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Supporting Information

Nanostructured Interfacial Dipole layers for High-Performance and Highly Stable Nonvolatile Organic Field-Effect Transistor Memory

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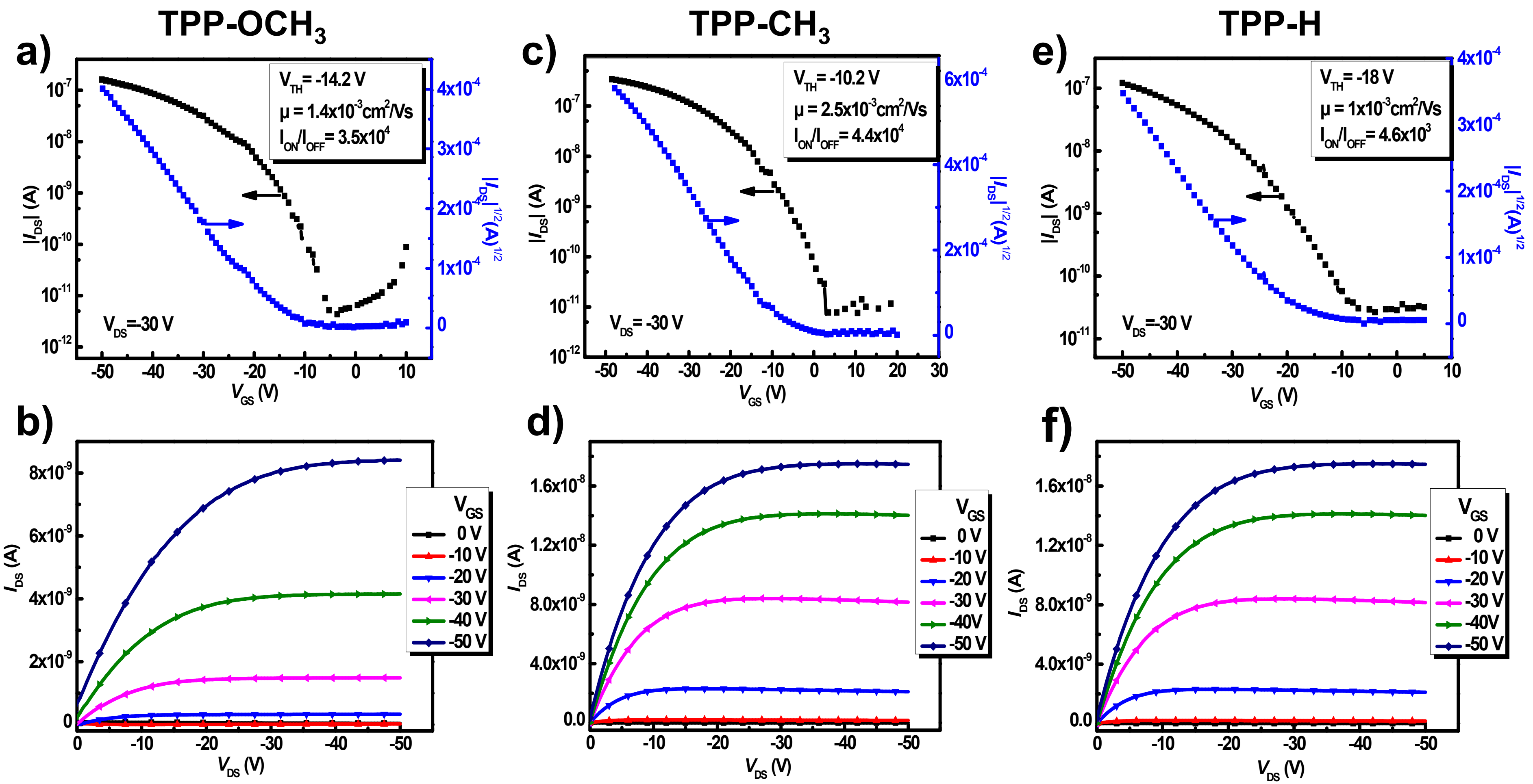

Figure S1. Transfer (a, c, e) and output (b, d, f) characteristics of TPP-OCH$_3$ (a, b), TPP-CH$_3$ (c, d) and TPP-H (e, f) film-based devices.

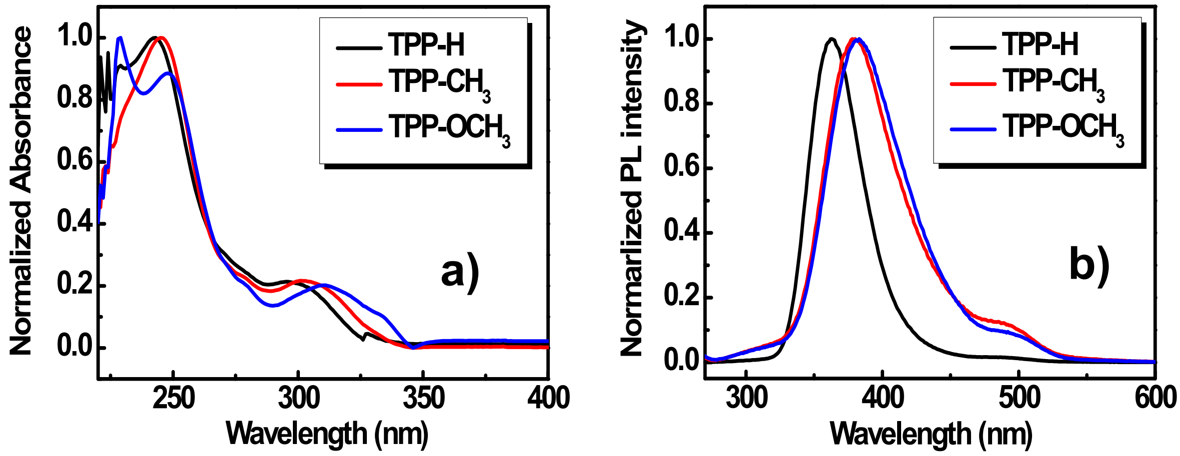

Figure S2. UV-visible absorption (a) and photoluminescence spectra (b) of pure TPP-H, TPP-CH_3 and TPP-OCH_3 films.

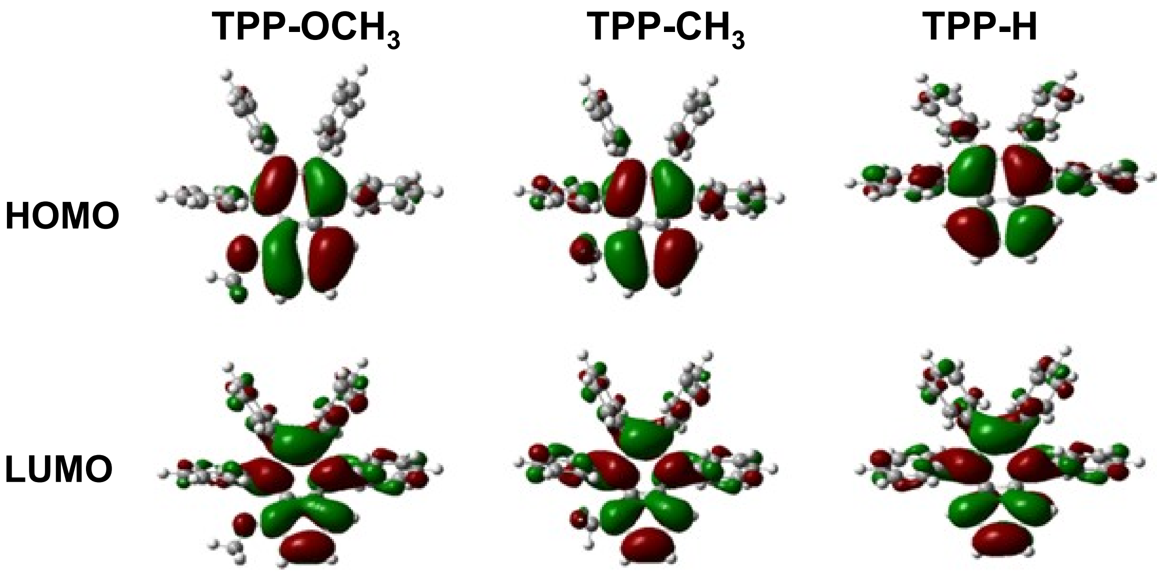

Figure S3. Theoretically calculated frontier molecular orbital picture of TPP-H, TPP-CH_3 and TPP-OCH_3, respectively (HOMO: Highest Occupied Molecular Orbital, LUMO: Lowest Unoccupied Molecular Orbital).

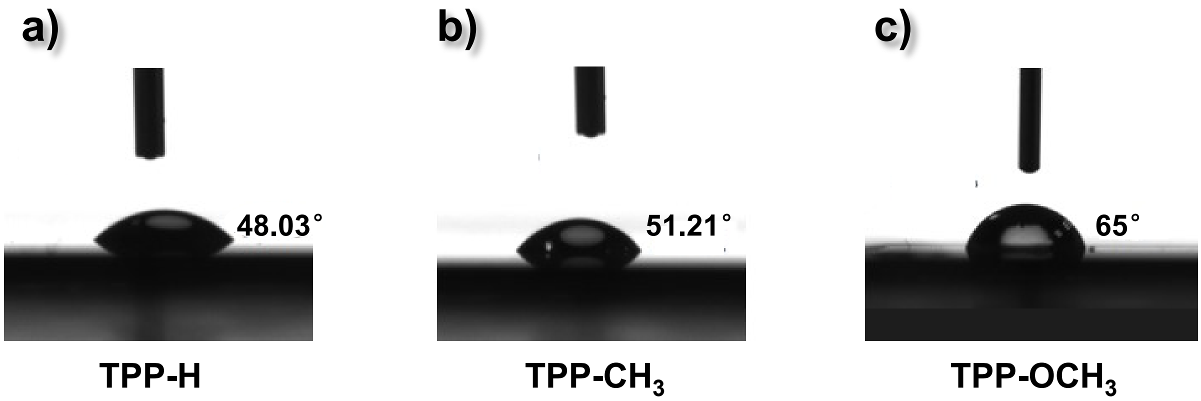

Figure S4. Water contact angle measurement of a) TPP-H, b) TPP-CH_3 and c) TPP-OCH_3 pristine films.

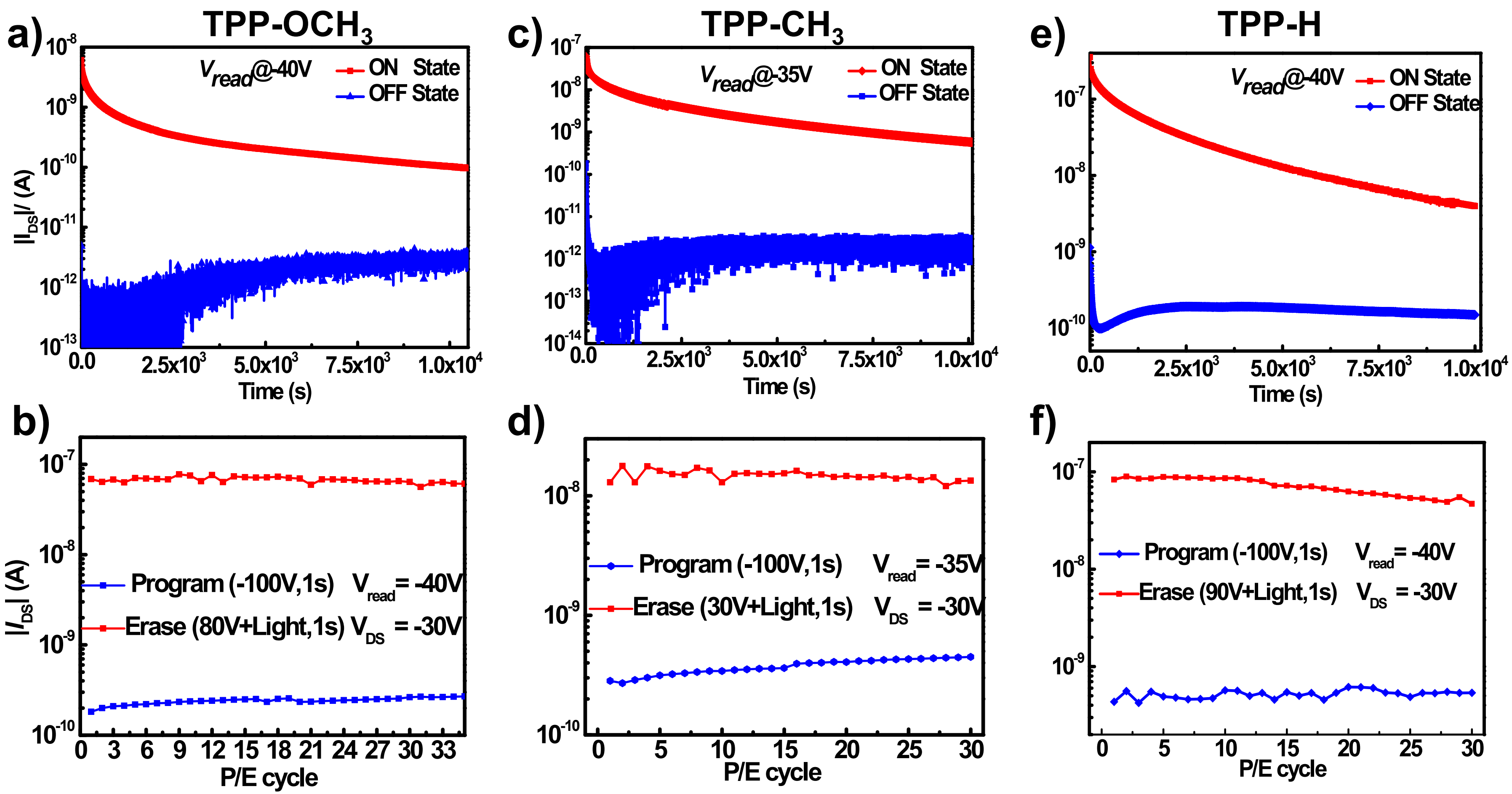

Figure S5. Retention characteristics (a, c, e) and switching cycles (b, d, f) of OFET memory devices with TPP-OCH_3, TPP-CH_3 and TPP-H film, repectively. Program operation: V_G = −100 V for 1 s, V_D = 0 V, under dark, for all devices; read operation: V_G = −40 V, V_D = −30 V, under dark, for TPP-OCH_3 and TPP-H film devices, V_G = −35 V, V_D = −30 V, under dark, for TPP-CH_3 film device; erase operation: V_G = 80 V, V_D = 0 V for TPP-OCH_3 film device, V_G = 30 V, V_D = 0 V for TPP-CH_3 film device, V_G = 90 V, V_D = 0 V for TPP-H film device, light illumination for 1 s for all film devices.

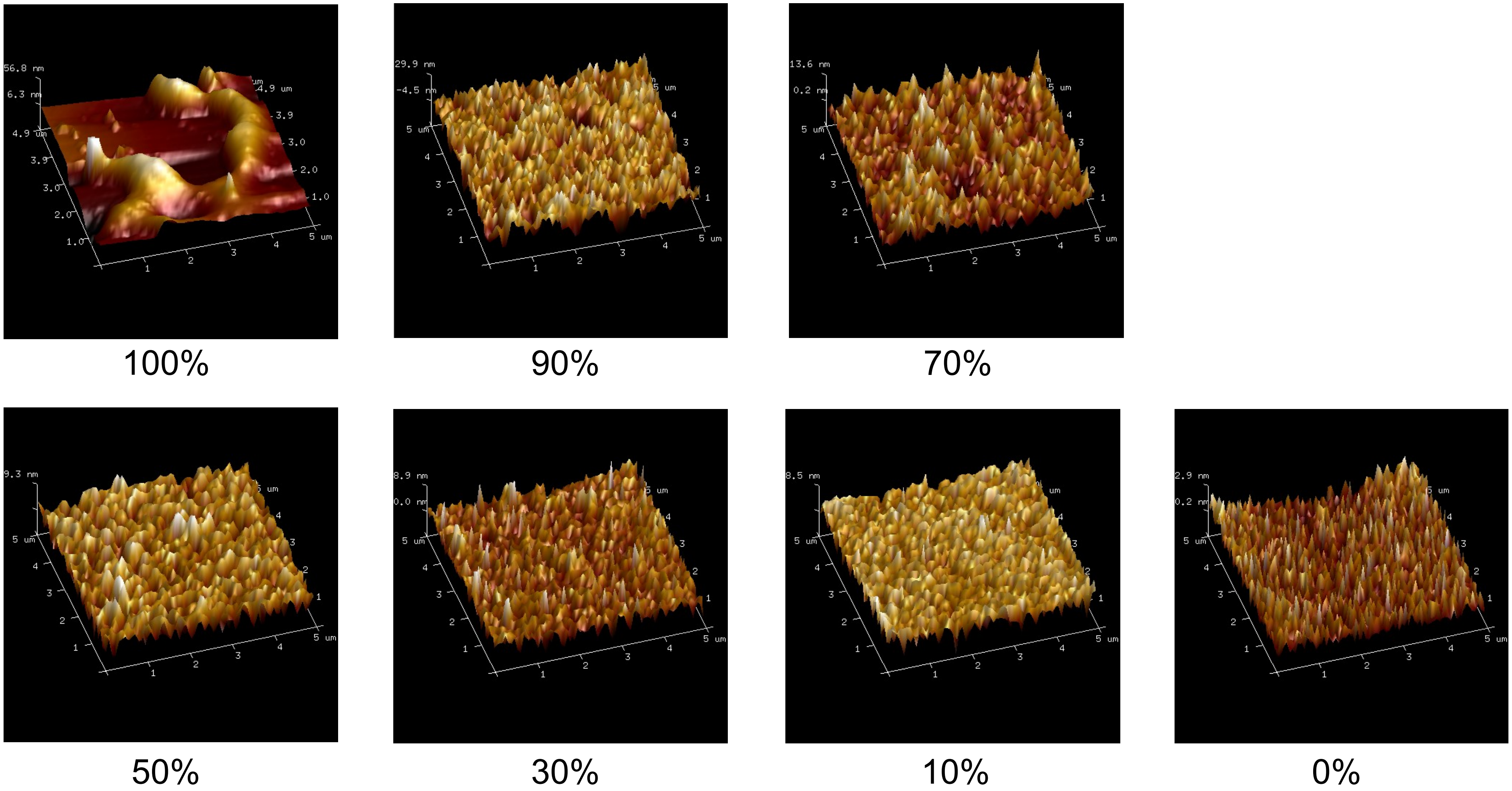

Figure S6. 3D AFM images of single PS film and TPP-OCH_3/PS blended with different mixing proportions.

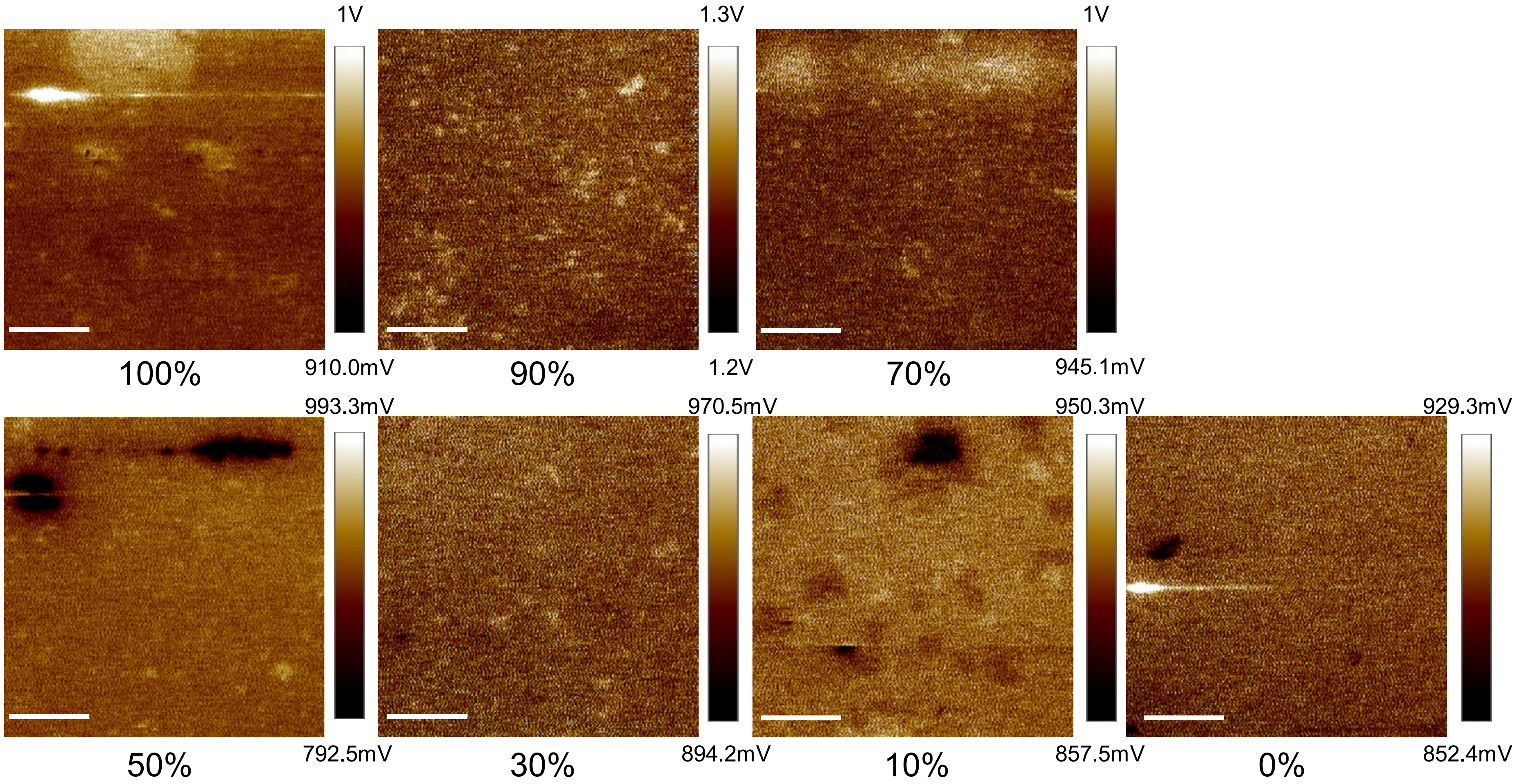

Figure S7. CPD images of single PS film and TPP-OCH_3/PS blended with different mixing proportions.

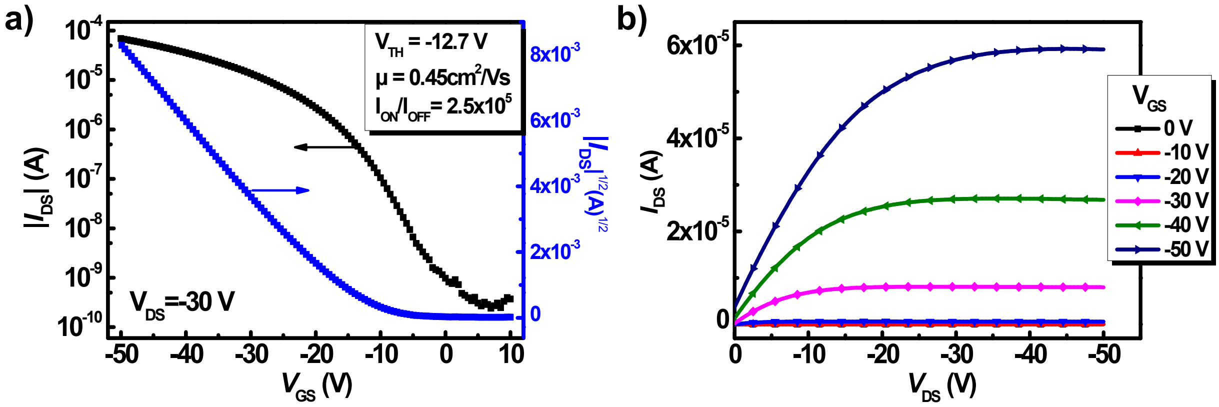

Figure S8. a) Transfer and b) output characteristics of pure PS film device.

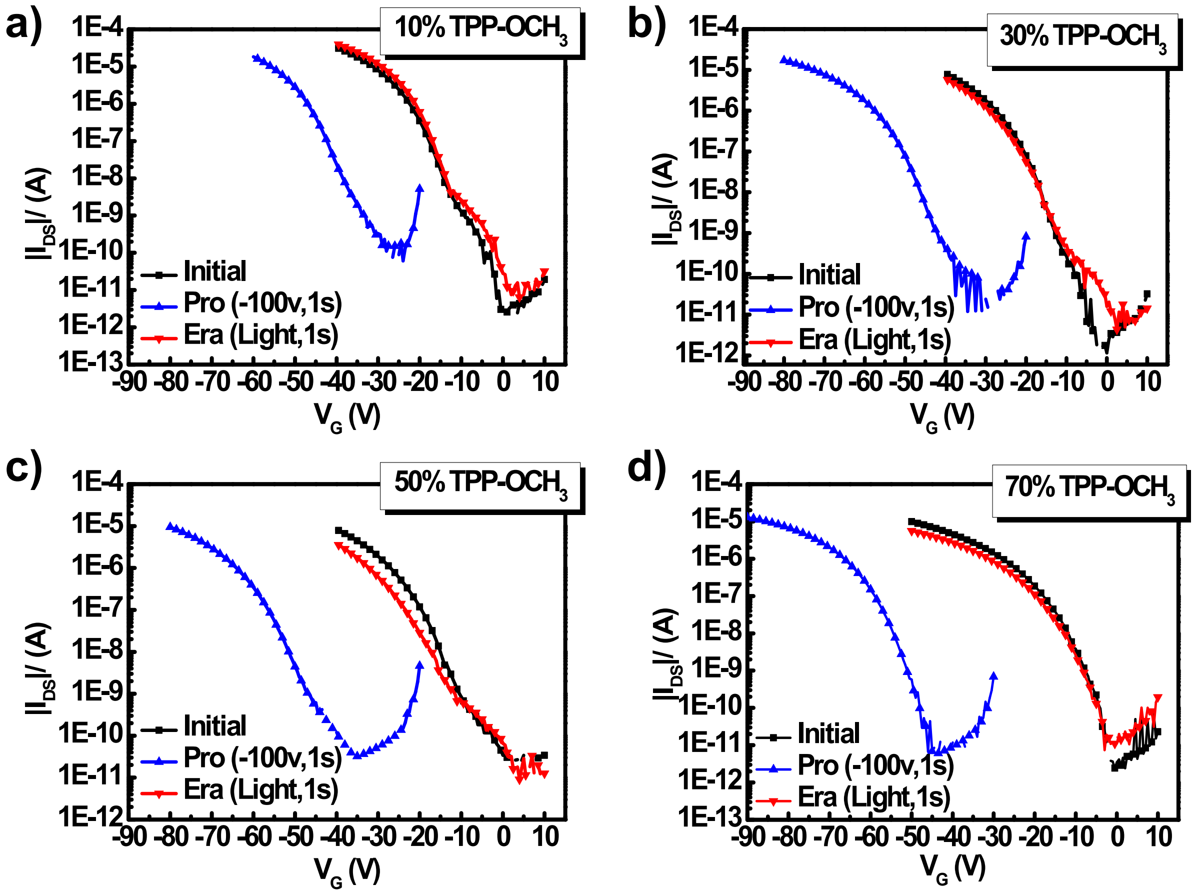

Figure S9. Transfer characteristics obtained in the dark after programming and erasing operations for TPP-OCH_3/PS NAs OFET memory devices with TPP-OCH_3 weight ratios of a) 10%, b) 30%, c) 50% and d) 70%. Program operation: V_G = −100 V, V_D=0 for 1 s; erase operation: light illumination for 1 s.

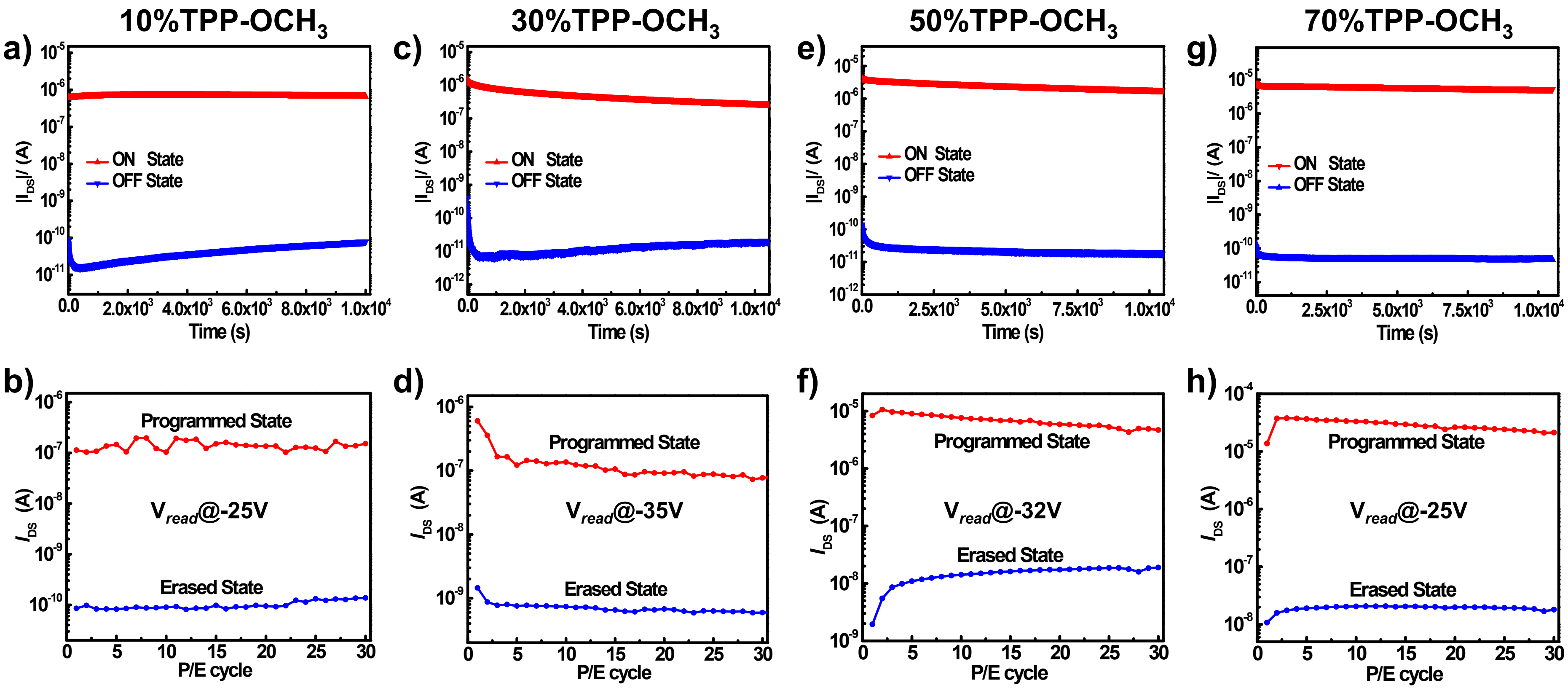

Figure S10. Retention characteristics (a, c, e, g) and switching cycles (b, d, f, h) of OFET memory NAs devices with TPP-OCH_3/PS blend ratios of 10% TPP-OCH_3 (a, b), 30% TPP-OCH_3 (c,d), 50% TPP-OCH_3 (e, f), 70% TPP-OCH_3 (g, h). Program operation: V_G = −100 V for 1 s, V_D = 0 V, under dark; read operation: V_G = −25,−35,−32,−25 V for 10%, 30%, 50% and 70% TPP-OCH_3 devices respectively, V_D = −30 V, under dark; erase operation: V_G = 0 V, V_D = 0 V, light illumination for 1 s.

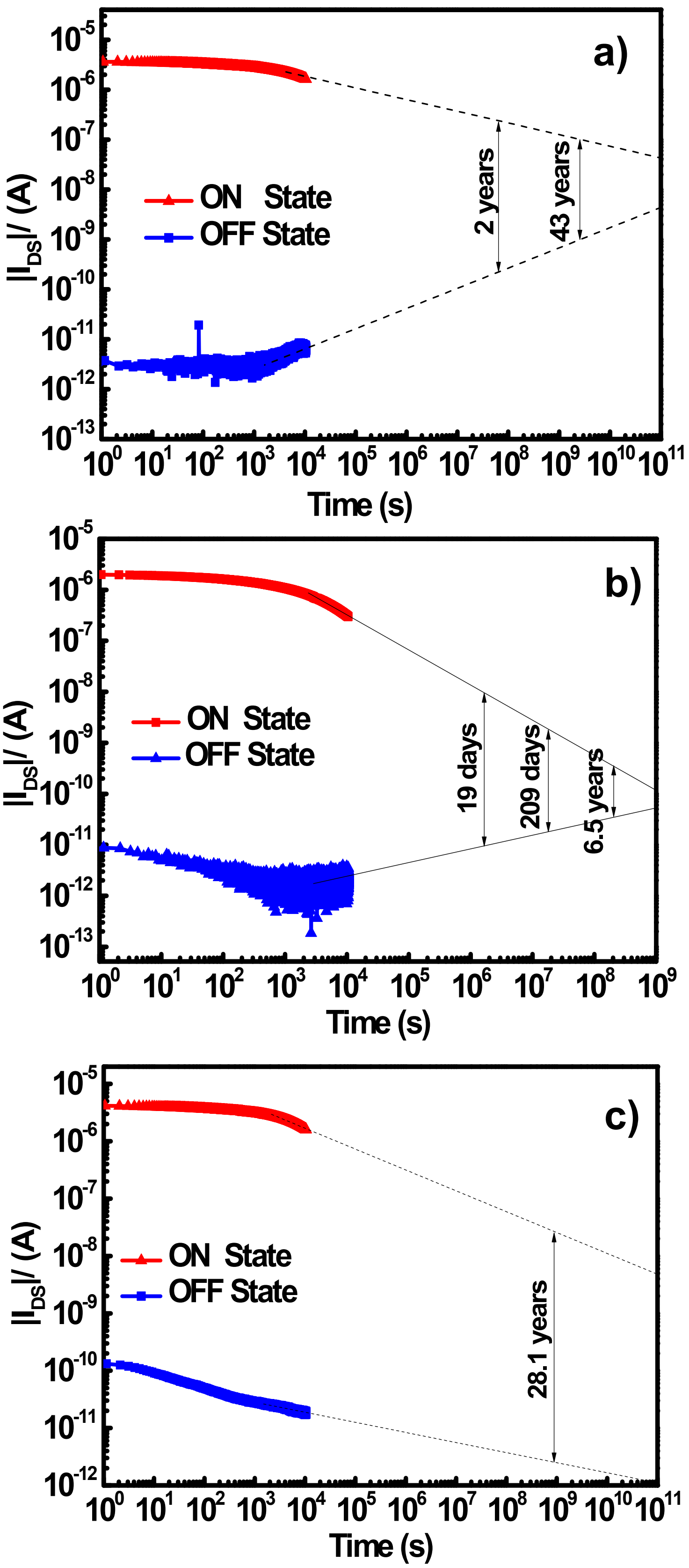

Figure S11. Extrapolation of the retention time of 90 wt% a) TPP-OCH_3, b) TPP-CH_3 and c) TPP-H NAs device.

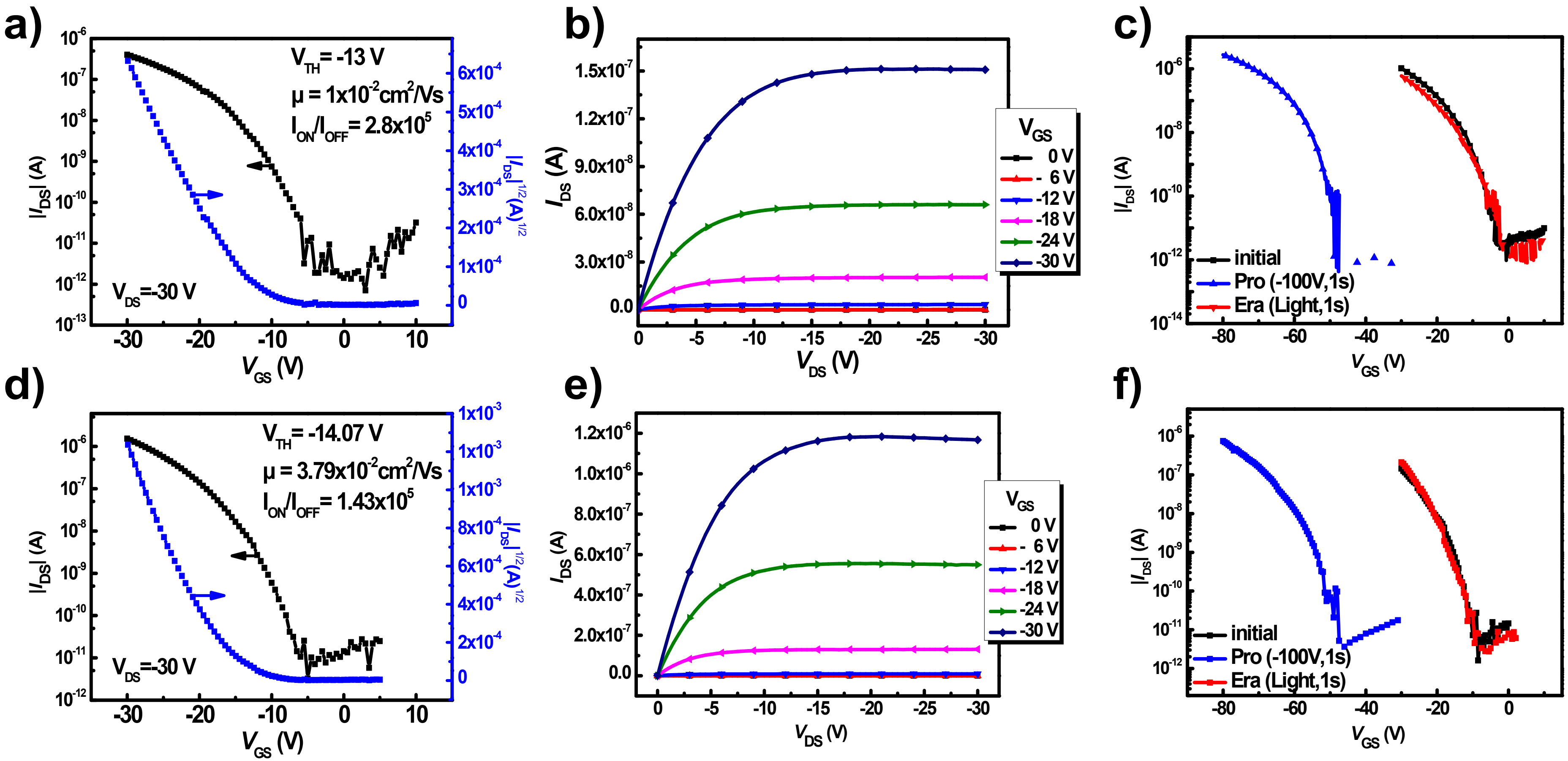

Figure S12. a) Transfer (a, d), output characteristics (b, e) and transfer characteristics (c, f) obtained in the dark after programming and erasing operations (c, f) for OFET memory NAs devices based on 90% TPP-CH_3 NAs film (a, b, c) and 90% TPP-H NAs film (d, e, f). Program operation: V_G = −100 V for 1 s; erase operation: light illumination for 1 s for both NAs devices, and V_G = 0 V, V_D=0 for TPP-CH_3 NAs device, V_G = 40 V, V_D = 0 for TPP-H NAs device, respectively.

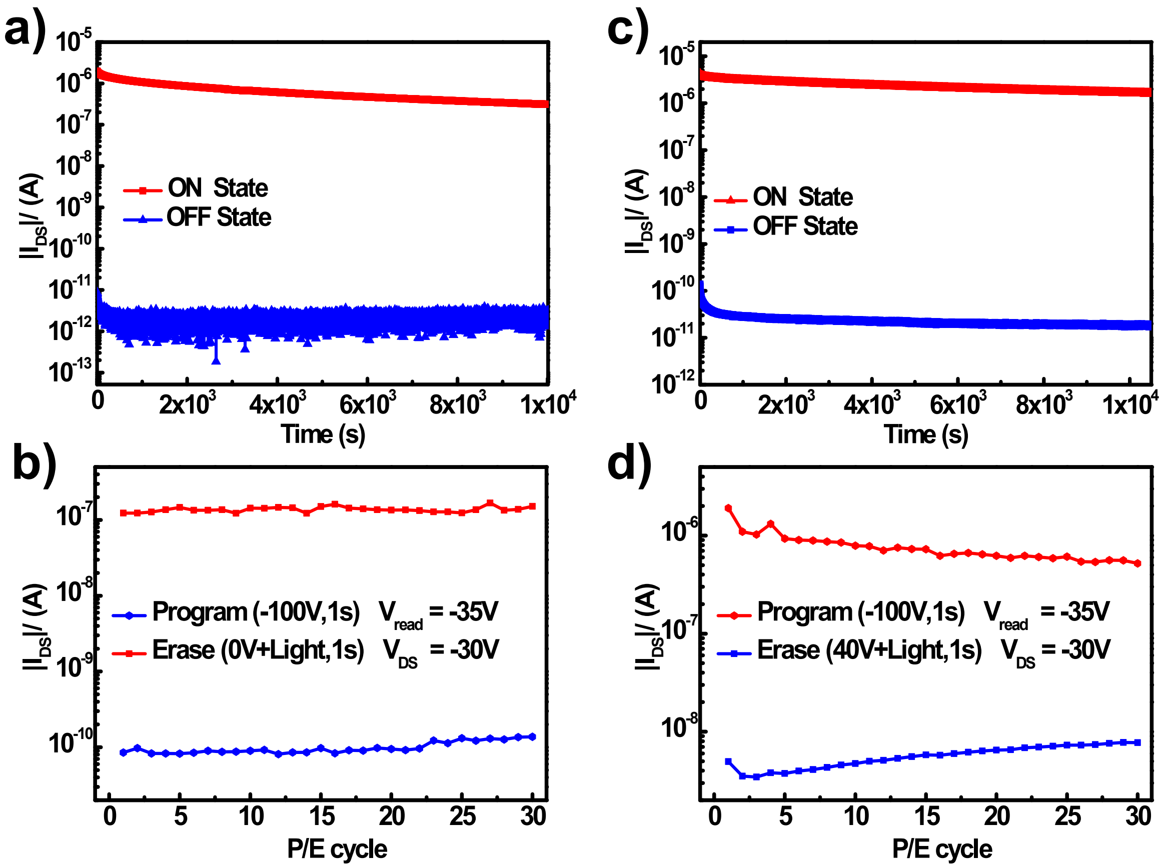

Figure S13. Retention characteristics (a, c) and switching cycles (b, d) of OFET memory NAs devices based on 90% TPP-CH_3 NAs film (a, b) and 90% TPP-H NAs film (c, d). Program operation: V_G = −100 V for 1 s, V_D = 0 V, under dark, for both devices; read operation: V_G = −35 V, V_D = −30 V, under dark, for both NAs device; erase operation: V_G = 0 V, V_D = 0 V for TPP-CH_3 NAs device, V_G = 40 V, V_D = 0 V for TPP-H NAs device, light illumination for 1 s for both devices.