973, pp. 40-54.
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13. Y. Kojima, et al., "Mechanical Properties of Nylon 6-Clay Hybrid", J. Mater. Res., vol. 8, No. 5, May 1993, pp. 1185-1189.
14. K. Suzuki, et al., "Preparation Of Delaminated Clay Having A Narrow Micropore Distribution In The Presence Of Hydroxyaluminum Cations And Polyvinyl Alcohol", Clays And Clay Minerals, vol. 36, No. 2, 1988, pp. 147-152.
15. R. Levy, et al., "Interlayer Adsorption of Polyvinylpyrrolidone On Montmorillonite", Journal of Colloid And Interface Science, vol. 50, No. 3, Mar. 1975, pp. 442-450.
16. A. Usuki, et al., "Swelling Behavior Of Montmorillonite Cation

- Exchanged For .omega.-Amino Acids by .epsilon.-Caprolactam", J. Mater. Res., vol. 8, No. 5, May 1993, pp. 1174-1178.
17. Y. Kojima, et al., "One-Pot Synthesis of Nylon 6-Clay Hybrid", Journal of Polymer Science: Part A: Polymer Chemistry, vol. 31, (1993), pp. 1755-1758.
 18. Y. Kojima, et al., "Fine Structure of Nylon-6-Clay Hybrid", Journal of Polymer Science: Part B: Polymer Physics, vol. 32 (1994), pp. 625-630.
 19. B. K. G. Theng, "Clay-Polymer interactions: Summary And Perspectives", Clays and Clay Minerals, vol. 30, No. 1 (1982) pp. 1-9.
 20. Yu, M., Liu, Y., Moser, A., Weller, D. & Sellmyer, D.J. Applied Physics Letters 75, 3992-3994 (1999).
 21. <http://www.freechal.com/nano>
 22. <http://www.nanonet.info>
 23. <http://www.nanotechkorea.com>
 24. <http://www.kisti.re.kr>
 25. http://sms.kaist.ac.kr/bk21/proposal/section/ko_sec9.html