Non volatile memory TFT using mobile proton in gate dielectric by hydrogen neutral beam treatment

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We have fabricated the nc-Si, IGZO based nonvolatile memory TFTs using mobile protons, which can be generated by simple hydrogen insertion process via H-NB treatment at room temperature. The TFT devices above exhibited reproducible hysteresis behavior, stable ON/OFF switching, and non-volatile memory characteristics. Also executed hydrogen treatment in order to figure out the difference of mobile proton generation between PECVD and our modified H-NB CVD. The room temperature proton-insertion process can reveal flexible inorganic based all-in-one display panel including driving circuit and memory circuit.

Keywords: nonvolatile memory, H-NB CVD, mobile protons
H-NB Treatment
$V_{g_{well}} = -200 \text{ V, 5 MIN}$

Thermal SiO$_2$
Si Wafer

SiO$_2$ via ICP
300 $^\circ$C
(SiH$_4$, 80, N$_2$O 200, 300mTorr, 800W, 13min, 1000Å)

ICP - SiO$_2$
Hydrogen Rich
SiO$_2$
Si Wafer

Active
ICP - SiO$_2$
Hydrogen Rich
SiO$_2$
Si Wafer

Active
D
S
ICP - SiO$_2$
Si Wafer

(a) Drain Current [A]
Gate Bias [V]

(b) Drain Current [A]
Gate Bias [V]

(c) Drain Current [A]
Number of Pulse Sequency [#]

(d) hysteresis (V)
Vg Range (± V)