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10-2003-0017206  
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(73)

136-1

(72)

11-1

518

1112

808-902

(74)

:

(54)

;

2c

, ECD,

1a 1c  
 2a 2d  
 3a 3d  
 4a 4b  
 \*  
 31 : 32 : /  
 33 : 34 :  
 35 : 39 :  
 A : C :

(Capacitance; C)  $\frac{\epsilon A}{d}$  ( : , A: , d: )  
 가 가  
 (Storage) 3 가  
 BST[(Ba,Sr)TiO<sub>3</sub>]  
 , 3 가 가  
 , BST (Oxygen stoichiometry)  
 , BST 가 (Pt), (Ru) (N  
 oble metal) , (Sput  
 ering) (Electro C  
 hemical Deposition; ECD )  
 1a 1c  
 , 1a (11) (11) (11) (11) (11)  
 , / (12) , (11) (13) , (11) (13)  
 , (13) (12) / (12) (13)  
 hing; CMP ) (14) (Etchback) (14) (Chemical Mechanical Polis  
 , (14) - (15) , - (15) (16)  
 , (15) (ECD) (P  
 hysical Vapor Deposition; PVD )  
 , (16)  
 (17) , (17) (16) CF<sub>4</sub>, CHF<sub>3</sub> C<sub>2</sub>F<sub>6</sub> 가  
 , (15) (18) 가 (15)  
 1b (19) , (15) (16) (19) (15)  
 (15) , (15) , (15)  
 , (19) (Alkaline) (Base) -  
 (Gap-fill) (Selective deposition) OH (Lig  
 and) 가 (Addictive) 가  
 . ECD (Anode) (Cathode) (Electric fiel  
 d) 가 (Degradation) , (Plating)  
 (19) , (19) (A)  
 1c , - (19) BST(20) (Chemical Vap  
 or Deposition; CVD ) , BST(20) CVD (21)

effect, B) (A) BST (20) - 4(a) (19) (Trap) (D  
 ump) (H  
 age) (19) BST (20) (Breakdown volt  
 가 (25) SC(Standard Cleaning)  
 가 (Residue)  
 ;  
 H<sub>2</sub>SO<sub>4</sub> H<sub>2</sub>O<sub>2</sub>가 ;  
 ;  
 ; NH<sub>4</sub>OH H<sub>2</sub>O가 ;  
 ; ;  
 ; ;  
 ; ; H<sub>2</sub>SO<sub>4</sub> H<sub>2</sub>O<sub>2</sub>가 ;  
 ; ;  
 ; ;  
 ; ; OH  
 ; NH<sub>4</sub>OH H<sub>2</sub>O가 ;  
 ; ;  
 ; ; 가 가  
 ; 가  
 2a 2d (31) (31) (31) (31) ( )  
 ; 2a / (32) (31) (33) ; (31) ( )  
 a) (33) BSG(Boro Silicate Glass), BPSG(Boro Phospho Silicate Glass), HDP(High Density Plasm  
 ) , USG(Undoped Silicate Glass), TEOS(Tetra Ethyl Ortho Silicate), APL(advanced planarization layer  
 , SOG(Spin On Glass) Flowfill (33) ( )  
 ; ) 300 1000 가 , CVD (33) ( )  
 ; (33) / (32) 가 (33) (34) )  
 ; ( ) 가 (33) ( )  
 ; , CMP ( ) (34)가 ( ) ( )  
 가 (33) (P) (As) ;  
 ; (34) (W), (W-silicide), TiN, TiAlN, TaSiN, TiS  
 iN, TaN, TaAlN, TiSi TaSi  
 ; CVD, PVD ALD ;  
 ; (Ti) (34) (Si) (Ti) (34) Ti가  
 ; (34) ( ) ; ( ) ( )

(34) WSi<sub>x</sub>, MoSi<sub>x</sub>, CoSi<sub>x</sub>, NoSi<sub>x</sub> ( ) TaSi<sub>x</sub> ( ) (Recess) ( )  
 (33) 500 1500  
 (34) ( ) ( ) TiN, TiAlN, TaSiN, TiSiN, TaN, RuTiN RuTiO  
 ( ) Ir, Ru, Pt, Re, Ni, Co Mo  
 ( )  
 N<sub>2</sub> O<sub>2</sub>  
 가  
 (34) Pt, Ru, Ir, Os, W, Mo, Co, Ni, Au Ag  
 PVD (35) , 50 1000 가  
 (35) (36) 5000 10000  
 (36) (37)  
 (37) (36) CF<sub>4</sub>, CHF<sub>3</sub> C<sub>2</sub>F<sub>6</sub> 가 (37)  
 (35) (38)  
 (36)  
 2b (35) 가 (35)  
 (39) (PR Strip) (37)  
 , ECD , 0.1mA/cm<sup>2</sup> (39) DC(Direct Current), (Pulse) (Pulse reverse)  
 , 10mA/cm<sup>2</sup> (36)  
 (39) OH 가 가 가  
 . ECD (39) (A) (A) (39) (39)  
 , OH (39) (A) (A)  
 2c (33) (36) ( )  
 39) (35) (35) (35)  
 (35) (36) HF HF NH<sub>4</sub>F가  
 (35) (35) , Pt (39) (C)  
 SC (C) (A) (A) , SC-1  
 (C) (A)  
 , H<sub>2</sub>SO<sub>4</sub> H<sub>2</sub>O<sub>2</sub>가 NH<sub>4</sub>OH  
 NH<sub>4</sub>OH H<sub>2</sub>O가  
 H<sub>2</sub>SO<sub>4</sub> H<sub>2</sub>O<sub>2</sub>가 1 100 : 1 25 150 , H<sub>2</sub>SO<sub>4</sub> H<sub>2</sub>O<sub>2</sub>가 H  
 H<sub>2</sub>O가 NH<sub>4</sub>OH H<sub>2</sub>O가 1 500 : 1 25 150 , NH<sub>4</sub>OH  
 , 10 3600 (C) (A)  
 2d (39) (40) (41)  
 , TiO<sub>2</sub>, HfO<sub>2</sub>, Y<sub>2</sub>O<sub>3</sub>, Ta<sub>2</sub>O<sub>5</sub>, STO (SrTiO<sub>3</sub>), BST, PZT, PLZT ((Pb, La) (Zr, Ti)O<sub>3</sub>), B  
 TO (BaTiO<sub>3</sub>), PMN(Pb(Ng<sub>1/3</sub>Nb<sub>2/3</sub>)O<sub>3</sub>), SBTN((Sr,Bi) (Ta, Nb)<sub>2</sub>O<sub>9</sub>), SBT((Sr, Bi)Ta<sub>2</sub>O<sub>9</sub>), B  
 LT((Bi, La)Ti<sub>3</sub>O<sub>12</sub>), BT(BaTiO<sub>3</sub>), ST(SrTiO<sub>3</sub>), PT(PbTiO<sub>3</sub>)  
 , CVD, ALD PVD 150 500 가 , CVD  
 BST 400 600  
 (40) , O<sub>2</sub>, N<sub>2</sub>, Ar, O<sub>3</sub>, He, Ne  
 Kr 가 400 800  
 (Rapid Thermal Process; RTP ) , 30 18  
 0

(40) (41)

(41) (39) , ECD CVD, PVD

(35) (39) (40) (39)

(39) (40)

4(b) 가 (V),

(A/cm<sup>2</sup>)

4(b) 가 가 (Transition voltage) (Shottky barrier)

(39) (40)

(Mid-trap)

3a 3d

3a (54)가 (55)

'51' '52' '53'

3b (55) ECD (56) , DC(Direct Curre

nt), (Pulse) (Pulse reverse) , 0.1mA/cm<sup>2</sup> 10mA/cm<sup>2</sup>

(56)

OH 가 가

ECD 가 (56) (56)

(A) (A) OH

3c (56) (A)

H<sub>2</sub>SO<sub>4</sub> H<sub>2</sub>O<sub>2</sub>가 NH<sub>4</sub>OH

NH<sub>4</sub>OH H<sub>2</sub>O<sub>2</sub>가

H<sub>2</sub>SO<sub>4</sub> H<sub>2</sub>O<sub>2</sub>가 1 100 : 1 25 150 H

H<sub>2</sub>O<sub>2</sub>가 NH<sub>4</sub>OH H<sub>2</sub>O<sub>2</sub>가 1 500 : 1 25 150 , NH<sub>4</sub>OH

3d 10 3600 (A) (57) (58) (56)

(56) (57) (58)

(58) (57) (58) (56)

(57) (58) (56)

, ECD

ECD

, ECD

가가 가

(57)

1.

2.

3.

H<sub>2</sub>SO<sub>4</sub> H<sub>2</sub>O<sub>2</sub>가 ; OH ; ;

4.

3 , H<sub>2</sub>SO<sub>4</sub> H<sub>2</sub>O<sub>2</sub>가 1 100 : 1 25 150

5.

3 , NH<sub>4</sub>OH

6.

NH<sub>4</sub>OH H<sub>2</sub>O가 ; OH ; ;

7.

6 , NH<sub>4</sub>OH H<sub>2</sub>O가 1 500 : 1 25 150

8.

3 7 10 3600 ,

9.

3 6 , ;

10.

9 , , 50 1000

11.

3 6 , , 0.1mA/cm<sup>2</sup> 10mA/cm<sup>2</sup>

12.

3 6 , , DC(Direct Current), (Pulse) (Pulse reverse)

13.

3 6 , , Pt, Ru, Ir, Os, W, Mo, Co, Ni, Au Ag

14.

15.

16.

;

;

;

;

;

H<sub>2</sub>SO<sub>4</sub> H<sub>2</sub>O<sub>2</sub>가<sup>OH</sup> ;

17.

16

H<sub>2</sub>SO<sub>4</sub> H<sub>2</sub>O<sub>2</sub>가 1 100 : 1 25 150

18.

16

NH<sub>4</sub>OH

19.

;

;

;

;

;

NH<sub>4</sub>OH H<sub>2</sub>O<sub>2</sub>가<sup>OH</sup> ;

20.

19

NH<sub>4</sub>OH H<sub>2</sub>O<sub>2</sub>가 1 500 : 1 25 150

21.

16

20

10

3600

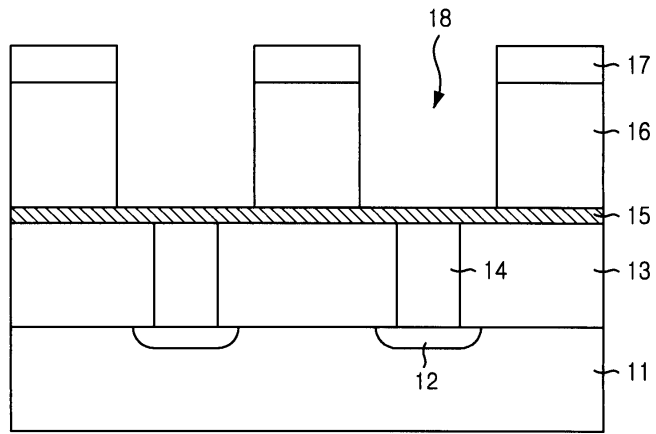
22.

16

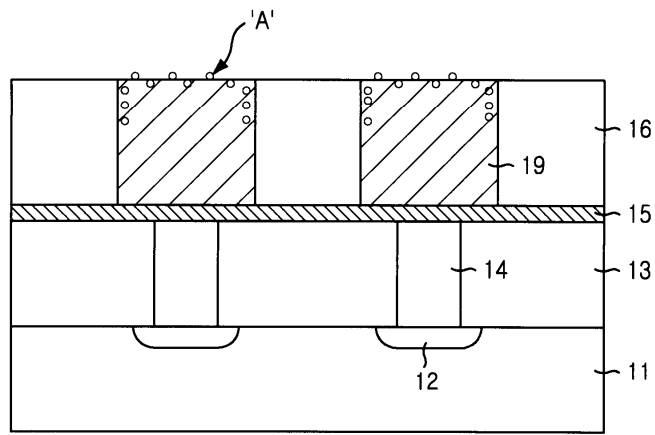
19

Pt, Ru, Ir, Os, W, Mo, Co, Ni, Au Ag

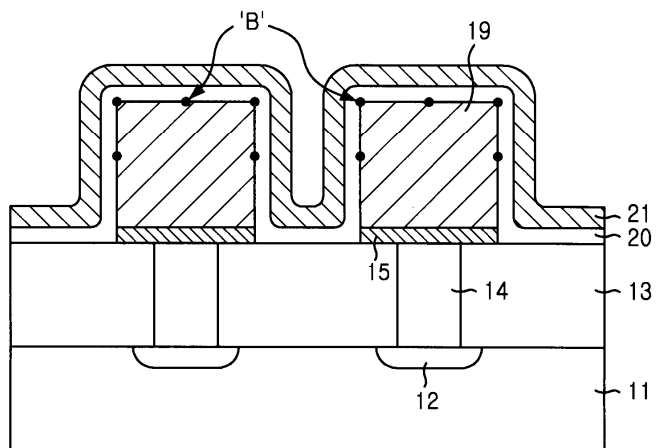
1a



1b

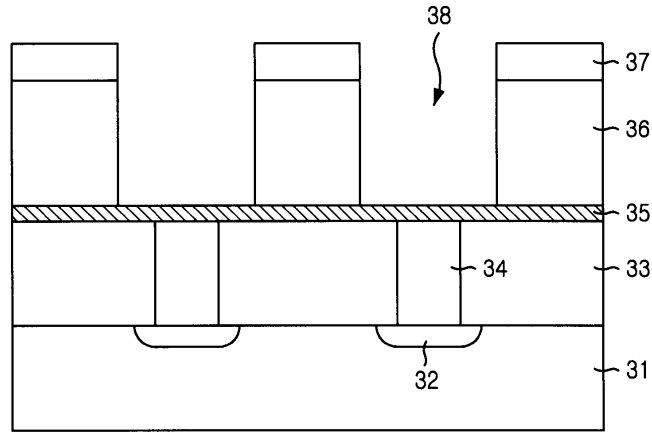


1c

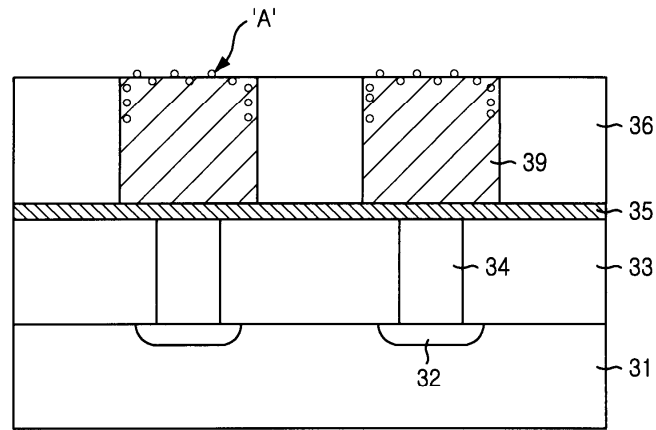




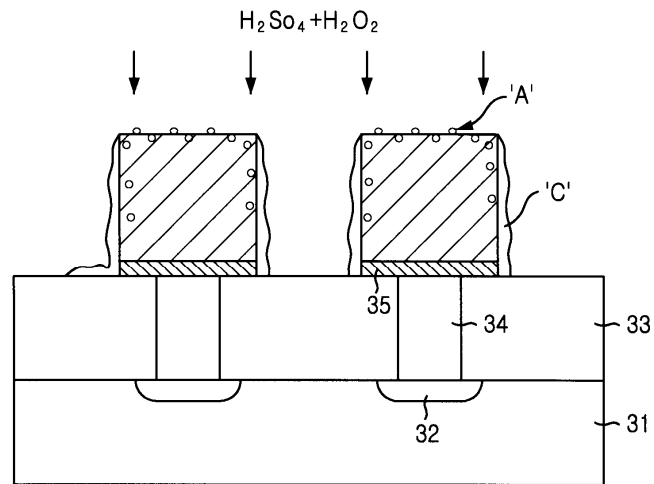
2a



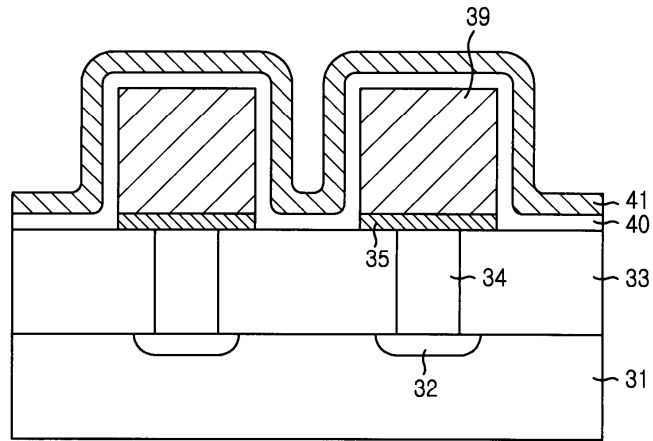
2b



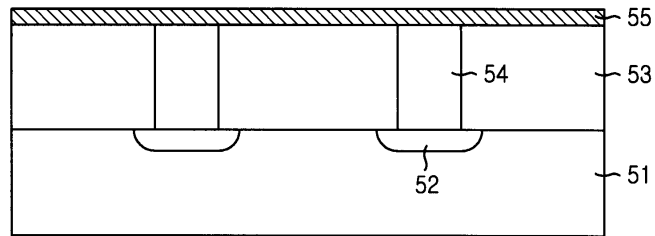
2c



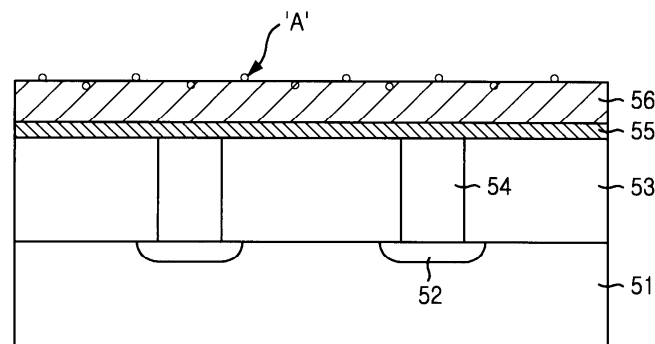
2d



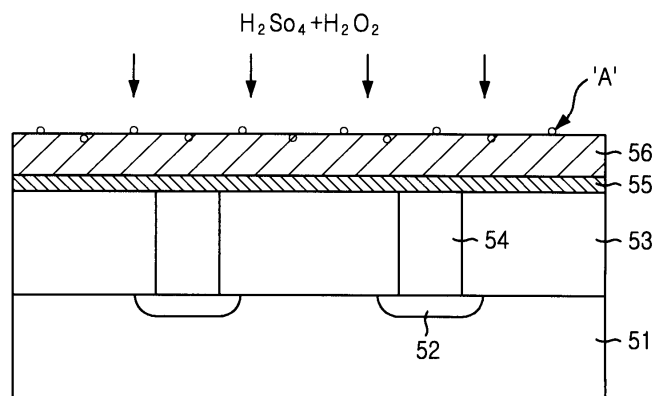
3a



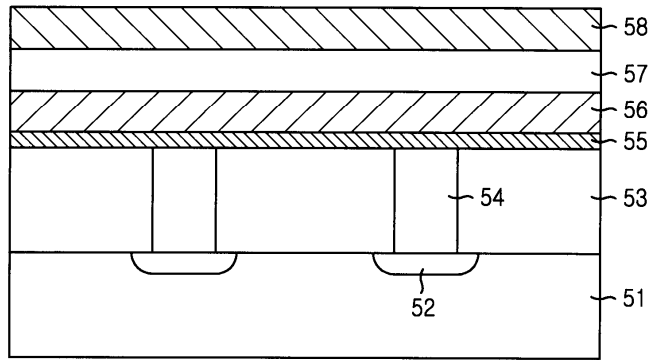
3b



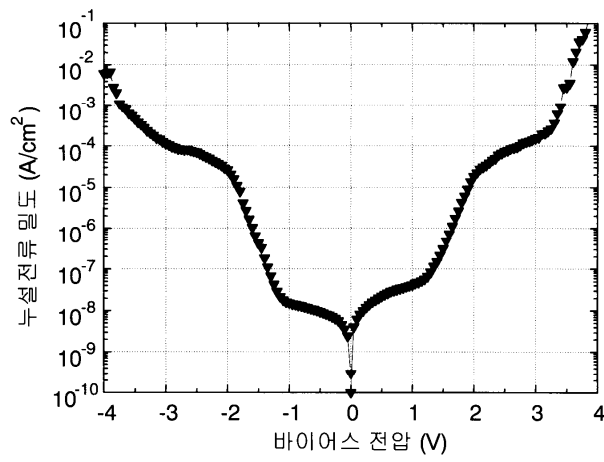
3c



3d



4a



4b

