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(KR)

(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] (solution cating) 가 (in-situ crosslinking)

(hot melting) PVDF

(Bellcore) [5,456,000 (Te 6,322,923

Icordia Technologies) (dibutyl phthalate;DBP)가 가 가 P(VDF-HFP)가

5,429,891 P(VDF-HFP) (trimethylolpropane trimethacrylate),

(glycerol trimethacrylate) 가

(trimethylolpropane triacrylate)

3 가 2002-0069601 PVDF P(VDF-HFP) 가 PET ,가

가 / /

가

가

가

,가 가

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) (LiPF₆; lithiumphosphohexafluoride) (PEO;polyethylene oxide) (PMMA;polyme
 (PVDF;polyvinylidene fluoride) (PP) PP/PE/PP thyl methacrylate)
 PVDF 가 가
 가
 가
 (electrospinning membrane) 가 0.005 ~ 3 μ m 30 ~ 80% 가 700kg/cm²
 가 150kg/cm² (MFPS)가 0.01 ~ 3 μ m 60 ~ 95%가 50 ~ 2,000nm
 40% 가 1,000kg/cm² 가 0.01 ~ 1.5 μ m 5
 ~ 70 μ m / 가 100kg/cm²
 가 0.005 ~ 3 μ m 30 ~ 80% 가 700kg/cm² (a) 가
 150kg/cm² 5 ~ 50 μ m ; (b)
 (가 50 μ m 50 ~ 2,000nm (electrospinning) (MFPS)가 0.01 ~ 2 μ m 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/cm² , (CD) 150kg/cm² , (mil, 1mil=25.4μm) 200g , 100 1 10% , 0.005 ~ 3μm 130 ~ 185 10,0

00 -cm²

[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) (SiO₂), (TiO₂), (Al₂O₃), BaTiO₃, LiO₂, LiF, LiOH, LiN, BaO, Na₂O, MgO, Li₂CO₃, LiAlO₃, 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)

(12);

가 (14);

가

가

가

(15a, 15b);

가 (17);

(16a, 16b);

(18);

(19);

(20)

50 가 1,500nm

50 2,000nm

(web

) 50μm 가

60 ~ 95 (MFPS) 0.0

% 1 ~ 3μm 65 ~ 90%

0.05 ~ 2μm 가

(CD) 가 20kg/cm²

(MD) 가 50kg/cm²

~60% 가 0.1~10kgf/cm 가

가 10

가 1 ~ 20

2~10

가

가 가 0.1~30kgf/cm

3~30 가

1cm

2

40%

가

3

3

가

5 ~ 70μm , 70μm

가 5μm

가

1000kg/cm²

100kg/cm²

10 ~ 30μm

0.

01 ~ 1.5μm

hexafluoride), (LiPF₆; lithiumphospho h
afluoroborate), (LiClO₄; lithiumperchlorate), (LiBF₄; lithiumtetr
(LiCF₃SO₃; 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/cm², CD 115kg/cm², 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/cm², CD 115kg/cm², 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 propylene)]
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
kg/10cm, PP 20cm/ () 3 140 , 1
PP (GMP , : EXCEL AM-655Q) PVDF
33μm, 60%, MFPS 0.136μm, 2.65μm , P
3

Gurley 22, MD
 (Celgard, PE 21 μ m, 43%, 0.110x0.054 μ m, 135
 Celgard 2730) 1700kg/cm², CD 120kg/cm², 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 50 μ l/가, 28kv,
 PE 10 μ m, PE 300~1,000nm,
 0cm/ (GMP, : EXCEL AM-655Q) 120, 1kg/cm, 2
 30 μ m, 45%, MFPS 0.304 μ m, 1.10 μ m, P
 E
 4

(PE)/ (PP)/ (PE)
 25 μ m, 36%, 0.05x0.11 μ m, (MD) 5%(90, 60min),
 Gurley 25, MD 1560kg/cm²(22kpsi), CD 135kg/cm²(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
 20 μ l/가, 28kv, 20cm
 PP/PE/PP 300~700nm,
 5 μ m
 3, 1kg/cm, 20cm/ (GMP,
 : EXCEL AM-655Q) 100, PVDF
 30 μ m, 37%, MFPS 0.127 μ m, 2.31 μ m, P
 P/PE/PP
 5

Gurley 22, MD
 (Celgard, PE 21 μ m, 43%, 0.110x0.054 μ m, 135
 Celgard 2730) 1700kg/cm², CD 120kg/cm², 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

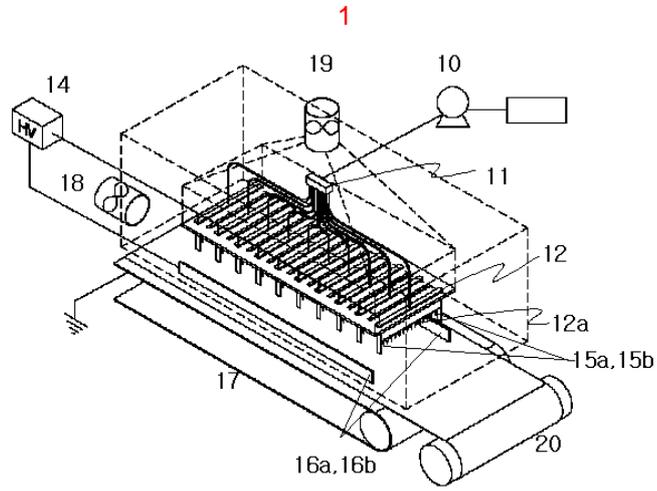
1, 50 μ l/가, 28kv,
 20cm, 300~1,000nm, 10 μ m
 PE, PE 100, 1kg/1
 0cm, 20cm/
 23 μ m, 43%, MFPS 0.304 μ m, 1.10 μ m, P
 E
 6

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

10.

(separator)

가 1



2

