Supplementary Materials

Impact of Fluorine Plasma and Electrothermal Annealing on the Interfacial Properties of Ni/β-Ga_2O_3 Schottky Contacts

Jianggen Zhu[1,‡], Jiaren Feng[2,‡], Shuting Huang[1], Ning Yang[1], Binju Qiu[1], Enchuan Duan[1], Sheng Liu[2], Bo Zhang[1], Zhaofu Zhang[2,3,4,†], and Qi Zhou[1,5,6,†]

[1]School of Integrated Circuit Science and Engineering, University of Electronic Science and Technology of China (UESTC), Chengdu 610054, China
[2]School of Integrated Circuits, Wuhan University, Wuhan 430072, China
[3]Suzhou Institute of Wuhan University, Suzhou, Jiangsu 215123, China
[4]Research Institute of Wuhan University in Shenzhen, Shenzhen 518057, China
[5]Shenzhen Institute for Advanced Study, UESTC, Shenzhen 518110, China
[6]Institute of Electronic and Information Engineering, UESTC, Dongguan 523808, China

‡ These authors contributed equally.
† Corresponding Author.
E-mail:
zhaofuzhang@whu.edu.cn and zhouqi@uestc.edu.cn

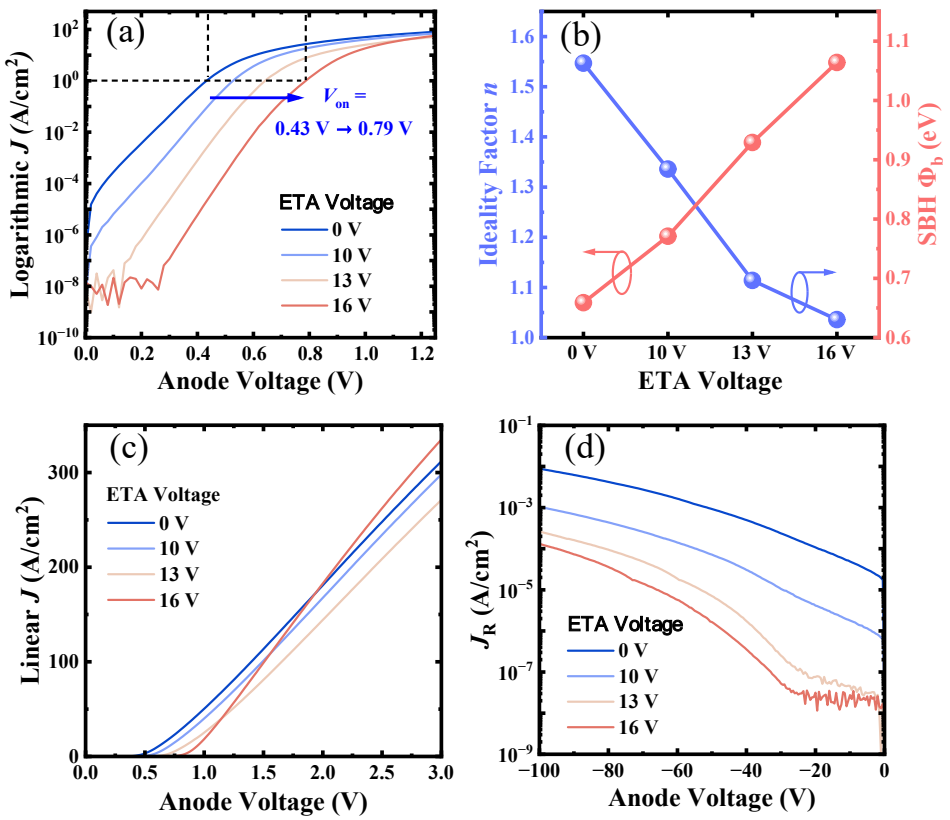

Fig. S1. (Color online) (a)Semi-logarithmic forward I–V characteristics and (b)extracted ideality factor n and Φ_b of Sample 3 with various ETA voltages; (c)linear forward and (d)reverse I–V characteristics of Sample 3 with different ETA voltages.

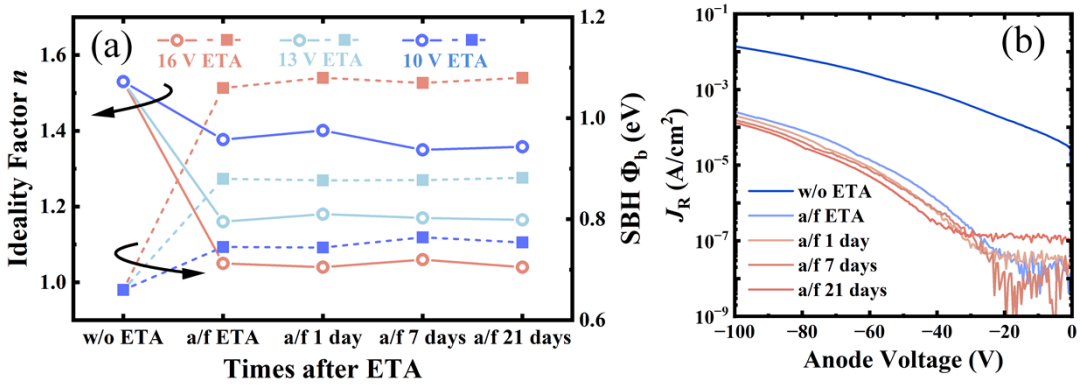

Fig. S2. (Color online) (a)The variation of the ideality factor, SBH and (c) the leakage current of Sample 3 with various degrees of ETA process and endurance tests up to 21 days after ETA in an idle state.

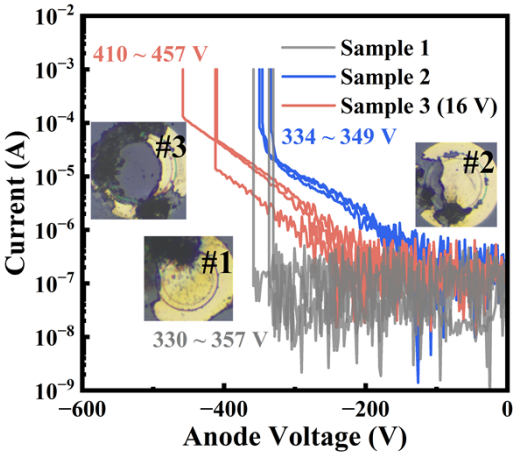

Fig. S3. (Color online) Reverse breakdown I–V characteristics of three types of samples and optical micrographs after the catastrophic breakdown measurement. Sample 1 shows premature breakdown characteristics at a low reverse bias due to surface contaminations.

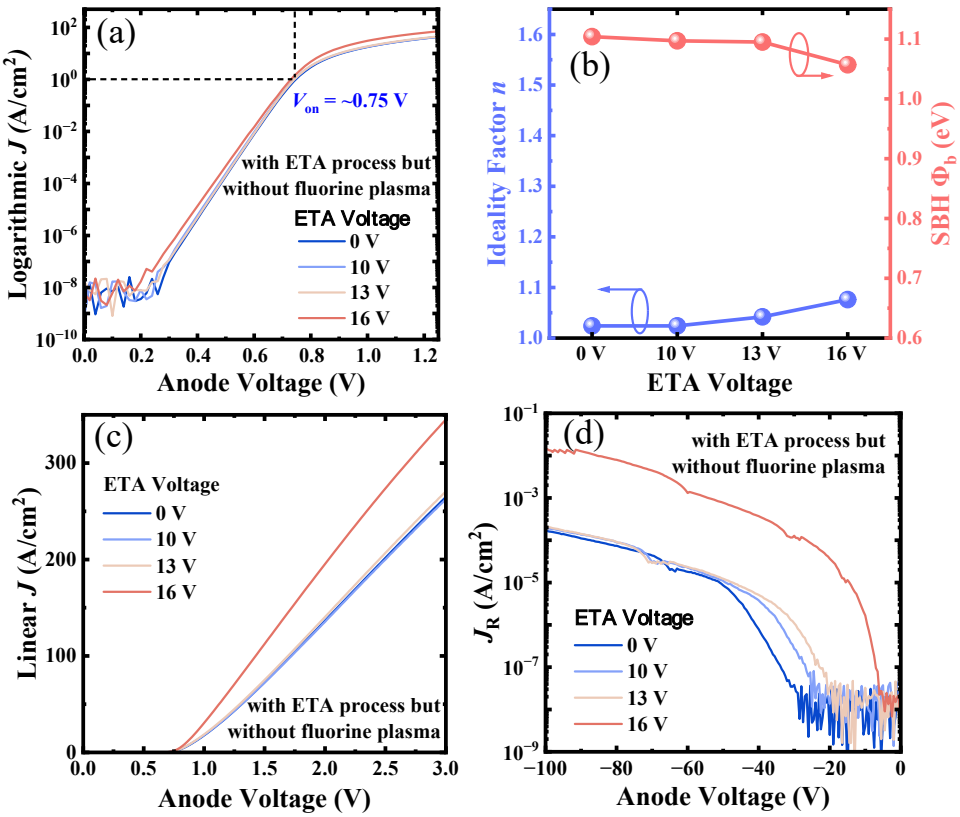

Fig. S4. (Color online) (a)Semi-logarithmic forward I–V characteristics and (b)extracted ideality factor n and Φ_b of the sample with various ETA voltages but without fluorine treatment; (c)linear forward and (d)reverse I–V characteristics of this sample with different ETA voltages. Compared to the sample subjected to both fluorine plasma treatment and the ETA process (Fig. S1), the sample with ETA process only exhibits degraded characteristics, as evidenced by an increased ideality factor and higher leakage current.

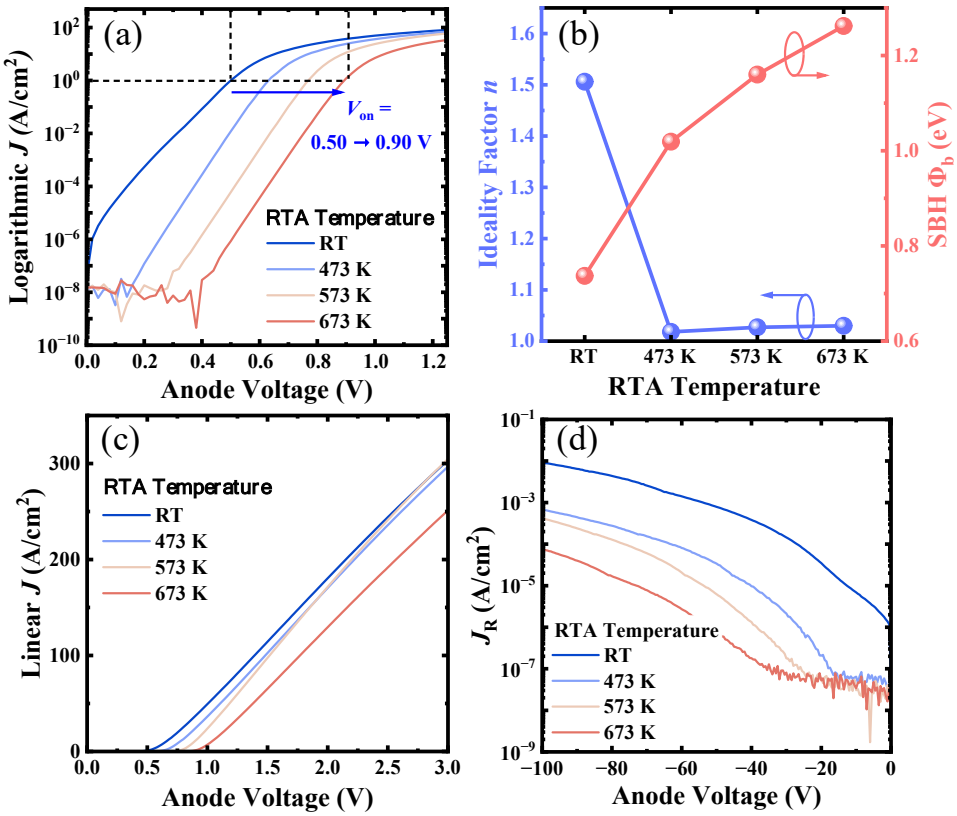

Fig. S5. (Color online) (a)Semi-logarithmic forward I–V characteristics and (b)extracted ideality factor n and Φ_b of the sample with RTA process for 30 seconds followed fluorine treatment; (c)linear forward and (d)reverse I–V characteristics of this sample with different ETA voltages.

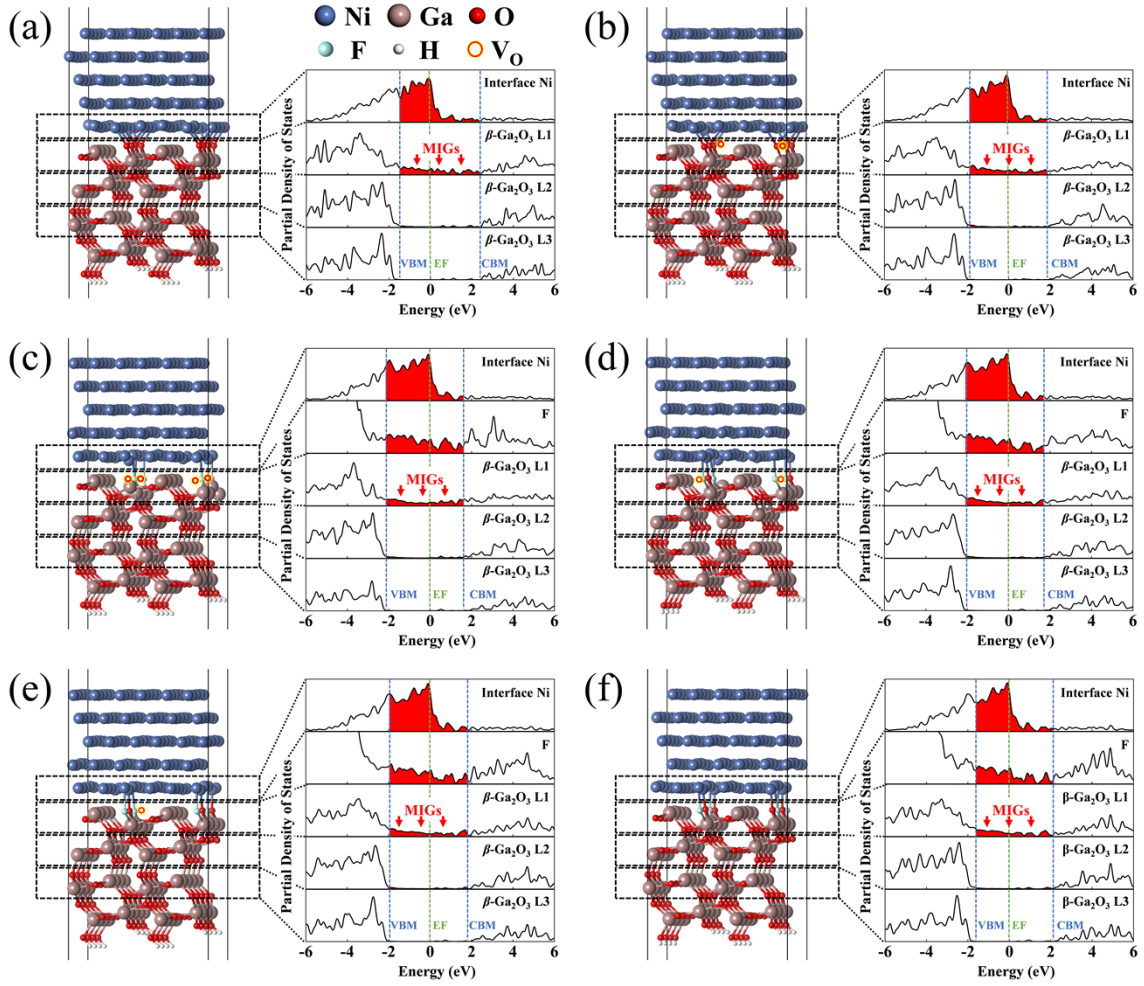

Fig. S6. (Color online) Layer-resolved PDOS of individual layers of different Ni/β-Ga_2O_3(001) interfaces with (a)100% O; (b)75% O and 25% V_O; (c)50% F_O and 50% V_O; (d)50% F_O, 25% O and 25% V_O; (e)50% F_O, 37.5% O and 12.5% V_O and (f)50% F_O and 50% O at the interface.

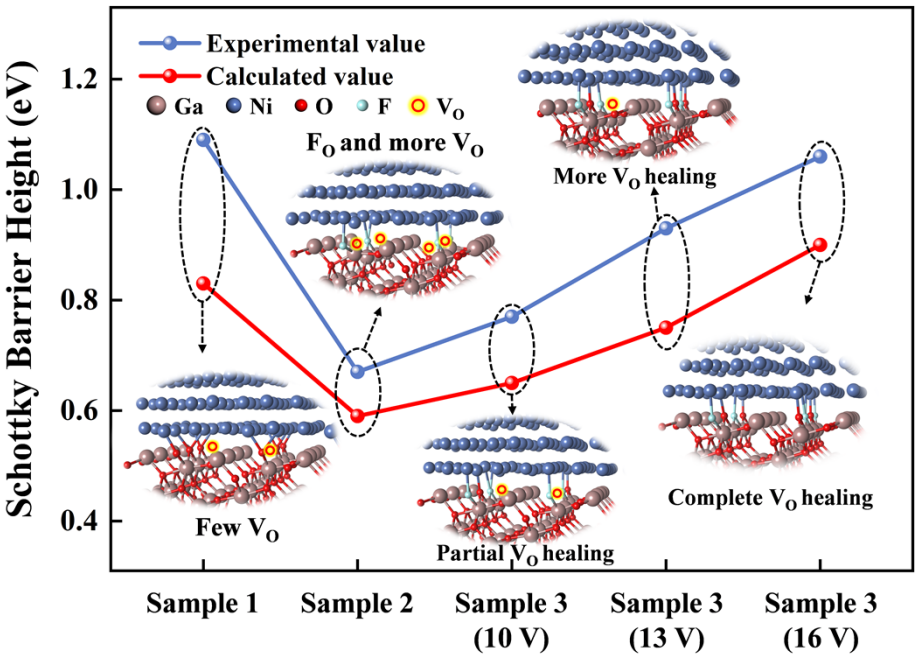

Fig. S7. (Color online) Schottky barrier height of experimental and calculated values in different samples.