

Supplementary material

Immunosensor based on high performance dual-gate oxide semiconductor thin-film transistor for rapid detection of SARS-CoV-2

Jingyu Kim^{‡a}, Sehun Jeong^{‡a}, Siracosit Sarawut^a, Haneul Kim^b, Seong Uk Son^{c,d}, Seungheon Lee^b, Gulam Rabbani^b, Hyunhwa Kwon^b, Eun-Kyung Lim^{c,d}, Saeyoung Nate Ahn^{b,e}, and Sang-Hee Ko Park^{*a}

J. Kim, S. Jeong, S. Sarawut, Prof. S.-H. K. Park*

^aDepartment of Materials Science and Engineering, Korea Advanced Institute of Science and Technology (KAIST), 291 Daehak-ro, Yuseong-gu Daejeon, 34141, Republic of Korea

H. Kim, S. Lee, G. Rabbani, H. Kwon, S. N. Ahn

^bNano Diagnostics & Devices (NDD), Room B-312 IT, Medical Fusion Center, Gumidae-ro, 350-27, Gumi-si, Gyeongbuk, 39253, Republic of Korea

S. U. Son, E.-K. Lim

^cBioNanotechnology Research Center, Korea Research Institute of Bioscience and Biotechnology (KRIBB), 125 Gwahak-ro, Yuseong-gu, Daejeon, 34141, Republic of Korea

S. U. Son, E.-K. Lim

^dDepartment of Nanobiotechnology, KRIBB School of Biotechnology, University of Science and Technology (UST), 217 Gajeong-ro, Yuseong-gu, Daejeon, 34113, Republic of Korea

S. N. Ahn

^eFuzbien Technology Institute, 12111 Parklawn Drive, Lab 130, Rockville, MD 20852, USA

* Corresponding author E-mail: shkp@kaist.ac.kr (Sang-Hee Ko Park)

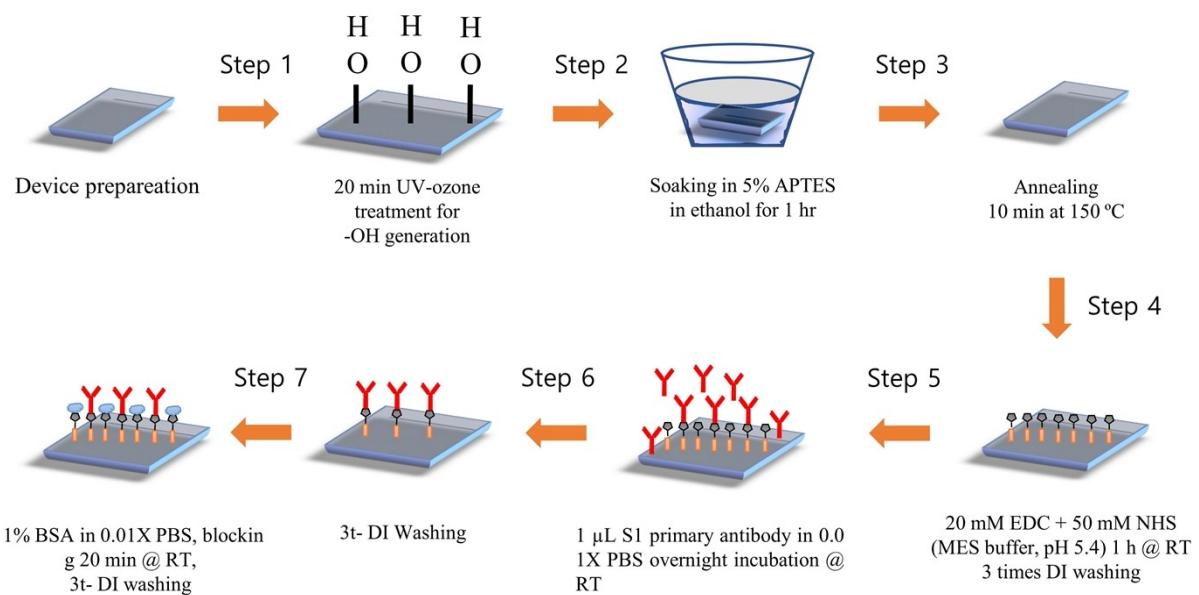


Fig. S1 A schematic illustration of the antibody immobilization process.

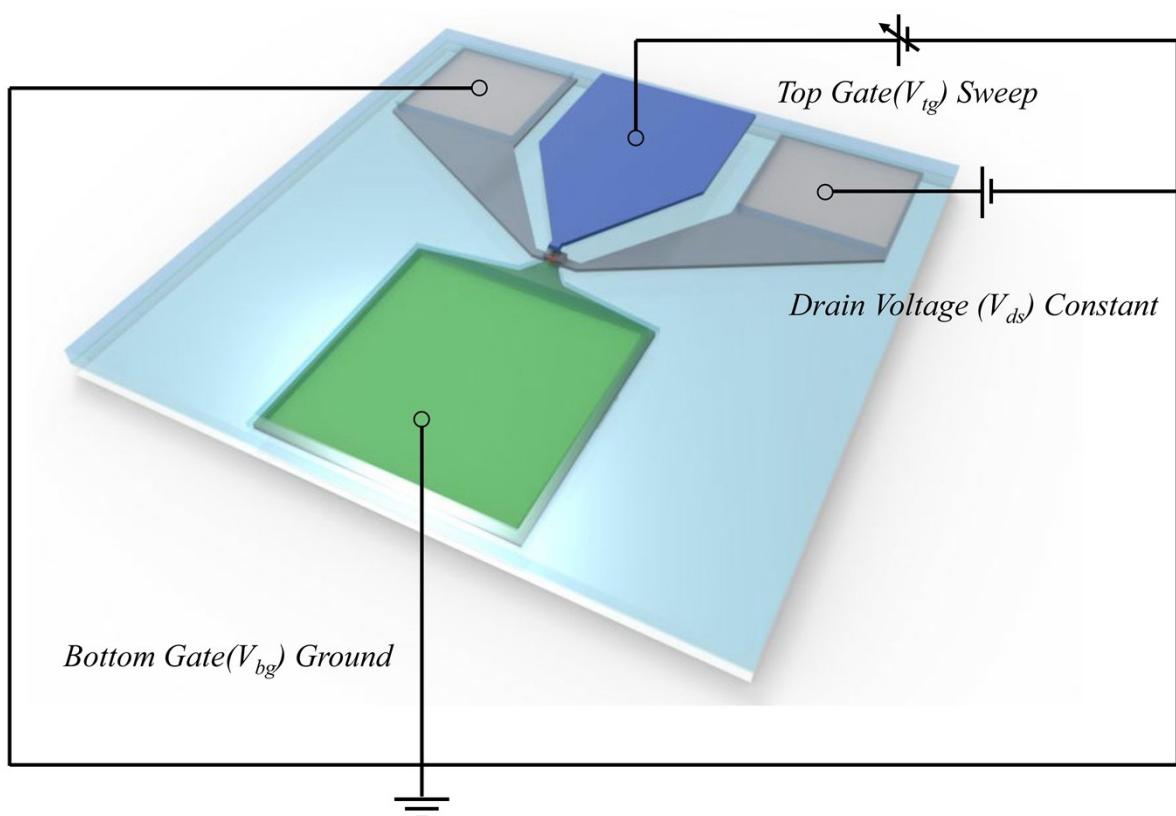


Fig. S2 Schematic diagram of I-V measurement for operating dual-gate oxide semiconductor thin-film transistor.

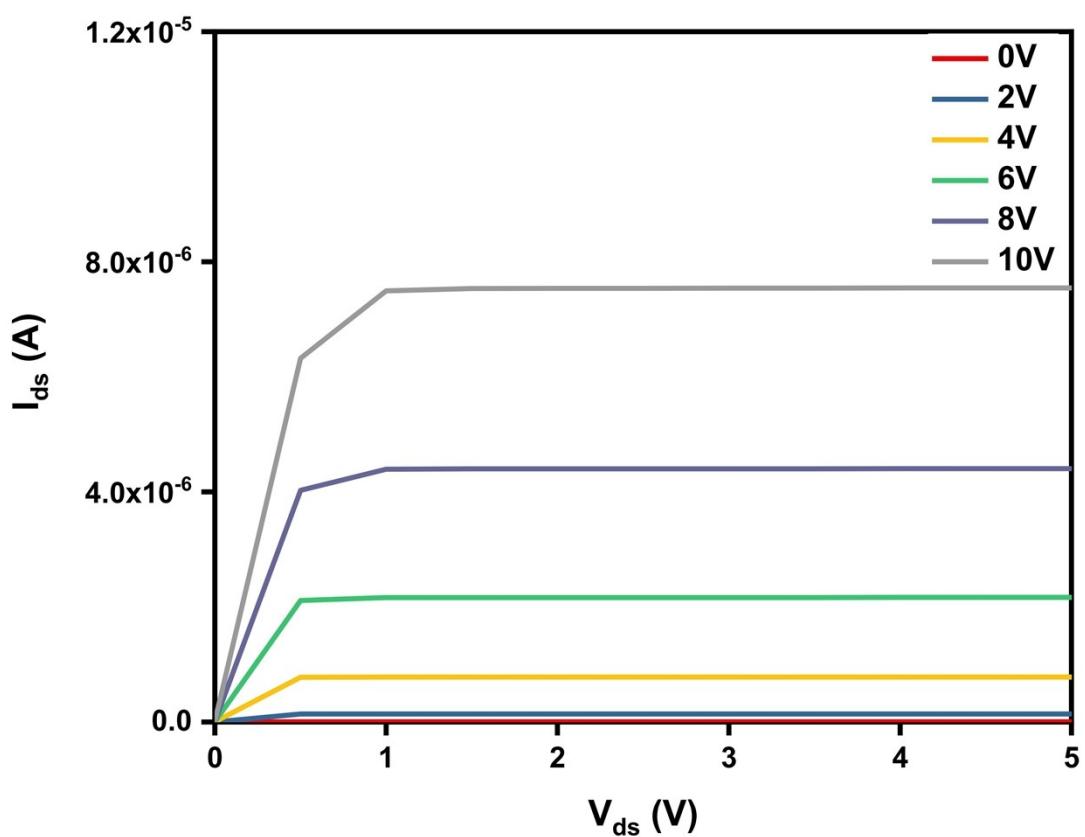
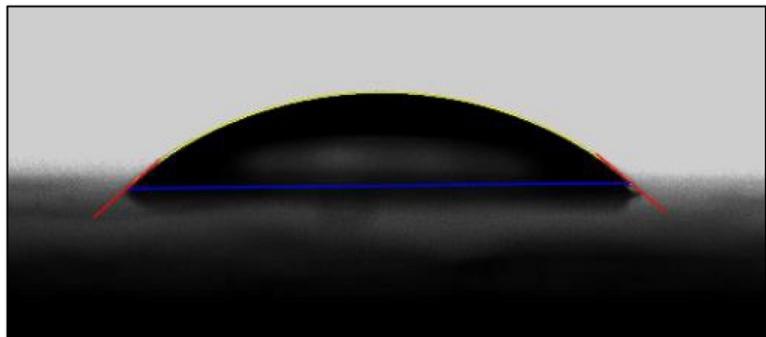


Fig. S3 Output curve ($V_{tg} = 0, 2, 4, 6, 8$ and 10 V) of dual-gate oxide semiconductor thin-film transistor.

a



b

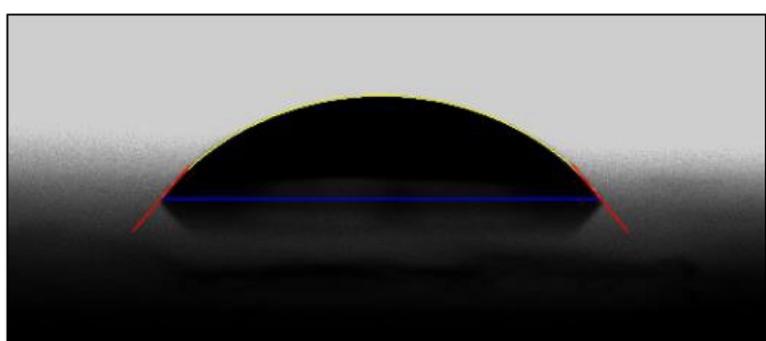


Fig. S4 Contact angle images of ITO sensing membrane (a) with and (b) without UV-ozone treatment.

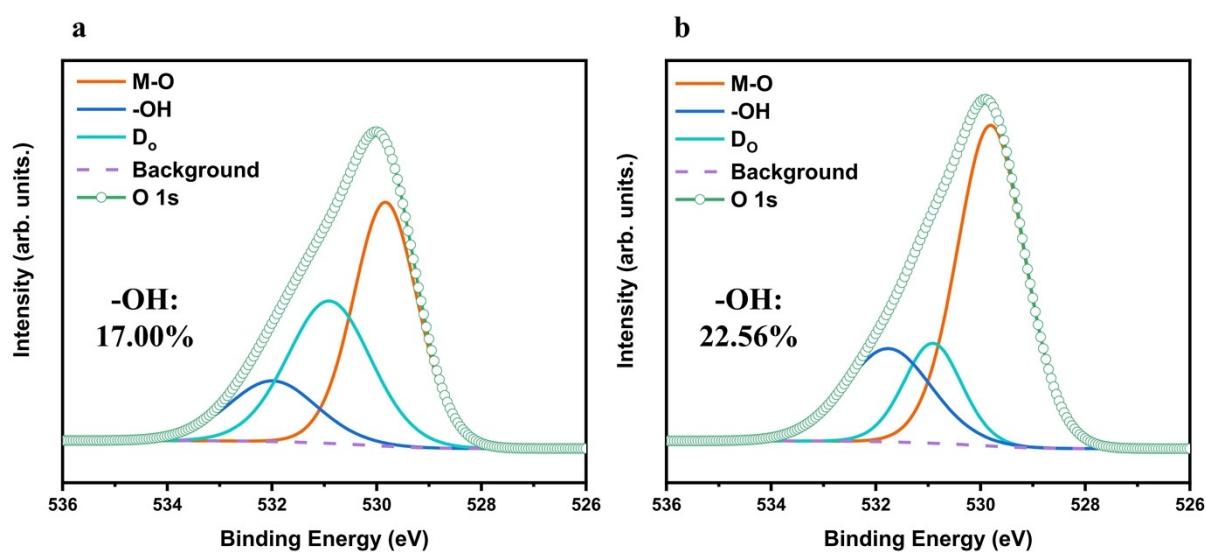


Fig. S5 Deconvolution of O 1s XPS spectrum in ITO sensing membrane (a) before and (b) after UV-ozone treatment.

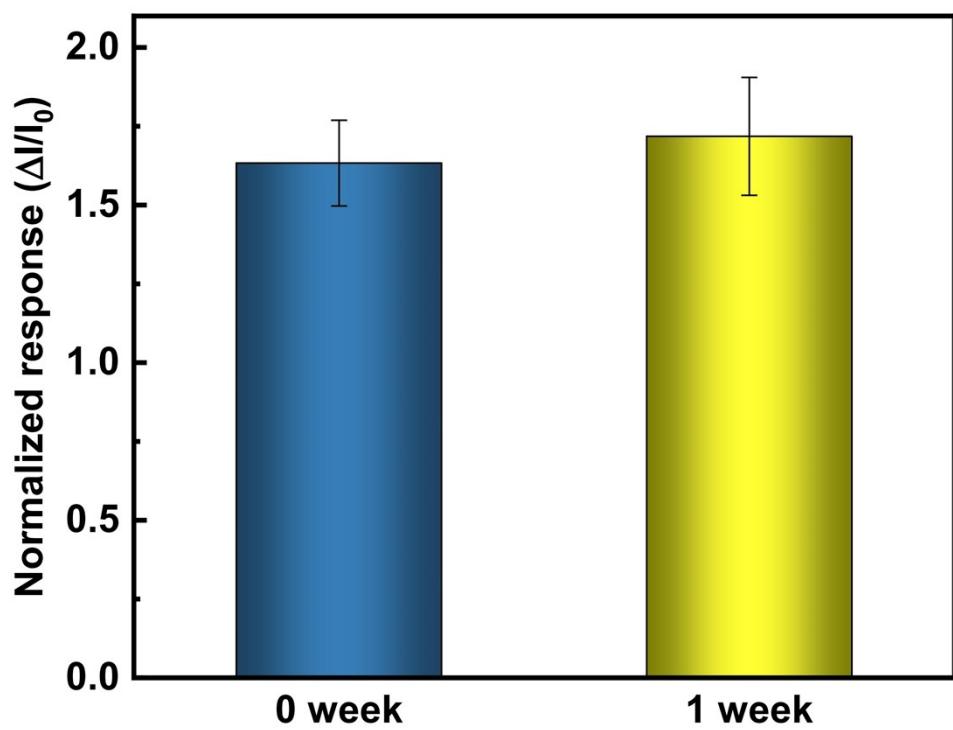


Fig. S6 Storage stability of the immunosensor for one week. (Storage temperature: 20 °C and concentration of SARS-CoV-2 spike protein S1: 1 pg/mL)

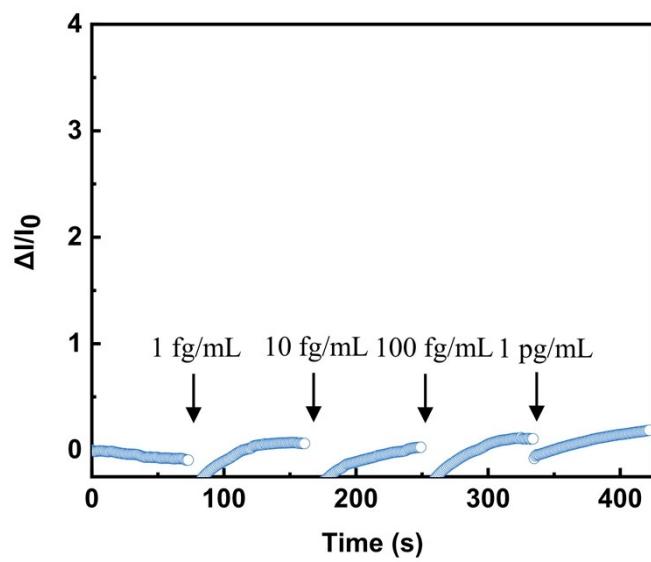


Fig. S7 Variations of drain current during real time detection to spike S1 protein of SARS-CoV-1 with increasing concentration; 1 fg/mL, 10 fg/mL, 100 fg/mL and 1 pg/mL.