Supplementary Materials for

Investigating Versatile Capabilities of Organic Field-Effect Transistors Incorporated with Vacuum-deposited Metal Nanoparticles

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Figs. S1 to S12



Figure S1. (a) AFM images of 10-nm thick DNTT film with Au nanoparticles. High magnification AFM images of a 10-nm thick DNTT film (b) without Au nanoparticles, (c) with Au nanoparticles, and (d) with Ag nanoparticles.



Figure S2. Bright-field TEM images of (a) a 10-nm thick pristine DNTT film, (b) a 10-nm thick DNTT film with Ag NPs, and (c) a magnified image of an Ag NP. The inset shows the selected-area electron diffraction (SAED) patterns of the corresponding film.



Figure S3. Transfer characteristics for the programming and erasing states of DNTT-based OFET devices with (a) Au nanoparticles and (b) Ag nanoparticles.



Figure S4. Comparison of electronic conductivities of DNTT films with and without metal nanoparticles.



Figure S5. Differential absorption spectra of the DNTT layer with and without metal nanoparticle layers, illustrating absorption enhancement.



Figure S6. Transfer characteristics of OFET devices with Au nanoparticles under varying optical programming light intensity.



Figure S7. Long-term transient response of OFETs with Au NPs with new batch of devices.



Figure S8. Plot of the normalized drain current value after 90 s of light deactivation as a function of metal deposition time. The red line represents a logistic fitting curve.



Figure S9. Plots of normalized current at 90 s after light deactivation as functions of (a) particle size, (b) interparticle distance, and (c) coverage area.



Figure S10. Long-term and short-term transient photocurrent measurements in OFETs with varying Au deposition times. Long-term measurements at VG = 0 V and VD = 2 V for deposition times of (a) 60 s and (b) 120 s. Short-term measurements at the same voltage settings for deposition times of (c) 200 s, and (d) 300 s. (e) Transfer characteristics of OFET devices with Au nanoparticles for different Au NP deposition times.



Figure S11. Plots of decay time constant values as functions of (a) deposition time, (b) nanoparticle size, (c) interparticle distance, and (d) coverage area.



Figure S12. Drain current measurements as a function of time from the repeated optical programming and electrical erasing cycle for an OFET with or without Au nanoparticles. Optical programming was performed by illuminating light with a power density of 1.46 mW/cm² for 300 s, and electrical erasing was achieved by applying $V_{\rm G} = -60$ V for 60 s (with $V_{\rm D} = 0$ V).