

## Supplementay Information

### Interface optimization and performance enhancement of Er<sub>2</sub>O<sub>3</sub>-based MOS devices by ALD-derived Al<sub>2</sub>O<sub>3</sub> passivation layers and annealing treatment

Q. J. Wu <sup>1</sup>, Q. Yu <sup>2</sup>, G. He <sup>3</sup>, W. H. Wang <sup>3</sup>, J. Y. Lu <sup>3</sup>, B. Yao <sup>1,\*</sup>, S. Y. Liu <sup>1</sup>, Z. B. Fang <sup>1,\*</sup>

<sup>1</sup> *Zhejiang Engineering Research Center of MEMS, Shaoxing University, Shaoxing 312000, PR China*

<sup>2</sup> *Semiconductor Manufacturing Electronics (Shaoxing) Corporation, Shaoxing 312000, PR China*

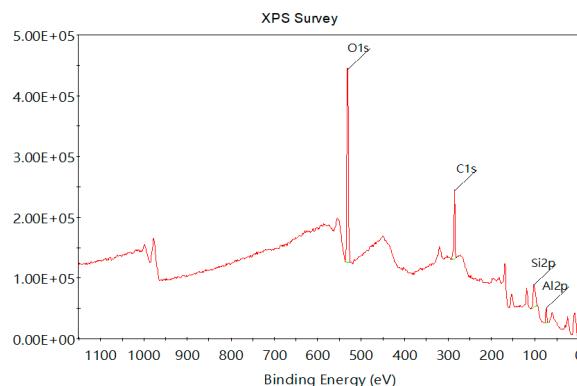
<sup>3</sup> *School of Materials Science and Engineering, Anhui University, Hefei 230601, PR China*

\* Correspondence: yaob\_usx@163.com (B. Yao); csfzb@usx.edu.cn (Z. B. Fang)

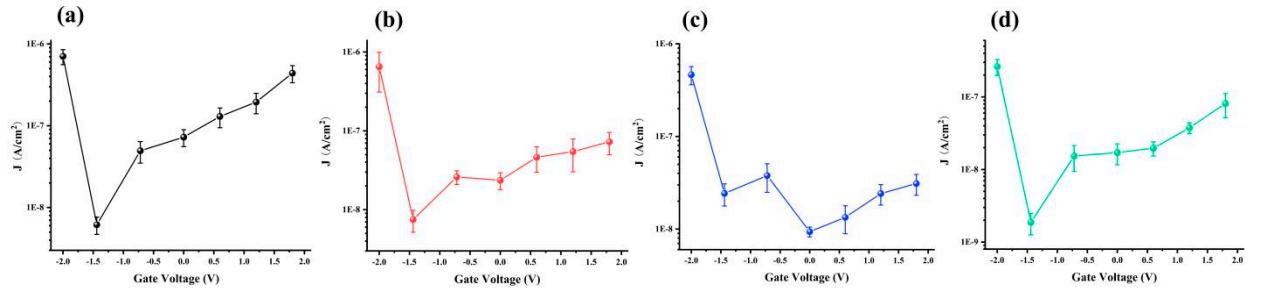
\*Corresponding authors.

E-mail address: yaob@usx.edu.cn(B. Yao).

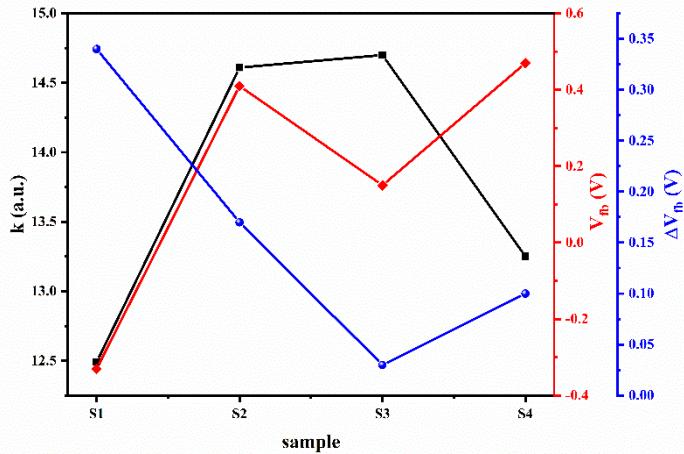
csfzb@usx.edu.cn(Z. B. Fang)



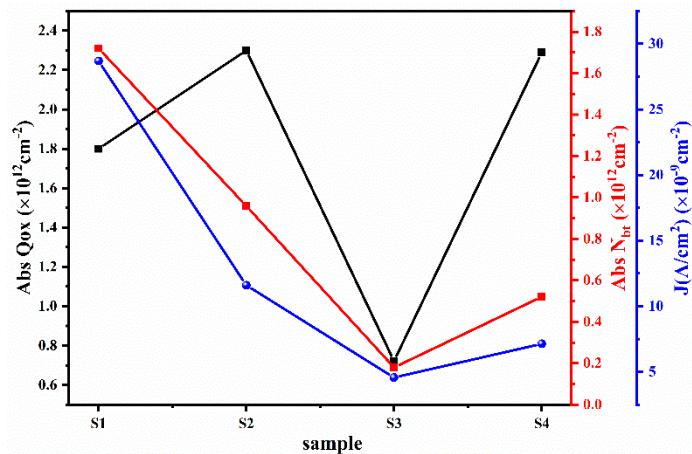
**Fig. S1.** XPS full spectrum of S4 sample.



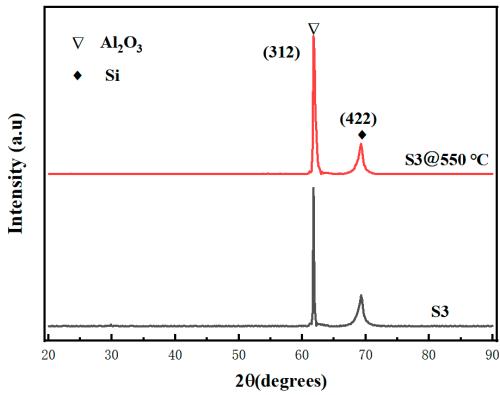
**Fig. S2.** (a)-(d) are the error plots of J-V curves for S1-S4 samples



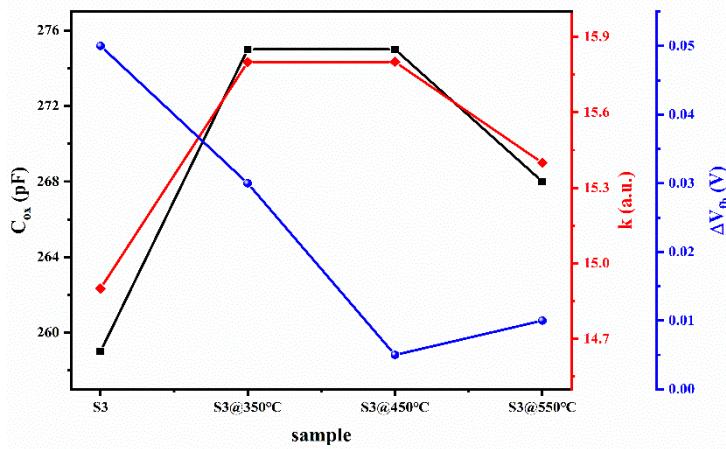
**Fig. S3.** Comparison of  $k$ ,  $V_{fb}$  and  $\Delta V_{fb}$  values for S1-S4 samples.



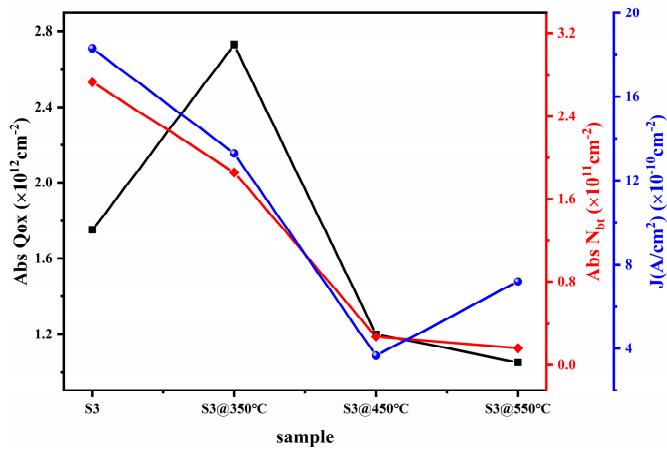
**Fig. S4.** Comparison of absolute values of  $Q_{ox}$  and  $N_{bt}$  and comparison of leakage current density values for S1-S4 samples.



**Fig. S5** XRD patterns of S3 and S3@550 °C.



**Fig. S6.** Comparison of  $C_{ox}$ ,  $k$ , and  $\Delta V_{fb}$  values for S3, S3@350°C, S3@450°C and S3@550°C samples.



**Fig. S7.** Comparison of absolute values of  $Q_{ox}$  and  $N_{bt}$  and comparison of leakage current density values for S3, S3@350°C, S3@450°C and S3@550°C samples.