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(22) 2001 03 13

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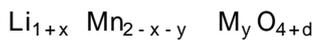
(72) 381 - 42 LG 5 - 103
8 - 2 514 403
694 101 1 01
381 - 42 LG 6 402
381 - 42 LG 8 510
386 - 1 3 403

(74) :

(54) 2

2 , 2
,
; b) a) 2 1
a) 2 .

[1]



x 0 1 0.12 , M Ti, V, Cr, Co, Ni, Mg, Zr, Fe, Gd, Ga 1 ,
 , y 0 0.5 , d 0 0.04 ,

[2]

LiNi_{1-z} Me_zO₂

2 , Me Ni, Co, V, Ti, Zr, Cr, Al, Cu, Zn, Ga, Gd 1
 , z 0 0.7 .

2

1

, 2 , , , , , , ,

1 1

2 1 EDS (Energy Dispersive X - ray Spectrometer)

3 1 EDS .

4 1

5 1 7 , 1 2 (25) .

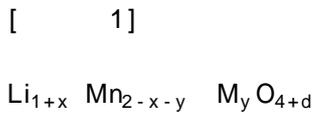
6 1 7 , 1 2 (55) .

2 , 2 .

2 가 , 가 .
 가 .
 가 .

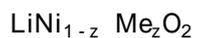
가 , 40 가 (cycle) 가
 (Mn³⁺) 가 (dissolution) 가가 3 가
 가 (doping)
 Mn³⁺
 Li₂CO₃, Na₂CO₃, K₂CO₃ (60 (storage)
 (5,733,685).

2
 a) 1 ;
 b) a) 2



M Ti, V, Cr, Co, Ni, Mg, Zr, Fe, Gd, Ga 1 ,
 x 0 0.12 (實數) ,
 y 0 0.5 ,
 d 0 0.04 ,

[2]



2 ,

Me Ni, Co, V, Ti, Zr, Cr, Al, Cu, Zn, Ga, Gd 1 ,

z 0 0.7 .

2 .

가 2 1 , 가 ,

2 , 2

Mn .

a) 1 ;

b)) ;

) ;

) Ni, Co, V, Ti, Zr, Cr, Al, Cu, Zn, Ga, Gd

1 Me

a)

;

c) b)

2 .

, 2 % 가 ,) 1 ,)
 LiOH , $\text{LiOH} \cdot \text{H}_2\text{O}$, LiCH_3COO , LiCHO
 MnCO_2 , $\text{Mn}(\text{CH}_3\text{COO})_2$, MnSO_4 , $\text{Mn}(\text{NO}_3)_2$, $\text{Mn}(\text{OH})_2$ 1) MnO_2 ,
 50 400 900
 ,) 1 .

$Li_{1.05} Mn_{1.95} O_4$, 480 , 10 , 750 , 20
 , 0.1 /gH
 [Li]/[Mn]가 0.538 Li

()

$Co(CH_3COO)_2$, $LiCH_3COO$, Ni 30 $Ni(CH_3COO)_2$, Co
 [Li]:[Ni+Co] 1:1 가 Ni:Co
 7:3 1.5 %

()

가 ,

()

(tube type) 700 10
 0.1 /gH

S(Energy Dispersive X - ray Spectrometer) 2 3 1 , ED

1 A , B Ni (A)
 (2, 3), Ni

()

hite) , (polyvinyledene fluoride:PVdF) , : : (grap

85:10:5

n - (n - methyl pyrrolidone:NMP) 가
 (tape casting) , 130

(coin cell)

$LiPF_6$ 1 , (ethylene carbonate:EC)
 (ethylmethyl carbonate:EMC)가 1:2

()

[Li₂MnO₄/LiPF₆ (1 M) in EC+2EMC/Li]

가	가	3.4	4.3 V	가	3.0	4.5 V	4
1			4.3 V	60		5	6
2							
1				Ni:Co	4:6		
3							
1				LiNi _{0.7} V _{0.3} O ₂			
4							
1							0.5 %
5							
1						400	10
6							
3 COO	Mn(CH ₃ COO) ₂			LiCH ₃ COO	Mn(CH ₃ COO) ₂	[Li]/[Mn]가 0.538	LiCH
						480	10
						700	20
						0.1 /gH	
				Li _{1.05} Mn _{1.95} O ₄			
	Li _{1.05} Mn _{1.95} O ₄				1		
7							
6				Ni:Co	4:6		
1							
1	Li _{1.05} Mn _{1.95} O ₄						1
					1		
2							
6	Li _{1.05} Mn _{1.95} O ₄						1

[1]

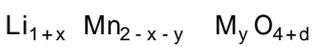
	2 (mAh/g)	60 1 (%)
1	126.7	8
2	127	10.6
3	127.3	15.2
4	127.5	16.4
5	127.4	20.5
6	126.5	7.5
7	126.1	5.5
1	128.5	24.7
2	129.2	32.8

5 (25) , 6 (55)
 1, 2 가
 4.3 V 60 가
 1 1??2 가 1 7
 2
 2

(57)

1.
 2
 a) 1 ;
 b) a) 2
 :

[1]



1 ,
 M Ti, V, Cr, Co, Ni, Mg, Zr, Fe, Gd, Ga 1 ,
 x 0 0.12 (實數) ,

y 0 0.5 ,

d 0 0.04 ,

[2]

LiNi_{1-z} Me_zO₂

2 ,

Me Ni, Co, V, Ti, Zr, Cr, Al, Cu, Zn, Ga, Gd 1 ,

z 0 0.7 .

2.

1 ,

b) a) 0.05 50 % .

3.

2 ,

a) 1 ;

b)) ;

) ;

) Ni, Co, V, Ti, Zr, Cr, Al, Cu, Zn, Ga, Gd

1 Me

a)

;

c) b)

:

[1]

Li_{1+x} Mn_{2-x-y} M_yO_{4+d}

1 ,

M Ti, V, Cr, Co, Ni, Mg, Zr, Fe, Gd, Ga 1 ,

x 0 0.12 (實數) ,

y 0 0.5 ,

d 0 0.04 .

4.

3 ,

a)

) LiOH, LiOH · H₂O, LiCH₃COO, LiCHO₂, LiCHO₂ · H₂O, LiNO₃

1 ;

) MnO₂, MnCO₂, Mn(CH₃COO)₂, MnSO₄, Mn(NO₃)₂, Mn(OH)₂

1

900 , 2 % 가 1 50 400 .

5.

4 ,

) Ti, V, Cr, Co, Ni, Mg, Zr, Fe, Gd Ga 1 M

6.

5 ,

) M M , , , , ,

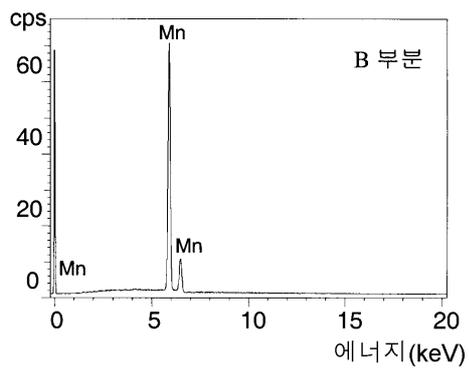
7.

3 ,

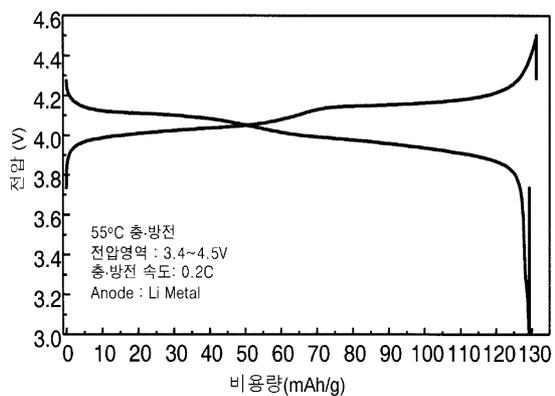
b)) LiOH, LiOH · H₂O, LiCH₃COO, LiCHO₂, LiCHO₂ · H₂O, LiNO₃
1 .

8.

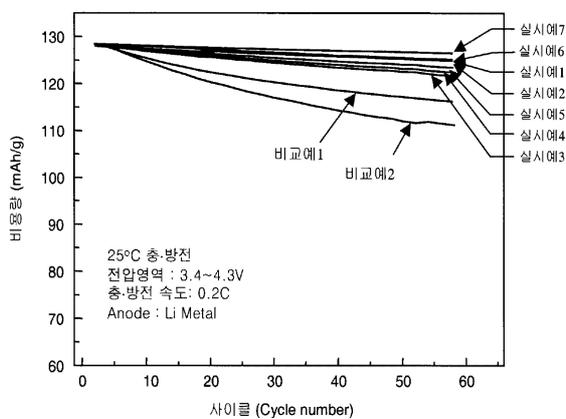
3



4



5



6

