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(71) 109 401

(72) 109 401

2 8 802 506

(74)
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(54)

(TMR)

4

TaO TMR

1

2

3 TaO AIO

TMR

- 4 TMR
- 5 ICP
- 6 AIO TMR () TaO TMR ()

가

(tunnel magnetoresistance: TMR)

MRAM

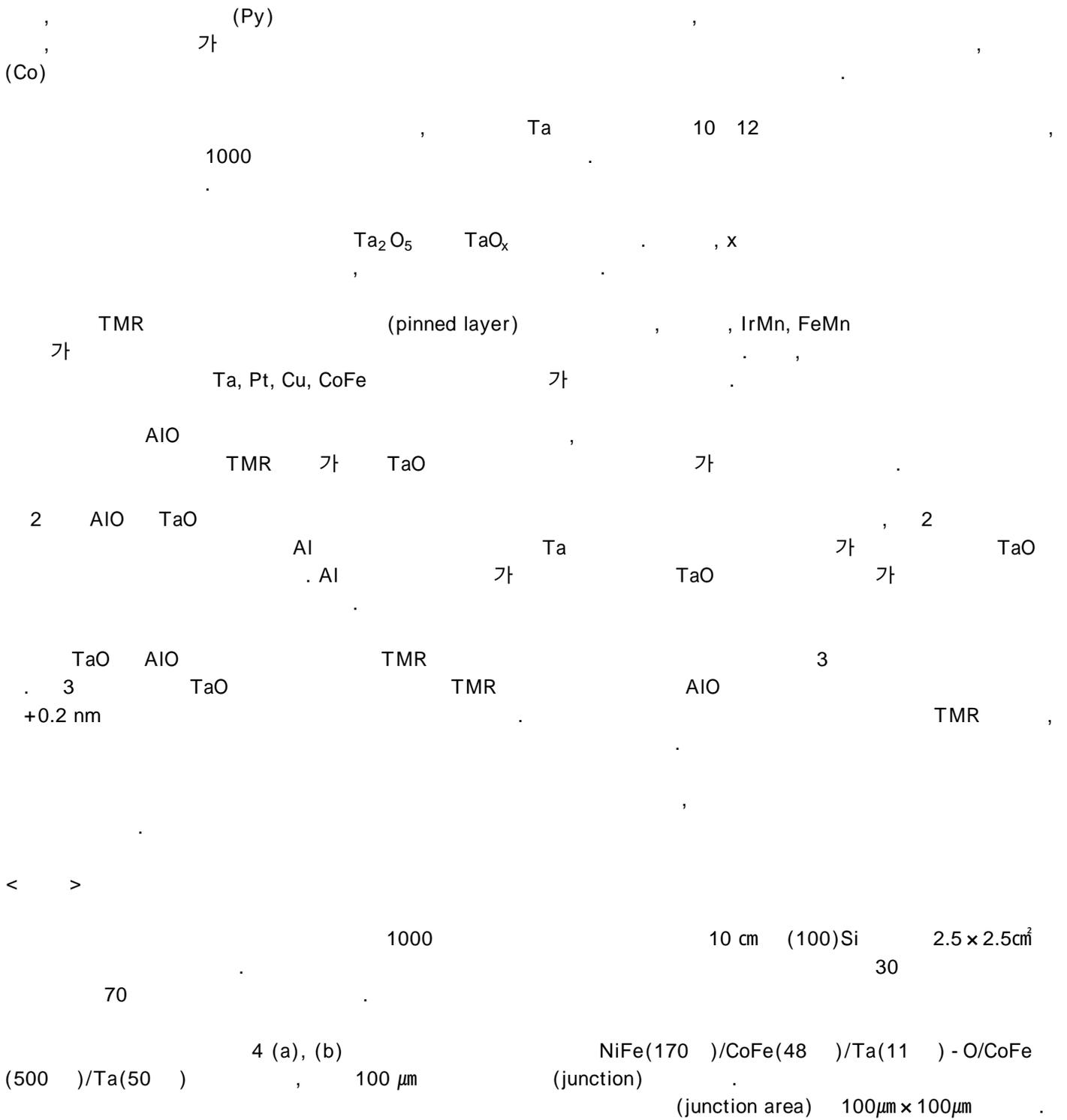
TMR 1975 Julliere가 가 1995
 Moodera Miyazaki가 20% 가

TMR 4 50% MR
 Al₂O₃가 TMR 가 MR 가 AIO가 GeO, CoO , AIO
 (process window)
 가

14 , 1 , 2.5cm x 2.5cm Si/SiO₂ (1000)
 TMR (MR)
 MR 가 MR 가
 MR 2.15, 64.19 , 2.5cm x 2.5cm 가 가
 , 가

MR TMR MR T

(Py)/ / (Co)
 (TMR)



ICP(inductive coupled plasma) Al
 MTJ(magnetic tunnel junction) . ICP
 (load lock)
 3 10⁻⁵ 10⁻⁶
 ICP 6
 1 /sec
 (sample preparation chamber) 3.0 x 10⁻⁵
 (Ferromagnet depositon chamber)
 Pa 3.0 x 10⁻⁶ Pa
 1.4 x 10⁻⁵ Pa Ta
 100 Oe 가 Ta 1
 1 Ar 1 3.0 x 10⁻⁶ Pa

[1]

	(/sec)	Ar (sccm)	(Pa)	(/W)	(/W)
Ta	0.5524	2.1	0.078	150	20
NiFe	0.6681	2.1	0.078	150	20
CoFe	0.4425	2.8	0.107	150	20

Ta Ta Ta
 1.4 x 10⁻⁵ Pa Ar Ta 11
 4.0 sccm O₂ 0.4 Pa, Ar 0.7 Pa O₂ 9.1 sccm, Ar
 get) (power) 15 W RF 210 sec 5 ICP 100 W, (tar
 가
 AIO TaO (MR) 6
 AIO R MR 가, 20K - 4Mohm/um², 2 - 10% 가 , TaO
 1.5 - 2.5Mohm/um², 8 - 10% 가

가 가 TMR TMR process window
 가

(57)

1.

(Py)/ / (Co)
 (TMR)

2.

1 , Ta_2O_5 TaO_x .

3.

1 , , IrMn, FeMn, Ta, Pt, Cu CoFe
가

4.

(Py) , (Co)
가

5.

4 , Ta_2O_5 TaO_x .

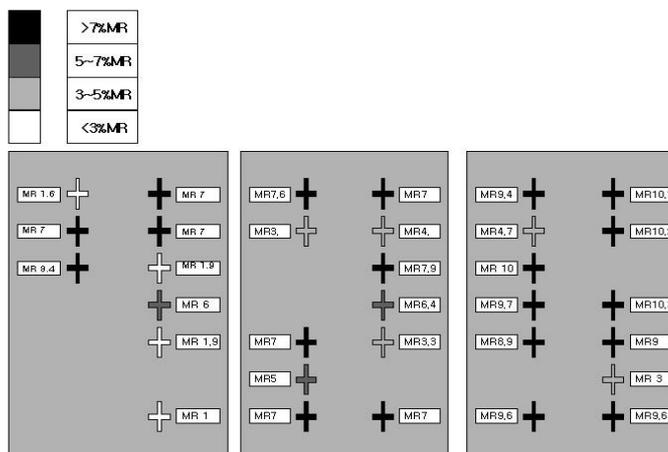
6.

4 , 10 12 .

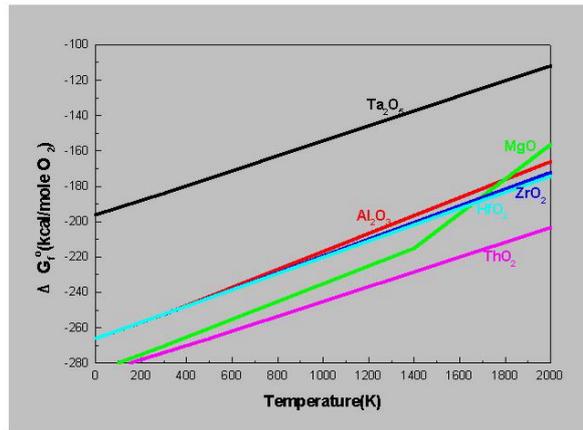
7.

4 , 1000 .

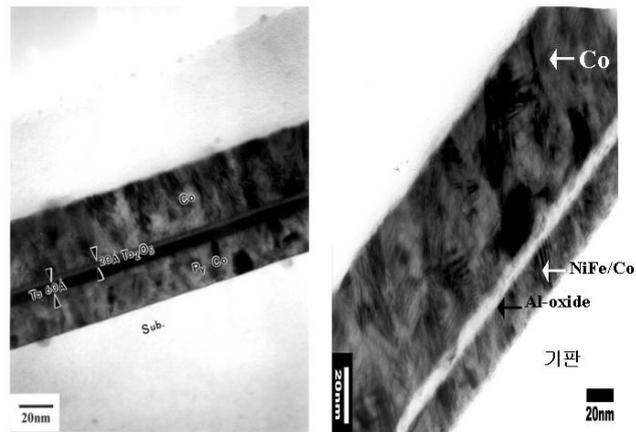
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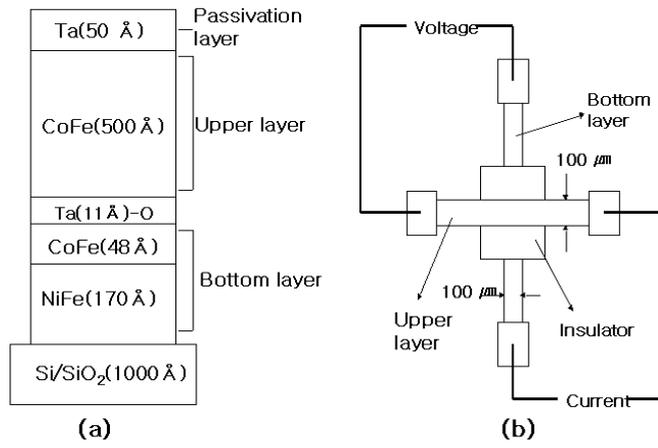
2



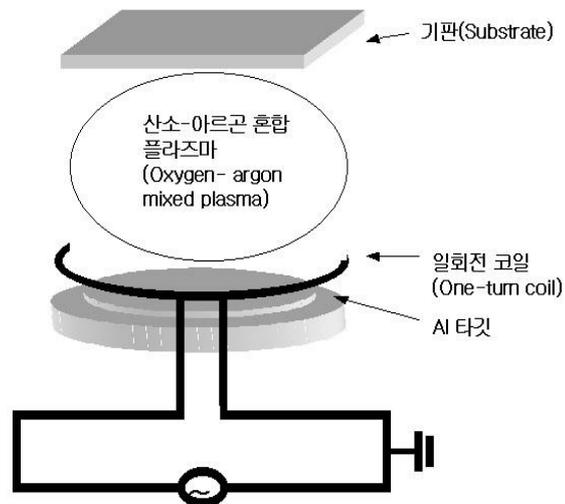
3



4



5



6

