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(12)

(KR)  
(A)

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(43)

2002 - 0012113  
2002 02 15

(21) 10 - 2001 - 0021948  
(22) 2001 04 24

(30) 2000 - 242750 2000 08 04 (JP)

(71)	가	가	가	4	6
	가				

(72) 3000 20 31.

1 - 47 - 3F203

2196 - 58

(74)

1

(54)

, , , (erosion)

2

1 CMP

2(a) CMP , (b) CMP  
, (c) CMP (b)3(a) CMP , (b) CMP  
, (c) CMP (b)

4

5(a) , (b)  
(a)6(a) , (b)  
(a)

7(a) CMP , (b) CMP

8 2 CMP ( )

9

10(a) LSI  
(b) LSI11(a) Cu - CMP , (b)  
, (a)12(a) Cu - CMP , (b)  
(a)

13(a1) (a5) (b1) (b4)

(a1) 1 (erosion) , (a2) 1 Cu  
 (erosion) , (a3) 2 , (a5) (a1) (a5) ( )  
 , (a4) 2 Cu - CMP (erosion)

(b1) 1 (erosion) , (b2) , (b4) 2  
 , (b3) 2 Cu (erosion)

( )

11... , 12... , 13... , 14... , 15... , 16... , 17... , 18...  
 , 21...Cu , 22... , 23...1 SiO<sub>2</sub> , 24...BPSG , 25...  
 , 26... , 27... , 31...2 Cu , 35...2  
 SiO<sub>2</sub> , 39...2 , 40... , 41... , 42... , 45...  
 , 52...1 2 , 81... , 82... , 83...  
 , 84... 1 , 85... 2 , 86... 1 , 87... 2 , 88...  
 , 89... , M1 M7... 1 7 , P1 P6... 1 6 , D... , 1  
 01... , 102...

,  
 , ( LSI ) ,  
 ( CMP ) , LSI ,  
 ,  
 , 4,944,836

, LSI , , (AI) (Cu)  
 , Cu AI  
 가 , 가 Cu ,  
 Cu CMP Cu ,  
 2 - 278822 Cu (Ta) (TaN)  
 , nm , (TiN) ,

Cu CMP ,  
 ) CMP  
 (柏木正弘 , 「 CMP 」 1997 8 20 , 299  
 , 10 100 nm  
 CMP 가  
 (前者)

, (H<sub>2</sub>O<sub>2</sub>), 2 (Fe(NO<sub>3</sub>)<sub>3</sub>), (KIO<sub>3</sub>)  
 「 CMP 」 299 300  
 ,

, CMP  
 (1) (7) 가  
 (1) ( ) (erosion) ( )

(2) (研磨傷))

(3)

(4) CMP

(5)

(6)

(7) CMP

CMP

CMP

가

11 - 135466

(防食性) ( )

가

( , BTA )

Cu

0 nm/ 300 g/cm<sup>2</sup>

(1) (7)

가

200 nm/

가 80 15

300 500 nm/

가

7 - 94455

Cu

100% 500g/cm<sup>2</sup>

Cu

14.5

4).

3%

(

5 ; Cu 가

(

20nm/

( erosio

n)

90rpm ) , 50nm/

700 nm/

1

가 , Cu

10 - 265776

CMP

가

( 2 )

( )

100nm/

, Cu

CMP

, Cu

CMP

가

( 乳酸 ))

Cu

11 - 21546

Cu CMP

) (錯生成劑)(

)

pH

( BTA,

가

Cu

Cu

(

)

가 Cu

(遊離)

52 - 21222

Cu

(emery)

(研磨紙) Cu

가

1000nm/

,

100nm

Cu

55 - 47382

6 - 57455

A1

가 가

가

A1

가

(梨地)

가

100nm/

(

가 )

, LSI

Cu

가

( )

nm

Cu

10nm/

100nm

가

300nm 1000nm

10nm

1nm/

100

,

10nm

Cu가 100nm

,

(防食劑)

가

11 - 21546

, BTA,

10 - 116804

Cu

가

8 - 83780

11 - 135466

BTA

가

가

, BTA

Cu

가 ,

, (700nm/ ) , (1) (7)

, , , , , , , , , , ( - ) 가

BTA , 4 - - 1.H - (4 - methyl - 1.H - benzotriazole)( tolyltriazole), 4 - - 1.H - (4 - carboxyl - 1.H - benzotriazole), 5 - - 1.H - (5 - methyl - 1.H - benzotriazole)( tolyltriazole), (benzotriazole butyl ester), 5 - - 1.H - (5 - chloro - 1.H - benzotriazole), 1 - (1 - chloro benzotriazole), 1 - , 1 - , 2, 3 - , 4 - , 4 - , 4 - - 1.H - , 4 - , 4 - - 1.H - , 5 - , [1, 2, 3 - - 1 - ] [1, 2, 4 - - 1 - ] [2 - ] , 5, 6 - - 1.H - .

, 4 - (4 - methylimidazole), 4 - - 5. (4 - methyl - 5 - hydoroxymethylimidazole), 1 - - 4 - (1 - phenyl - 4 - methylimidazole), 1 - (p - ) - 4 - (1 - (p - tolyl) - 4 - methylimidazole), (長鎖)).

, 2 - (2 - mercapto benzothiazole), 2, 1, 3 -

, 0 - , M - , 0 - , 2 -

(增粘劑) . 가 CMP

가 . BTA Cu

, 가 , 가 , 가

, 2 가 , BTA 1  
가 , 2

가 2 가

2, 1, 2 가, 2  
 Cu, (erosion) .  
 2, 가, Cu 가  
 ., 가, /Cu 2  
 가, (1% BTA (水))  
 가, .

2           CMP           ,           ,           , TiN

SiN 가 . Cu, Ti, TiN, Ta, TaN, WN, WSiN 가 . Cu . Cu . Ti, TiN, Ta, TaN, WN, WSiN

가  
Cu  
Cu  
(26), BTA

가 700nm/ 1nm/ 가 ( 가  
10nm/ 700 ). CMP 가 .  
가 , CMP

( 1 )

1	1	1	1	1	1	1	1
CMP	CMP	Cu	( )	(17)가	(11)	CMP	(18)
(14)	(12)가	CMP				가	
(13)	CMP			(12)	가		
220g/cm <sup>2</sup> ,	60rpm,	60rpm	IC1000	IC1400	가	가	가
2					가		
8	CMP				2	1	(84) Cu
(85)					가		2
(83)가	(89)		(2 )		가	81	(81), 82
			3				

1 (11) 1 (15) 200cc/ 2 (16)  
 CMP CMP가 3000cc/ 30 60 CMP , ,  
 , ,  
 ,  
 ,  
 200nm 30nm TaN 2000nm  
 Cu , 5 .  
 ( , 30 %, % H<sub>2</sub>O<sub>2</sub> ) ( , 0.5 % )  
 ( , 30 %, BTA 0.2 %, 0.2 %, , 0.5 %  
 , Cu , , ,  
 Cu 2 , 10 ,  
 , Cu 750nm/ 1.0nm/ , ,  
 11 - 135466 ( , 30  
 %, 5 %, BTA 0.2 %) 7 가 . SiO<sub>2</sub> 0.1  
 nm/ , (erosion) , ,

가 500nm/ , 가 100nm/ .  
가 200nm/ , 가 100nm/  
, 가 1.0nm/ .  
, , , , 가 .

1% 가, 60nm/ 가, TiN/Ta, TaN, SiO<sub>2</sub>, 1nm/ 100nm

, 8 1 (84) CMP , 11(a) (b)  
(erosion) 50nm 가 가 .  
7 1 가 .

가 30 . 2(b) (c) ( ) Cu 가 1% , 가 (erosion) CMP , TaN (erosion) 50nm 2 (85)

가 , 3(a) 2 CMP , 3(b) (c) Cu  
 가 . Cu - CMP 12 .  
 (erosion) 50nm 가 .  
 Cu , Cu

0.5 %, Cu  
 Cu 가 . , 1.0 % 가 Cu  
 가 , 2%

2 Cu ( 0.3 , TaN 1.9  
 3 , 40mm) 3 , 40mm) ( 檍形 ) ( 0.3  
 4 (45) (42) , LSI

2 3 5  
 가 Cu , 100% , LSI  
 가 , TiN Ti , CVD

, 가 6 (41) 가  
 , , LSI

5 6 3  
 가 13(a1 5) , 가 3 , LSI  
 (erosion) 13(a4) CMP  
 (erosion) 가 13(a5) ,  
 (erosion) 가 3  
 가 (erosion) ,  
 (erosion) 50nm 7  
 100nm

, 13(b4) 3  
 (erosion) 50nm 9  
 (erosion) 80nm 7

9 , 14 CMP(M1 M7, P1 P7)  
 가 (erosion) 80nm

, 10 LSI (102) (101)  
 , , 10(a) (疏密) 가  
 , 13(a) 가 , 3  
 가

, 3 LSI , 10(b) CMP  
 LSI , (erosion) 50nm  
 , , LSI

( 2 )

Cu ( 30% H<sub>2</sub>O<sub>2</sub> ) BTA  
 30 %, 0.2 %, 0.5 %, BTA 0.2  
 %, Cu  
 가 1 가 . . . . 1%

, Cu 700nm/ , 1.0nm/ , 7 가 . , SiO<sub>2</sub> 0.1nm/ . , (erosion)

erosion) 50nm , 2 CMP , 2(b) (c) , (erosion) Cu 가 3(b) (c) , 50nm 가 7 ,

Cu (0.3, 40mm), 3 / 40mm), 100% (1.9 (0.3, 5, 6 . 3 .

Cu 20% 가 . 1 100 , 10 가  
Cu 30% 가 . 가 .

( 3 )

1 , Cu 1 CMP ,  
1 가 2 Cu 가 .

, Cu 1000nm/ , 1.0nm/ Cu 1 가 750nm/ .

TiN 100nm/ ,  
 20nm/ . Ta 50nm/ ( ), 10nm/ ( ) , TaN  
 60nm/ ( ), 15nm/ ( ) , TiN  
 . Ta TaN 가

Cu , 1 가 2 (2 ) 1 (Cu) TiN  
 CMP , 1 7(a) 2 가 , 50nm Cu (erosion) 가  
 . 1 50nm . 7(b) 2 CMP  
 (erosion) 10 100 , 1  
 2 CMP , TiN 4 1  
 가 , 1  
 가

1 CMP Cu , TiN 1.9  
 (erosion) ( ). , 2 ( 0.3 10%  
 ( 0.3 3 ( 40mm)  
 100% LSI ,  
 CMP , (erosion) 가 . , 1

( 4 )

· SF<sub>6</sub> ( )가 . 가 25cc/ , 5mmTorr, SiO<sub>2</sub>  
 600W, 0 100W .  
 가 가 , 가 11 . TiN TaN F  
 0 , TiN/SiO<sub>2</sub> 가 15, TaN(Ta)/SiO<sub>2</sub> 가 ,  
 가 , SiO<sub>2</sub> F ,  
 가 ,  
 Cu  
 240nm/ ,  
 .

, Cu (0.3, 40mm), TaN (3, 40mm), 1.9 (3, 40mm), 100% (0.3, 40mm)

, 4 (45) (42) , LSI

, 6 (41) 가  
가 . LSI

( 5 )

2 CMP , 2(b) (c) (erosion) 50nm  
 , Cu 3(b) (c) , (erosion) .

3 Cu (0.3, 40mm), TiN (3, 40mm) / 1.9 (100%) 0.3

$$, \quad 4 \quad \quad \quad (45) \quad \quad \quad (42) \quad \quad \quad , \text{ LSI}$$

6 가 . LS (41)

CMP (erosion), CMP 가

(57)

2.

1 ,

3.

1 ,

4.

1 3 ,

5.

1 4 ,

6.

1 5 ,

가 (防蝕劑)

7.

6 ,

가

8.

6 ,

가

9.

1 5 ,

가

10.

9

, 가 (增粘劑)

11.

9

, 가 ,

12.

6 11 ,

가

13.

12 ,

가

14.

13 ,

,

15.

1 14 ,

가 10nm/

16.

1 15 ,

17.

16 ,

18.

1      17      ,  
 Cu      Cu      Cu

19.

Cu      ,  
 ,      ,      ,      ,      Cu

20.

Cu      ,  
 ,      ,      ,      ,      Cu

21.

,      Cu  
 ,      ,      ,      1      ,      Cu  
 ,  
 ,      2      ,      Cu

22.

21      ,  
 2      가,      2      Cu      2

23.

가      (基體)      ,  
 가      ,  
 ,      Cu      ,  
 ,      ,      1      ,      Cu  
 가      ,  
 ,      2      ,      Cu      가  
 ,  
 가

24.

가

가

Cu

3

1

Cu

가

2

Cu

25

가

가

Cu

1

Cu

2

Gu

가

26.

21

25

2

27.

26

2

가

1

28.

1

Cu

Cu

29.

28

六氟化硫黃 (六氟化硫黃)

30.

21

28

31.

21

28

32.

21

28

33.

TiN

Cu

1

Cu

TiN

34.

33

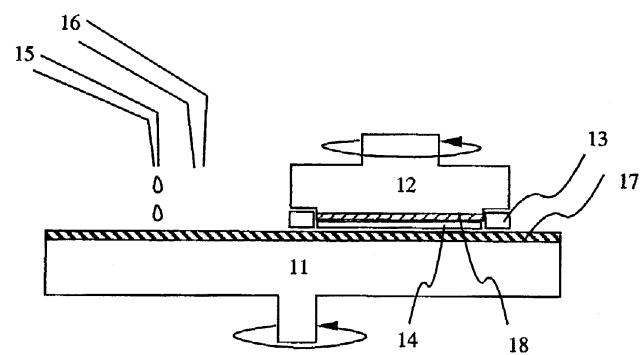
35.

33

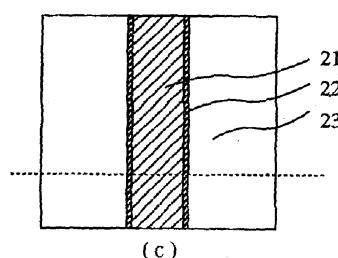
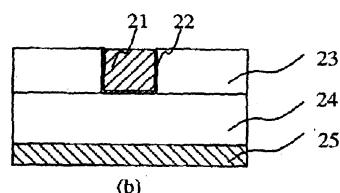
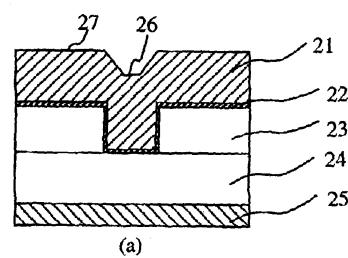
2

Cu

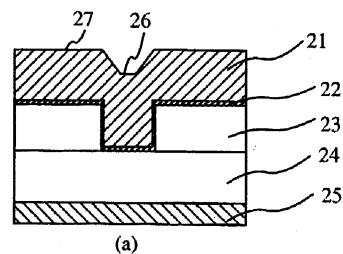
1



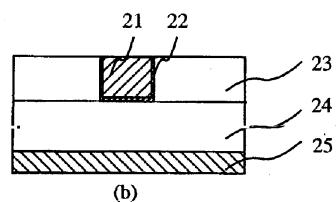
2



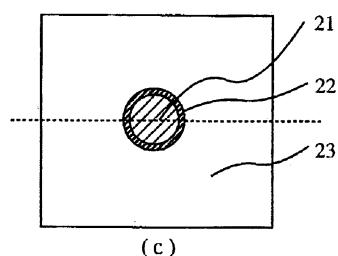
3



(a)

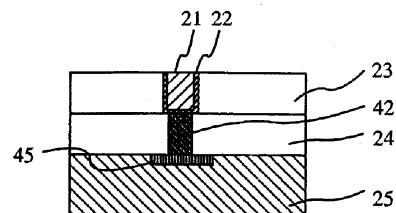


(b)

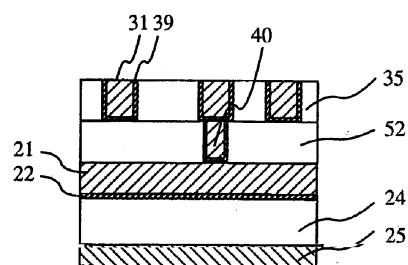


(c)

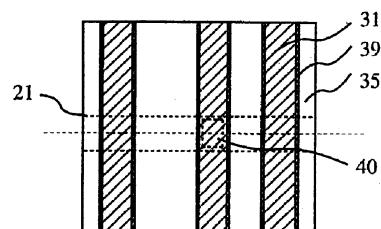
4



5

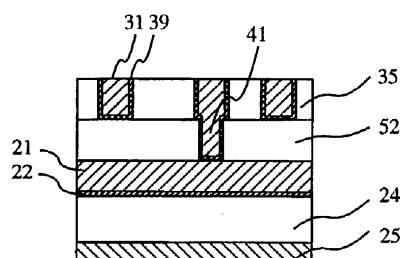


(a)

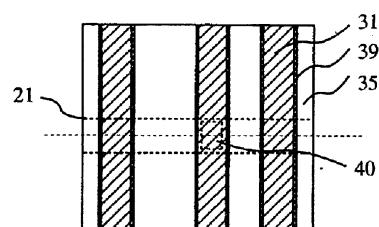


(b)

6

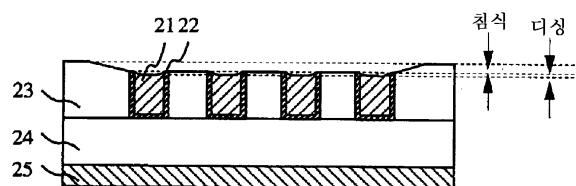


(a)

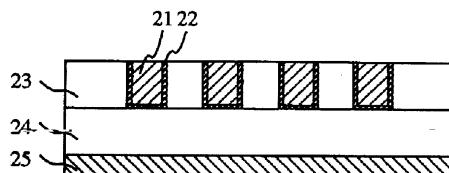


(b)

7

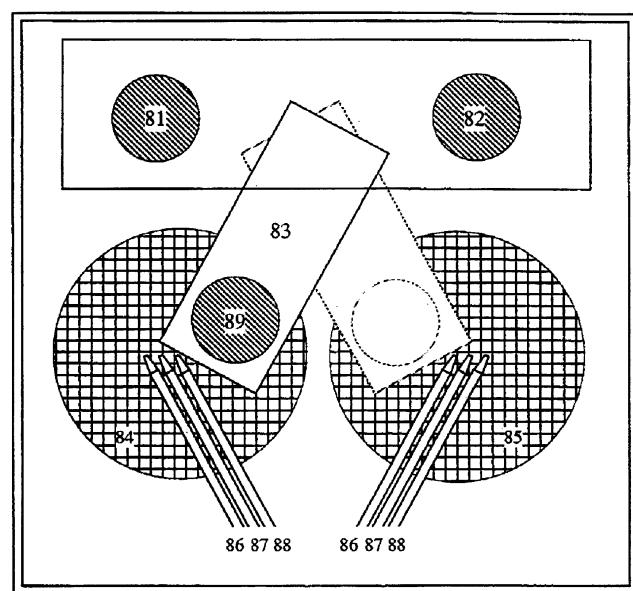


(a) 실리카 지름이 들어간 연마액

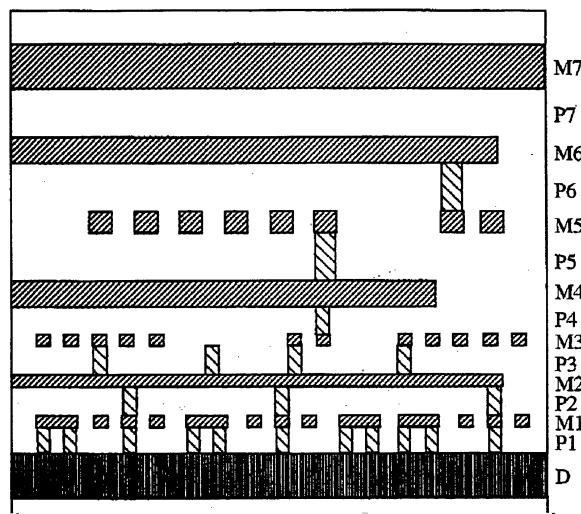


(b) 지름이 없는 연마액

8

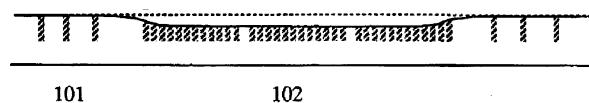


9

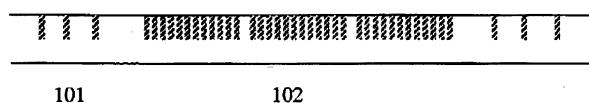


10

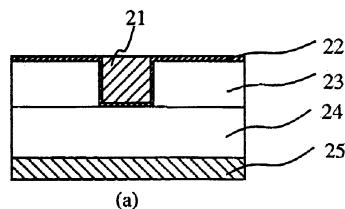
(a)



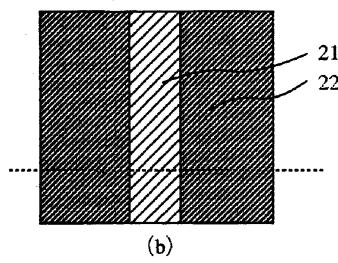
(b)



11

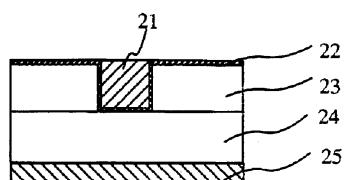


(a)

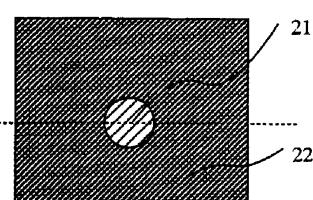


(b)

12



(a)



(b)

13

