

Supporting Information

Tunable Dielectric Properties of Parylene Dielectric Layer through Surface-Modulation by Click Chemistry

*Seong Cheol Jang^{‡a}, Gunoh Lee^{‡b}, Ilhoon Park^b, Byeongil Noh^b, Ji-Min Park^a, Jaewon Lee^b,
Kyung Jin Lee^{b,*}, and Hyun-Suk Kim^{a,*}*

^a Department of Energy and Materials Engineering, Dongguk University, 04620, Republic of Korea, E-mail: khs3297@dongguk.edu

^b Department of Chemical Engineering and Applied Chemistry, College of Engineering, Chungnam National University, 34134, Republic of Korea, E-mail: kjlee@cnu.ac.kr

E-mail: kjlee@cnu.ac.kr, khs3297@dongguk.edu (H.-S. K.)

* Corresponding author

[‡] These authors contributed equally to this work

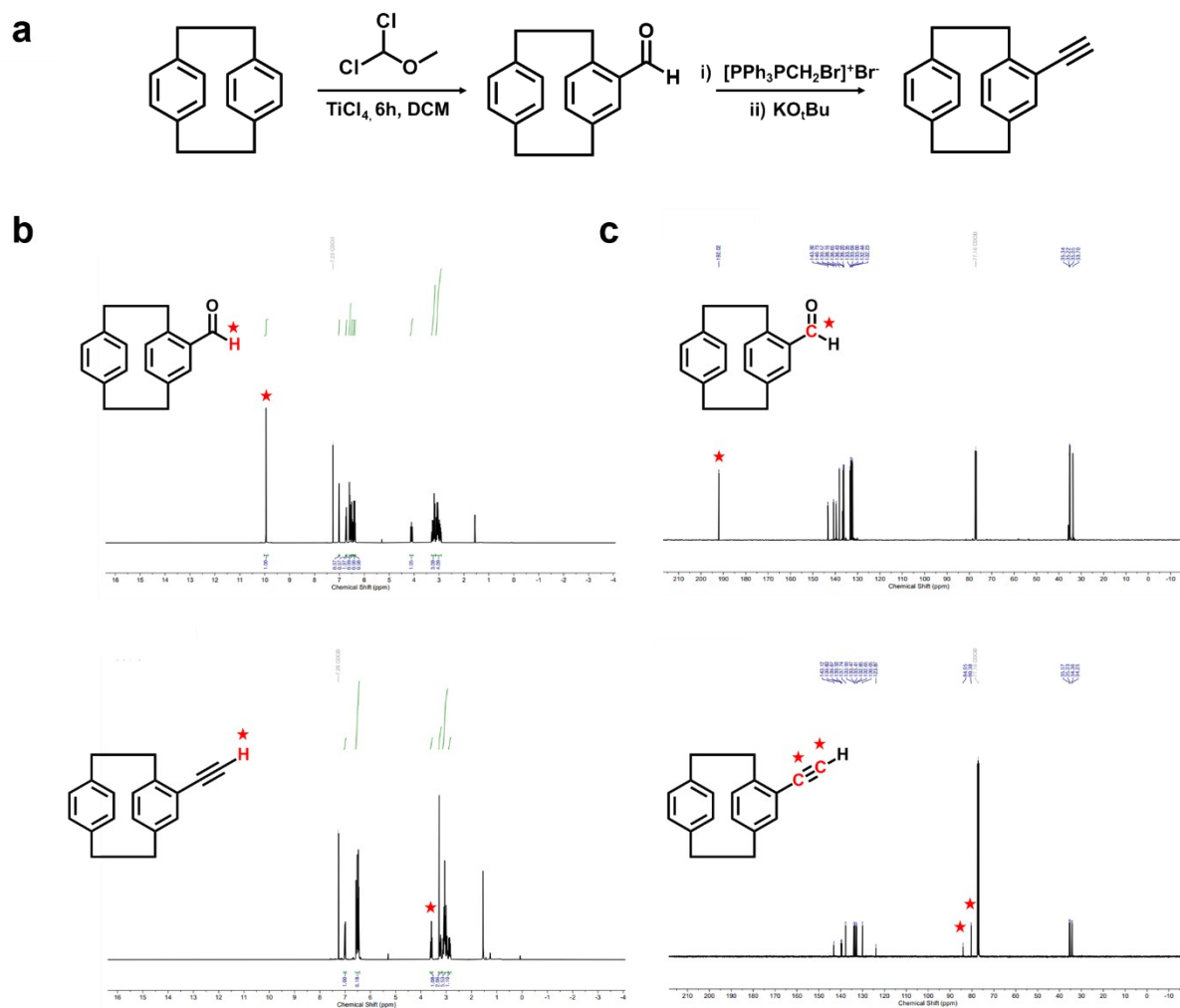


Fig. S1. a) Reaction scheme for synthesizing the 4-ethynyl[2.2]paracyclophane, and its b) ^1H NMR, c) ^{13}C NMR spectra.

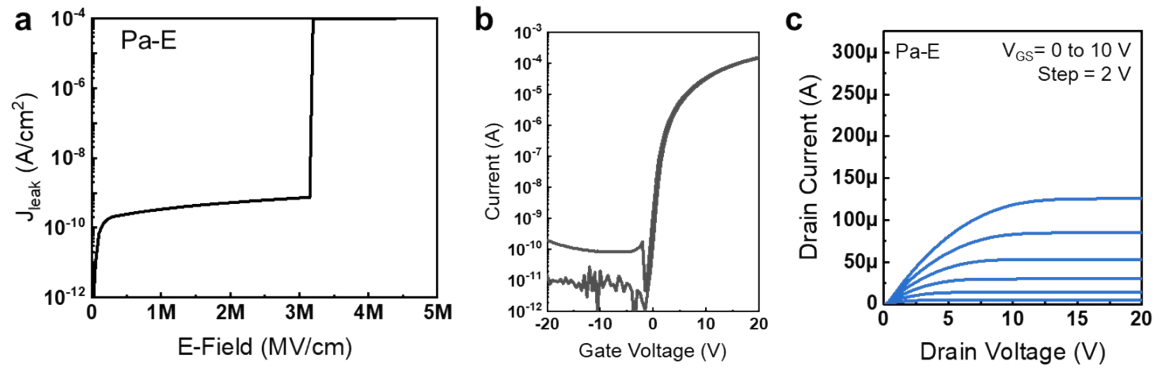


Fig. S2. a) Electrical property of Pa-E thin-film. b) Hysteresis behavior and c) output curves of IGZO TFTs with Pa-E gate dielectric.

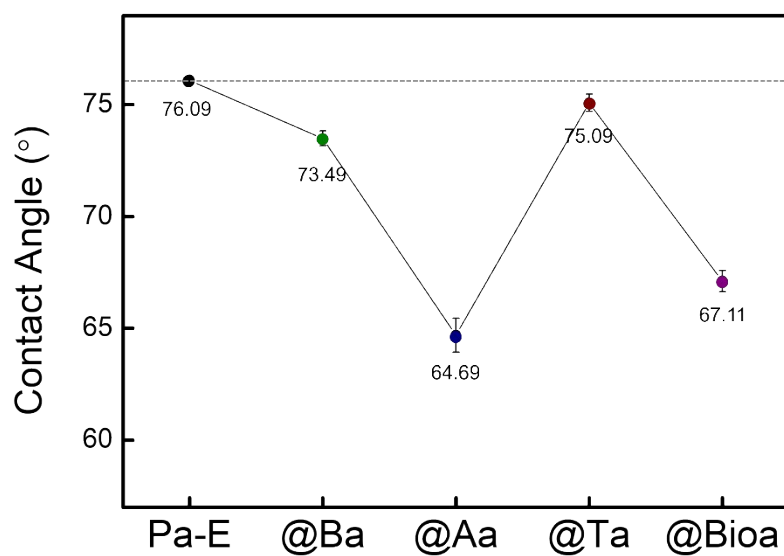
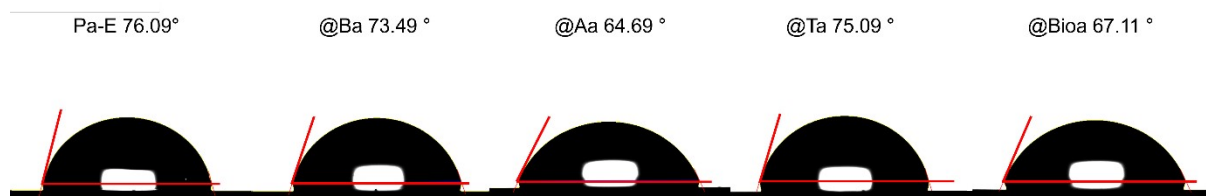


Fig. S3. Contact angle results showing different surface properties against water after surface-click reaction.

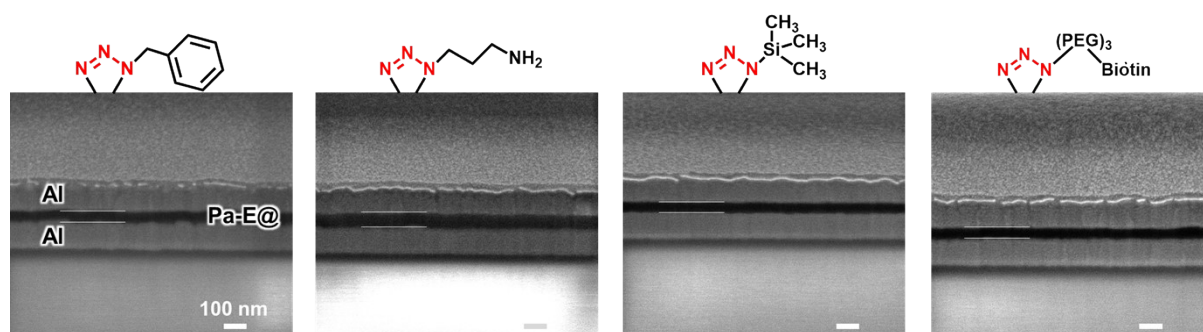


Fig. S4. Cross-sectional FIB-SEM images of MIM devices fabricated by clicked parylene.

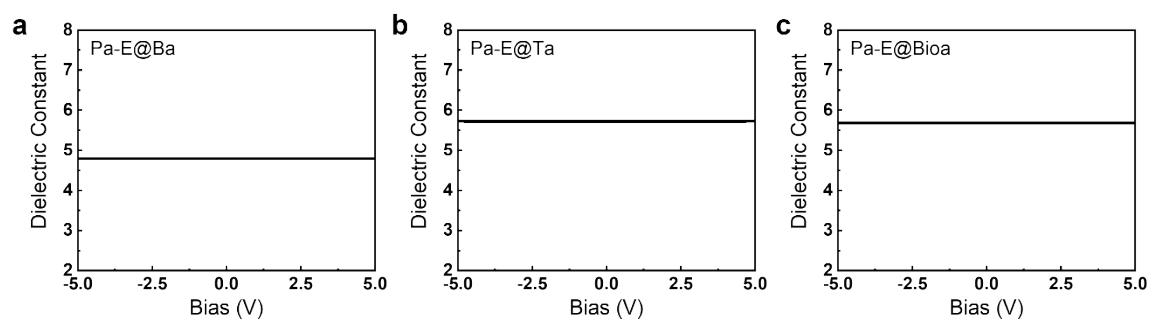


Fig. S5. Dielectric properties of Pa-E with a) Ba, b) Ta, and c) Bioa modulator.

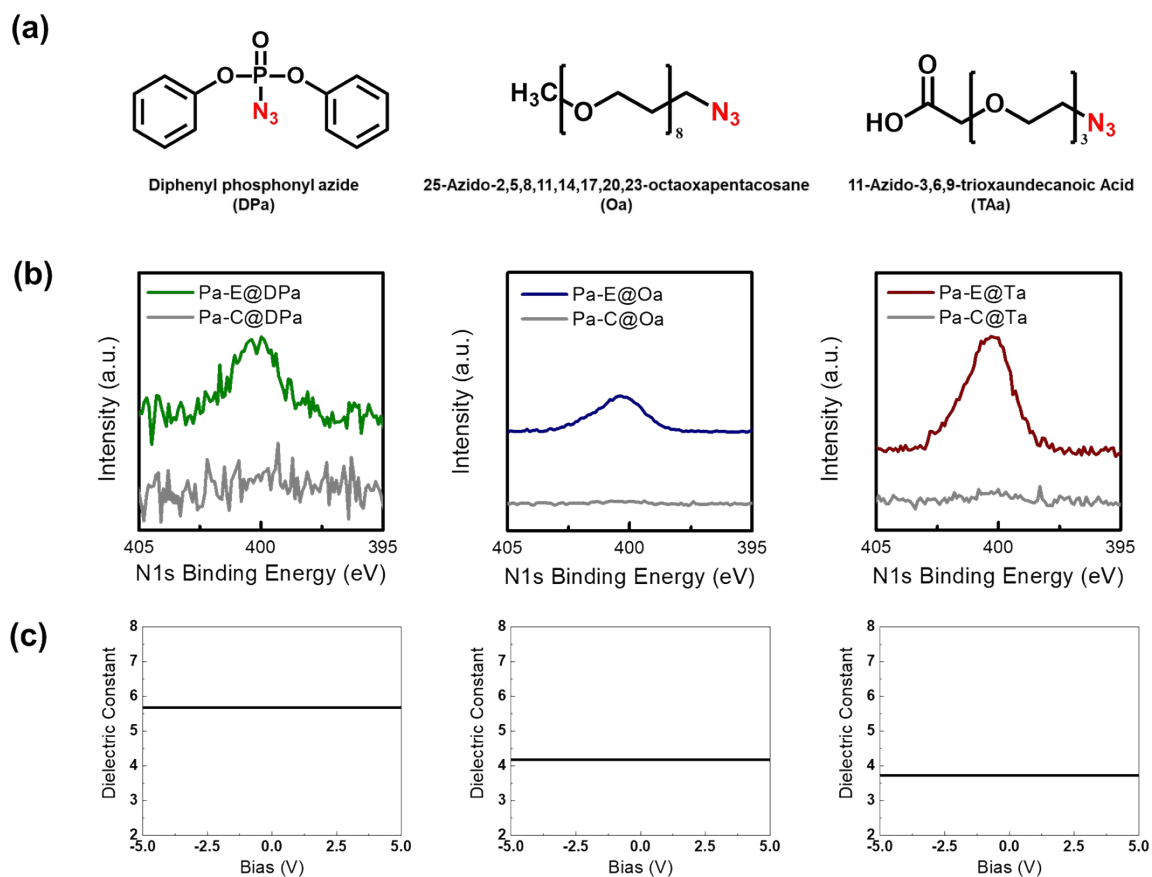


Figure S6. a) Candidate modulators that can be used in this system, b) N1s narrow scan of XPS demonstrating the successful click reaction with Pa-E, c) Changes in the dielectric properties of the material after reaction with these modulators.

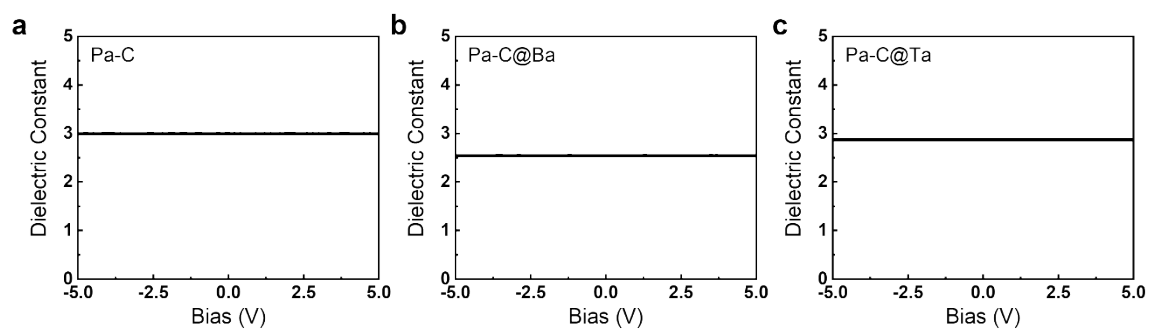


Fig. S7. Dielectric properties of parylene-C a) before and after click reaction with b) Ba, and c) Ta.

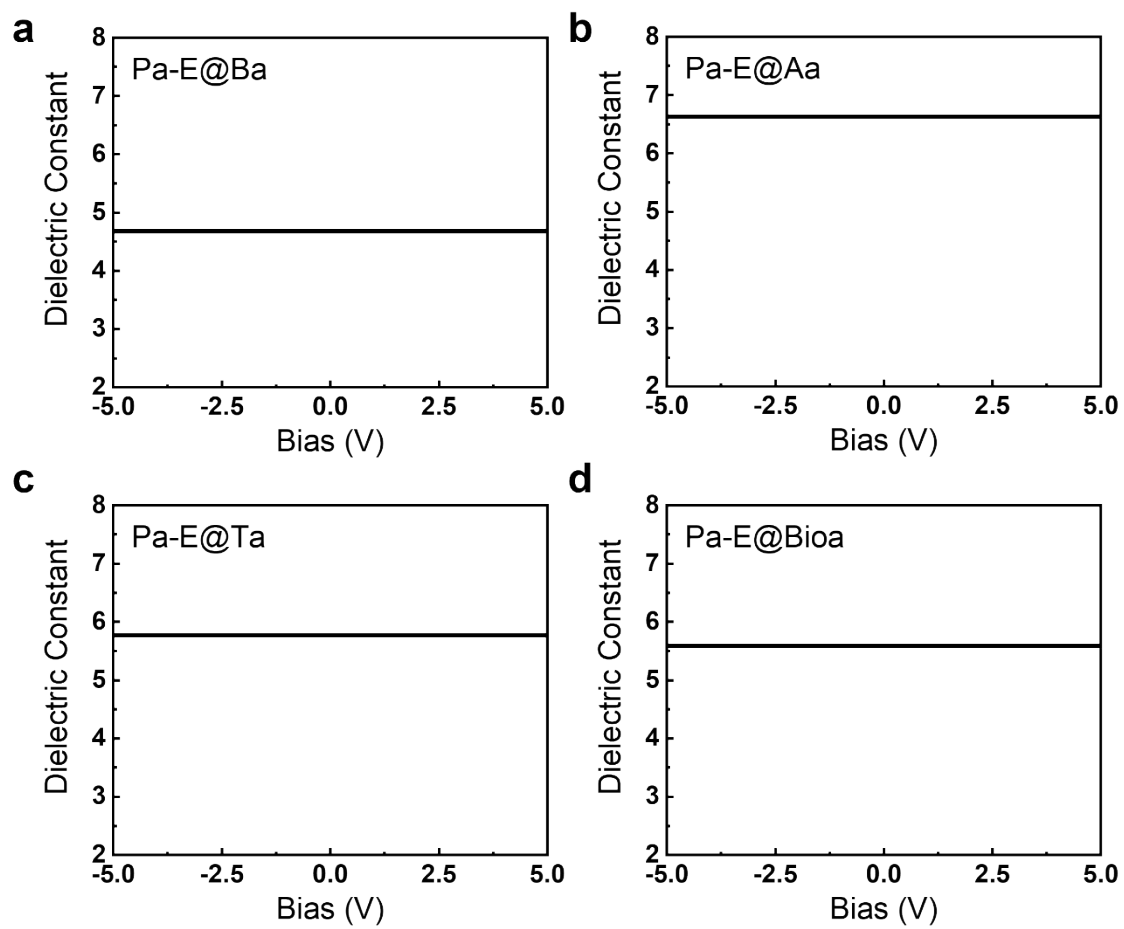


Fig. S8. Dielectric properties of Pa-E with modulators: a) Ba, b) Aa, c) Ta, and d) Bioa, after 1 month of storage in air at ambient conditions.

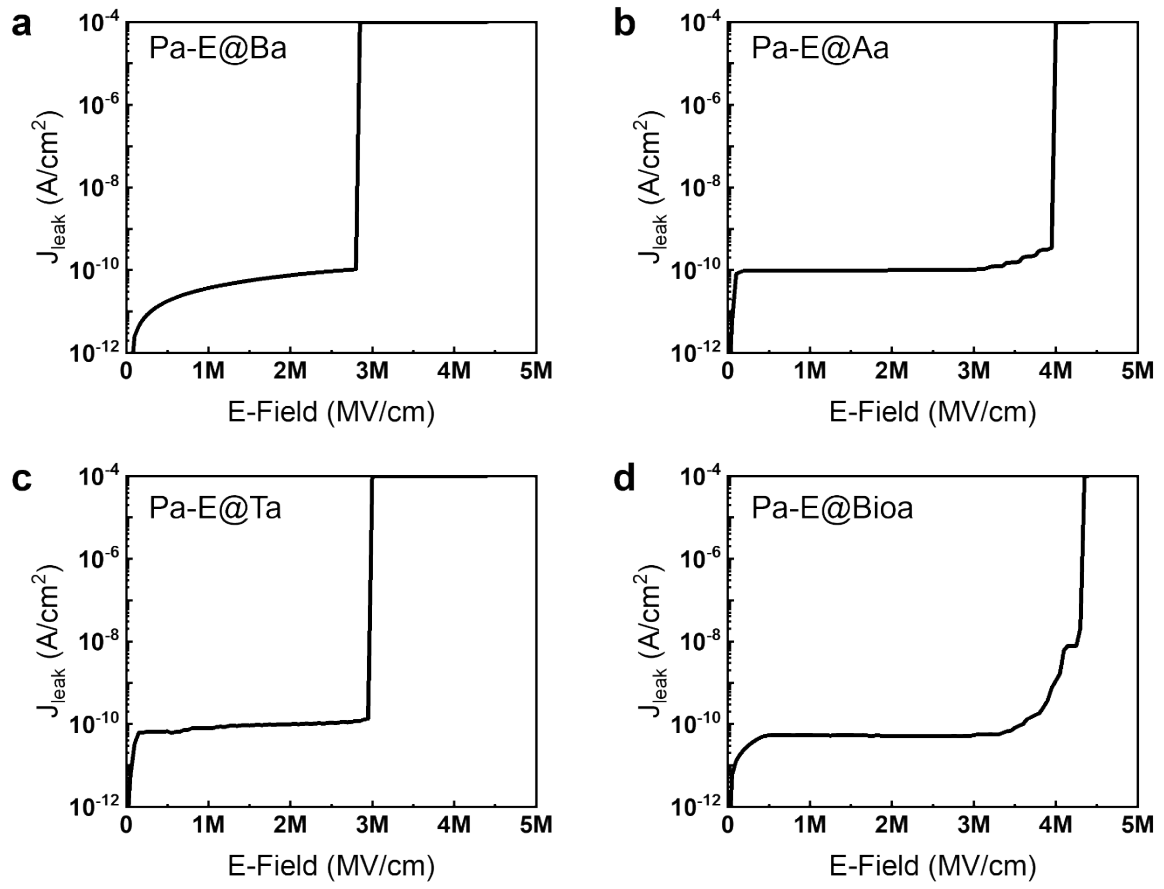


Fig. S9. Electrical properties of Pa-E surface modulated by a) Ba, b) Aa, c) Ta, and d) Bioa.

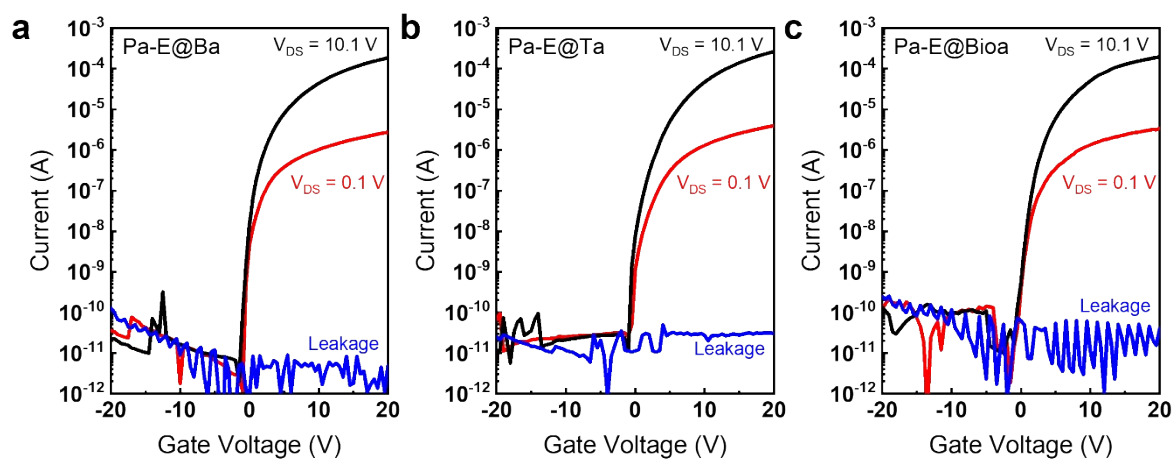


Fig. S10. IGZO TFTs with Pa-E gate dielectric tuned by a) Ba, b) Ta, and c) Bioa modulator.

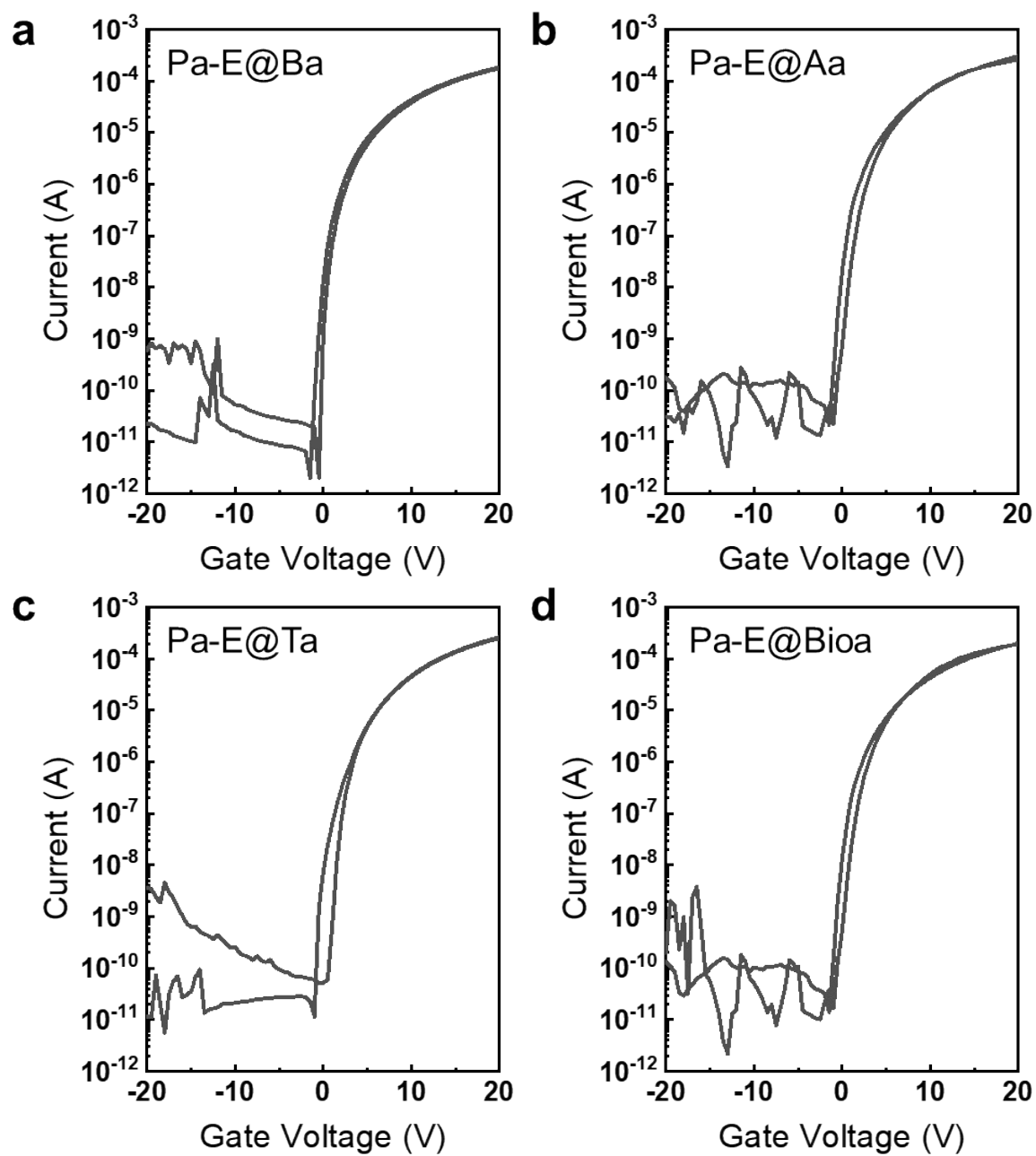


Figure S11. Hysteresis behavior of IGZO TFTs with Pa-E modulated by a) Ba, b) Aa, c) Ta, and d) Bioa

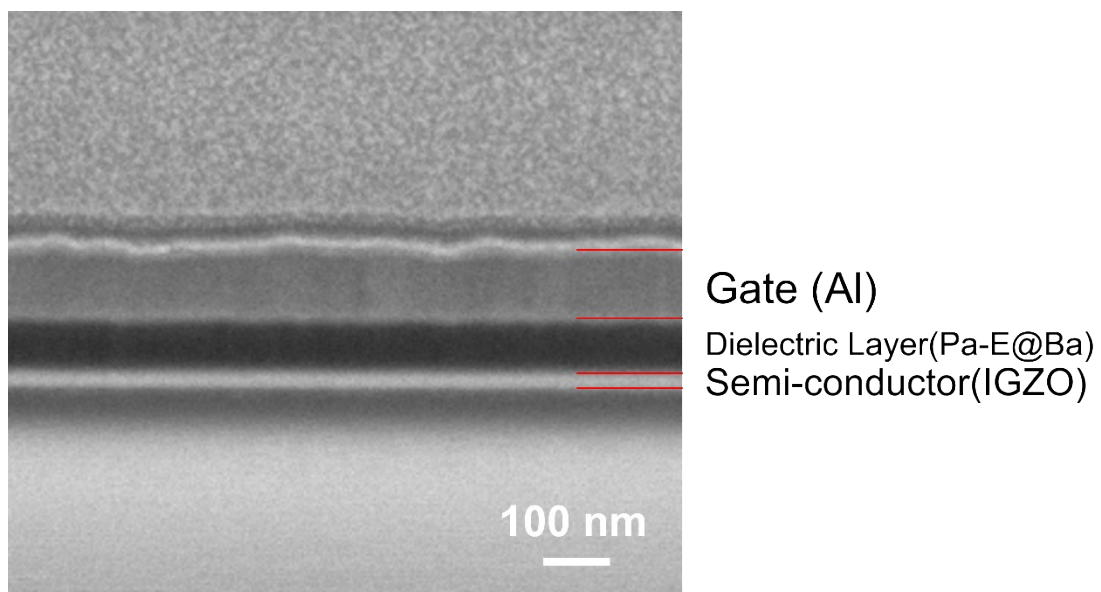


Fig. S12. Cross-sectional image of oxide TFTs with surface-modulated dielectrics.

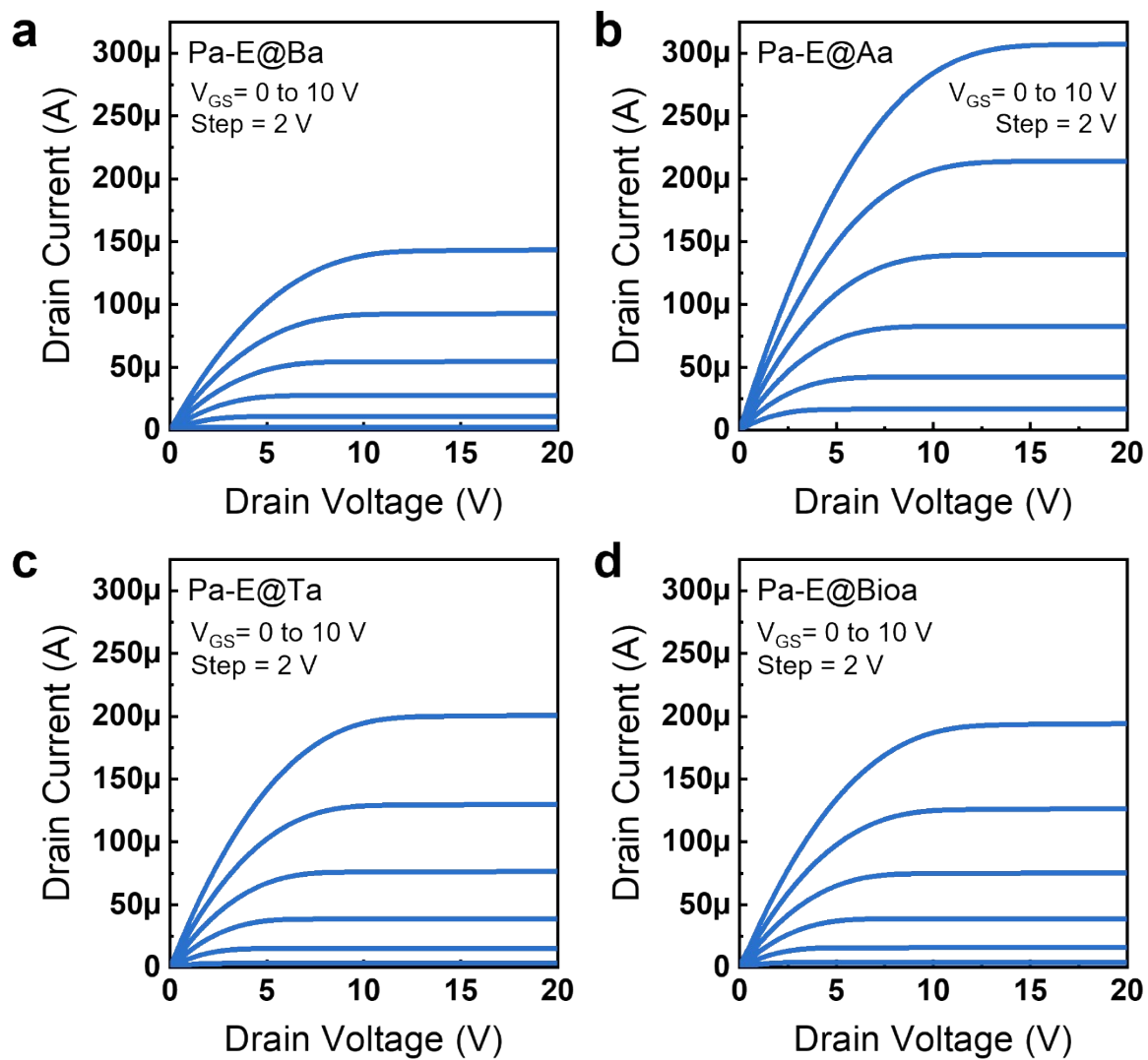


Fig. S13. Output curves of IGZO TFTs with Pa-E with a) Ba, b) Aa, c) Ta, and d) Bioa modulator.

Table S1. Summary of the information about the depth at which the click reaction occurred from ToF-SIMS data and their real thickness values calibrated by ellipsometric analysis

	Pa-E@Ba	Pa-E@Aa	Pa-E@Ta	Pa-E@Bioa
% of Click Depth [%]	1.65	0.61	1.13	0.65
Clicked Depth [nm]	2.95	1.04	1.94	1.09