Supporting Information:

Work function-tunable transparent electrodes based on all graphene-based materials for organic-graphene photodetectors

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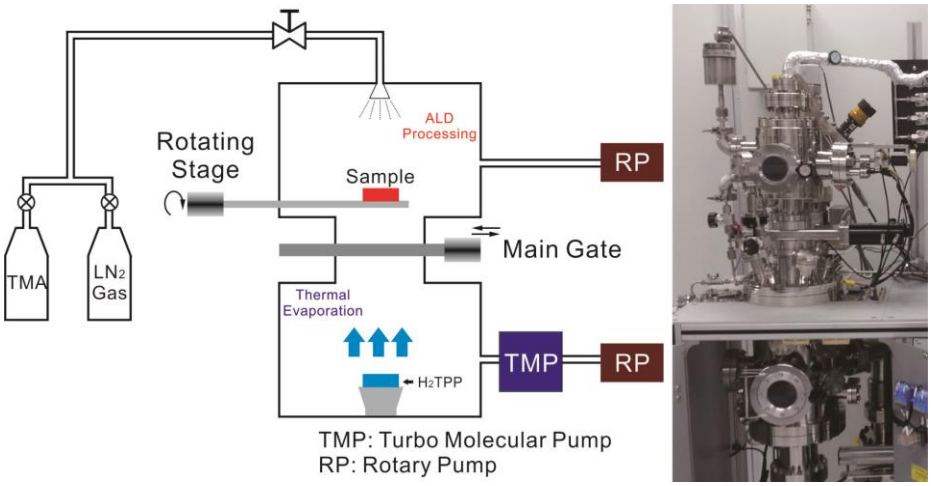

Figure S1. Schematic representation of the hybrid deposition system combining thermal evaporation (bottom) and vapor phase-metalation (top).

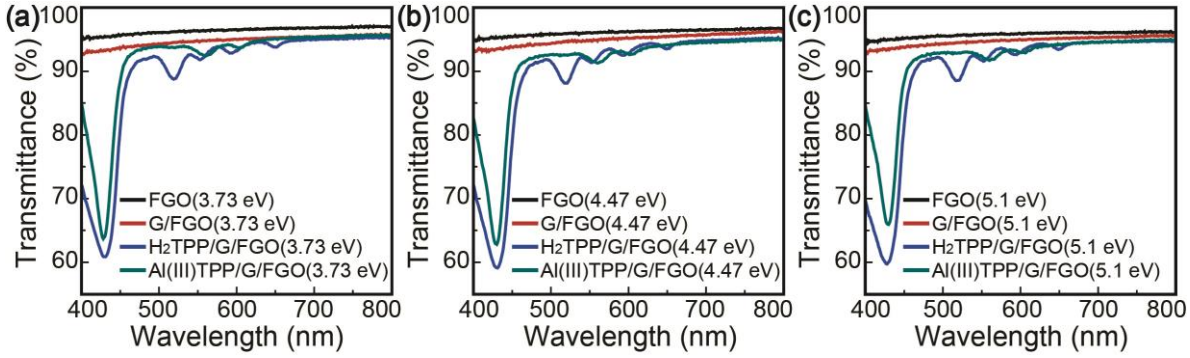

Figure S2. Transmittance of FGO, WF-tuned graphene, graphene nanosheets coated with porphyrin-based organic layer by using GO films with different WF values of (a) 3.73 eV, (b) 4.47 eV and (c) 5.1 eV.

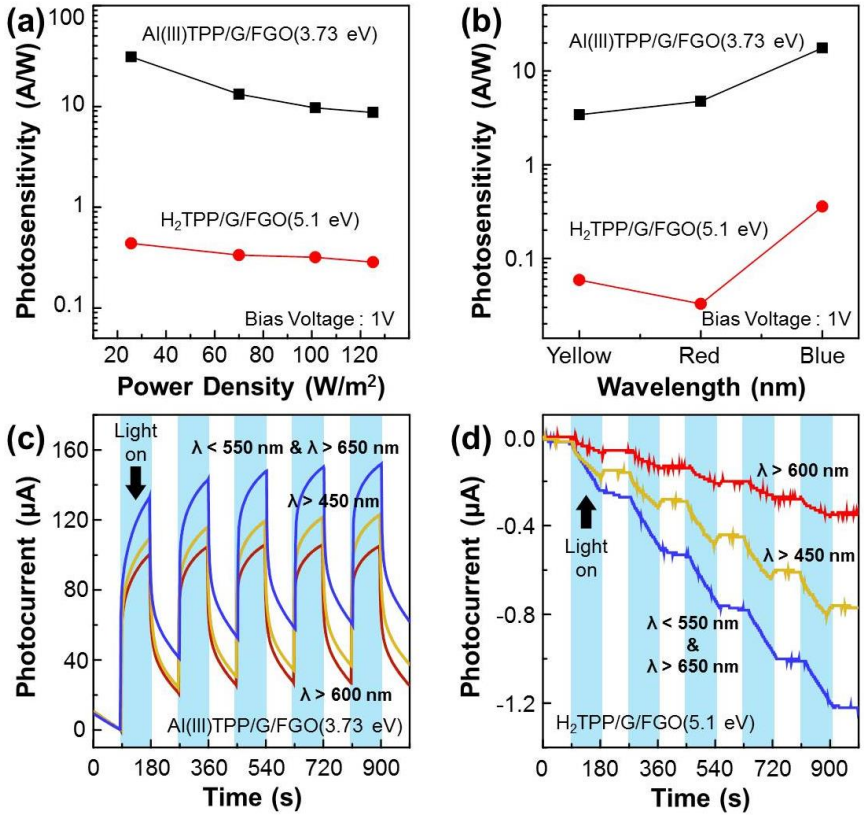

Figure S3. Photosensitivity as a function of (a) the light power density and (b) excitation wavelength; a bias voltage of 1 V was used for the measurements. Time-dependent photocurrent of (c) Al(III)TPP- and (d) H_2TPP-WF-turned graphene photodetectors; color filters of $\lambda < 550$ nm & $\lambda > 650$ nm (blue line), $\lambda > 450$ nm (yellow line), $\lambda > 600$ nm (red line) were employed in the measurements.

The devices including Al(III)TPP on WF-tuned graphene with GO (WF : 3.73 eV) and H_2TPP on WF-tuned graphene with GO (WF : 5.1 eV) were also measured with various power density and wavelength (Figure S3). In this study, three color filters under the illumination of halogen lamp were used in order to change the wavelength (red: λ > 450 nm, yellow: λ > 600 nm, blue: λ < 550 nm & λ > 650 nm). Al(III)TPP on WF-tuned graphene with GO with a 3.73 eV WF. Figure S3(a) showed the photosensitivity of Al(III)TPP- and H_2TPP-graphene hybrid device as a function of power density. At a 1 V bias voltage, the photosensitivity of both devices deceased with increasing light intensity. The photocurrent measured in the different wavelength by using color filter at 1 V, as shown in figure S3(b)-(d). Both Al(III)TPP and H_2TPP-graphene hybrid photodetectors showed the highest photocurrent and photosensitivity of the sample measured with blue filter (λ < 550 nm & λ > 650 nm).

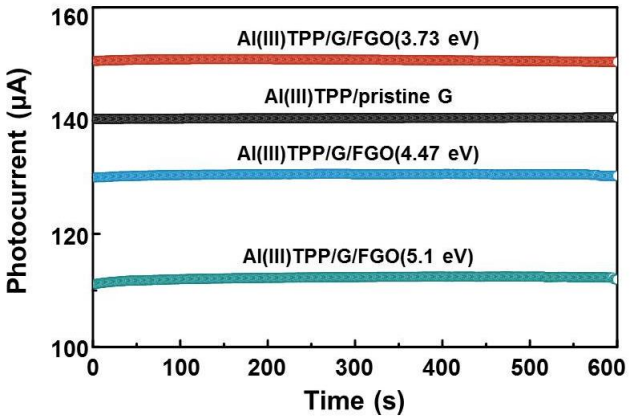

Figure S4. Time-dependent photocurrent of Al(III)TPP on pristine graphene and WF-turned graphene photodetectors at 1 V under continued illumination of halogen lamp (172 W/m^2).

The photostability of Al(III)TPP on pristine graphene and WF-tuned graphene based photodetectors were estimated under continued irradiation of halogen lamp (172 W/m^2). As shown in figure S4, the photocurrent values of each device indicated negligible variation, obviously revealing the good photostability of organic-graphene based devices.