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(73) ( ) 129-11 13

(72) 34 106 307

1 108 1303

27가236 201 308

60 103 601

(74)

:

(54) ,

가

1

1

2

< 10... 11... 12... >  
 12a... 14... 가 15a, 15b...  
 16a, 16b.... 17.. 18...  
 19... 20...

가

가

가

가

가

[poly(ethylene):PE],

[poly(propylene):PP]

PE/PP, PP/PE/PP

[poly(vinylidene fluoride);PVDF]

[poly(vinylidene fluoride)-co-(hexafluoropropylene);P(VDF-HFP)]

[poly (acrylonitrile);PAN] , (phase inversion) ,

[poly(ethylene oxide);PEO] , [acr

ylate] king) , (hot melting) PVDF (Bellcore) [ , (Te

king) , (hot melting) PVDF (Bellcore) [ , (Te

king) , (hot melting) PVDF (Bellcore) [ , (Te

king) , (hot melting) PVDF (Bellcore) [ , (Te

king) , (hot melting) PVDF (Bellcore) [ , (Te

king) , (hot melting) PVDF (Bellcore) [ , (Te

king) , (hot melting) PVDF (Bellcore) [ , (Te

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king) , (hot melting) PVDF (Bellcore) [ , (Te

king) , (hot melting) PVDF (Bellcore) [ , (Te

PVDF 5,681,357 5,688,293 5,716,421 가  
 가  
 5,853,916 PVDF 가  
 2000-0077418 (PE) / (PE/PP) 2  
 WO 99/54953 n- (NMP;n-methyl pyrrolidone) (LiPF<sub>6</sub>; lithiumphosphohexafluoride) (PEO;polyethylene oxide) (PVDF;polyvinylidene fluoride) (PP) PP/PE/PP (PMMA;polymethyl methacrylate)  
 PVDF 가 가  
 가  
 (electrospinning membrane) 가 0.005 ~ 3 $\mu$ m 30 ~ 80% 가 700kg/cm<sup>2</sup> 가 150kg/cm<sup>2</sup> (MFPS)가 0.01 ~ 3 $\mu$ m 60 ~ 95%가 50 ~ 2,000nm 가 0.01 ~ 1.5 $\mu$ m 가 100kg/cm<sup>2</sup> 40% 가 1,000kg/cm<sup>2</sup> 5 ~ 70 $\mu$ m / (a) 가 0.005 ~ 3 $\mu$ m 30 ~ 80% 가 700kg/cm<sup>2</sup> 가 150kg/cm<sup>2</sup> 5 ~ 50 $\mu$ m ; (b) 가 50 ~ 2,000nm (electrospinning) (MFPS)가 0.01 ~ 2 $\mu$ m 가 60 ~ 95% (c) (b) 가 (separator) (puncture) 가 가 가

(shut down)

(90~120 )

가 , PP/PE/PP , PE

PE , PP , PE/PP 2 , PP/PE/PP 3 , PE PP

PE , PE/PP 2 , PP/PE/PP 3

1,146,577 , 6,

368,742 , 5,691,077 , 6,180,280 , 5,667,911 , 6,080,507

PE/PP ) (Asahi Kasaei Hipore Celgard Celgard (PE , PP , PP/ (PE), Entek International Teklon (PE) (PE), Tonen/ExxonMobil Setela

5 ~ 50μm, (porosity, ) [ (

porosity(%))=1-( / )x100] 30 ~ 80%

(MD) 700kg/cm<sup>2</sup> , (CD) 150kg/cm<sup>2</sup> , (mil, 1mil=25.4μm) 200g , 100 1 10% , 0.005 ~ 3μm 130 ~ 185 10,0 00 -cm<sup>2</sup>

[poly(vinylidene fluoride); PVDF], [poly(vinylidene)-co-(hexafluoropropylene); P(VDF-H FP)], [poly(acrylonitrile); PAN], [poly(ethylene oxide); PEO], [poly(urethane); PU], [poly(methylacrylate)], [poly(methyl methacrylate); PMMA], [poly(acrylamide); PAA], [poly(vinyl chloride); PVC], [poly(vinylacetate); PVAc], [poly(vinylpyrrolidone)], (polytetraethylene glycol diacrylate), [acrylate] (electrospinning electrostatic spinning) (SiO<sub>2</sub>), (TiO<sub>2</sub>), (Al<sub>2</sub>O<sub>3</sub>), BaTiO<sub>3</sub>, LiO<sub>2</sub>, LiF, LiOH, LiN, BaO, Na<sub>2</sub>O, MgO, Li<sub>2</sub>CO<sub>3</sub>, LiAlO<sub>3</sub>, PTFE, 20%

([J.M.Deitzel, J.D.Kleinmeyer, J.K.Hirvonen, N. C.Beck Tan, Polymer 42 , 8163-8170(2001)], [J.M.Deitzel, J.D.Kleinmeyer, D.Harris, N.C.Beck Tan, Polymer 42 , 261-272(2001)], [Y.M.Shin, M.M.Hohman, M.P.Brenner, G.C.Rutledge, Polymer 42 , 9955-9967(2001)]).

[(+)] [(-)] 가

가

, (+) (-)

[P.K. Baumgarten, Journal of Colloid and Interface Science, Vol. 36, No. 1, 71(1971); G.Taylor, Proc. Roy. Soc. London A, 313, 453(1969); D.H. Reneker, A.L. Yarine, H. Fong, and S. Koombhongse, J Applied Physics, 876(190, 909(2000); J. Doshi and D.H. Reneker, J. Electrostatics, 35, 151(1995)].

가 10-2002-48594

1

가

(10);

가

(12a) 가 (14);

(12);

가

가

가

(15a, 15b);

가 (17);

(16a, 16b);

(18);

(19);

(20)

50가 1,500nm

50 2,000nm

(web

) 50μm 가 65 ~ 90% 60 ~ 95 (MFPS) 0.0  
% 1 ~ 3μm 가 가 0.05 ~ 2μm 가

(CD) 가 20kg/cm<sup>2</sup> 가 0.1~10kgf/cm 가 50kg/cm<sup>2</sup> 가 10  
~60% , 가 ,가 가 가

1 ~ 20

2~10

가

.가 가 0.1~30kgf/cm , ,가

3~30가

1cm

2

40%

가

3

3

가

5 ~ 70μm , 70μm

가 5μm

가

10 ~ 30μm

01 ~ 1.5μm

1000kg/cm<sup>2</sup>

100kg/cm<sup>2</sup>

0.

exafluoride), (LiPF<sub>6</sub>; lithiumphospho h  
afluoroborate), (LiClO<sub>4</sub>; lithiumperchlorate), (LiBF<sub>4</sub>; lithiumtetr  
(LiCF<sub>3</sub>SO<sub>3</sub>; lithiumtrifluoromethanesulfonate)  
arbonate, EC), (propylene carbonate, PC), (ethylene c  
(dimethyl carbonate, DMC), (diethyl carbonate, DEC),  
(dipropyl carbonate), (ethylmethyl carbonate, EMC), - (-butyr  
olactone),

가

가

가

1

0.2mm,

가 0.4mm, 20cm

10mm

6m

26mm

50KV, 3mA, (+) ] [DEL Global Technologies, : RLPS50-300P,  
3cm 가 20~40kv (+)  
0.4mm, 40mm

(6a, 6b)가 가 가  
1cm 1cm 5cm  
20cm (SUS 304)

1. (mean flow pore size;MFPS) automated capillary flow porometer[PMI(Porous Materials Inc.) , Model CFP- 1200AEL (CFP-34RTF8A-X-6-L4)]  
(wetting fluid) [galwick acid( 15.9dynes/cm)] 21mm  
wet-up/dry-up

2.SEM SEM(Spectroscan Leica Model 440) x10k x20k

3. (Instron Model 4201)

oad cell 2.5kg  
1

PP 25μm, 55%, 0.209x0.054μm,  
Gurley 9 , MD 1200kg/cm<sup>2</sup>, CD 115kg/cm<sup>2</sup>, 3%  
(Celgard , Celgard 2500)  
PVDF[poly(vinylidene fluoride)]  
, PVDF-HFP(88 %:12 %) [poly(vinylidene fluoride- co -hexafluoro propylene)] [Elf  
Atochem North America, Inc., Kynar Flex 2801: (Mn)=120,000, (Mw)=380,  
000, 1.77g/cc, 143 ] 가 7:3 (acetone) (DMAc) (Mw)=380,  
13 % 20μl/ , 가  
28kv ,

80%, MFPS 1μm 10μm 70~500nm,  
0.5kg/cm, 20cm/ PP 3 140 ,  
PP (GMP , : EXCEL AM-655Q)  
PP 33μm, 58%, 0.136μm, 2.65μm ,  
2

PP 25μm, 55%, 0.209x0.054μm,  
Gurley 9 , MD 1200kg/cm<sup>2</sup>, CD 115kg/cm<sup>2</sup>, 3%  
(Celgard , Celgard 2500)  
PVDF , 100% PVDF [Elf Ato  
chem North America, Inc., Kynar 761] 5:5 15  
% , PVDF-HFP(88mol%:12mol%) [poly(vinylidene fluoride- co -hexafluoro propylen  
e)] [Elf Atochem North America, Inc., Kynar Flex 2801: (Mn)=120,000,  
(Mw)=380,000, 1.77g/cc, 143 ] 13 %

1  
20cm , 20μl/ 가 100% PVDF  
28kv , 88% PVDF 21kv . 가 20cm .  
70~700nm , 가  
10μm  
PP ( ) 3 140 , 1  
kg/10cm, 20cm/ (GMP , : EXCEL AM-655Q) PVDF  
PP  
33μm, 60%, MFPS 0.136μm, 2.65μm , P  
3

Gurley 22, MD  
 (Celgard, PE 21μm, 43%, 0.110x0.054μm, 135  
 Celgard 2730) 1700kg/cm<sup>2</sup>, CD 120kg/cm<sup>2</sup>, 5%,  
 PVDF-HFP(88%:12%) [poly(vinylidene fluoride-co-hexafluoro propylene)]  
 [Elf Atochem North America, Inc., Kynar Flex 2801: (Mn)=120,000, (Mw)=  
 380,000, 1.77g/cc, 143 ] 4:6

2, PE (12) (SUS 304) (17)가  
 PE 20cm, PE 50μℓ/가, 28kv,  
 PE 10μm, PE 300~1,000nm,  
 0cm/ (GMP, : EXCEL AM-655Q) 120, 1kg/cm, 2  
 30μm, 45%, MFPS 0.304μm, 1.10μm, P  
 E  
 4

(PE)/ (PP)/ (PE)  
 25μm, 36%, 0.05x0.11μm, (MD) 5%(90, 60min),  
 Gurley 25, MD 1560kg/cm<sup>2</sup>(22kpsi), CD 135kg/cm<sup>2</sup>(2kpsi),  
 135 (PE)/165 (PP) (Celgard, Celgard 2300)  
 PVDF-HFP(88%:12%) [poly(vinylidene fluoride-co-hexafluoro propylene)]  
 [Elf Atochem North America, Inc., Kynar Flex 2801: (Mn)=120,000, (Mw)=  
 380,000, 1.77g/cc, 143 ] 4:6

3, PP/PE/PP 5mm  
 20μℓ/가, 28kv, 20cm  
 PP/PE/PP 300~700nm,  
 5μm  
 3, 1kg/cm, 20cm/ (GMP,  
 : EXCEL AM-655Q) PVDF  
 30μm, 37%, MFPS 0.127μm, 2.31μm, P  
 P/PE/PP  
 5

Gurley 22, MD  
 (Celgard, PE 21μm, 43%, 0.110x0.054μm, 135  
 Celgard 2730) 1700kg/cm<sup>2</sup>, CD 120kg/cm<sup>2</sup>, 5%,  
 PVDF-HFP(88%:12%) [poly(vinylidene fluoride-co-hexafluoro propylene)]  
 [Elf Atochem North America, Inc., Kynar Flex 2801: (Mn)=120,000, (Mw)=  
 380,000, 1.77g/cc, 143 ] 6:4

1, 50μℓ/가, 28kv,  
 20cm, 300~1,000nm, 10μm  
 PE, PE 100, 1kg/1  
 0cm, 20cm/ PE  
 23μm, 43%, MFPS 0.304μm, 1.10μm, P  
 E  
 6

2, PVDF-HFP PMMA[poly(methyl methacrylate), Mw=120,000]  
 8:2 PP  
 33μm, 60%, MFPS 0.136μm, 2.65μm

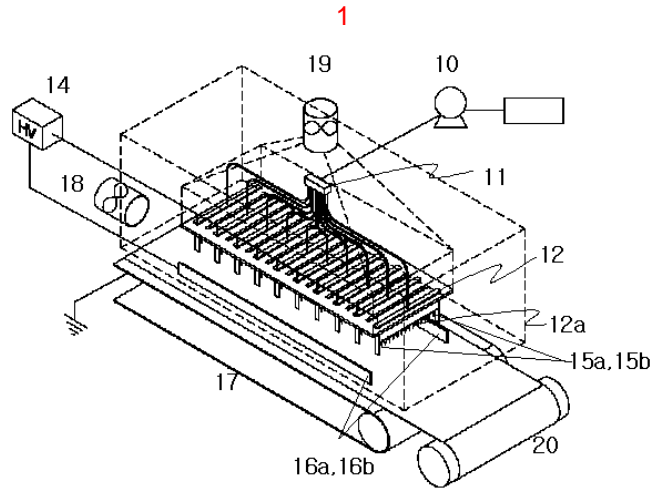




10.

(separator)

가 1



2

