Electronic Supplementary Information

Near Infrared Organic Photodetectors based on Enhanced Charge Transfer State Absorption by Photonic Architectures

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The extra K// rendered to the impinging light by the photonic crystal backelectrode is of 1.57 cm^{-1} for L=400 nm, 1.25 cm^{-1} for L=500 nm and 1.05 cm^{-1} for L=600nm for the first diffraction orders. This extra parallel momentum added to the initial K// = 0 cm^{-1} (in the studied case of normal incidence) renders specific wavelengths the possibility to couple to guided modes of the dielectric semiconductor. Such wavelengths are in this studied case: 750nm, 835, and 1010 nm for L=400, L=500 and L=600 nm for the P3HT:PC_{61}BM (**Figure S1a**) and 775, 900; and 1080 nm for L=400, L=500 and L=600 nm for the PBTTT:PC_{71}BM (**Figure S1b**), values which are in quite good agreement to the first EQE peaks shown in the **Figure 3** results for each lattice and material.

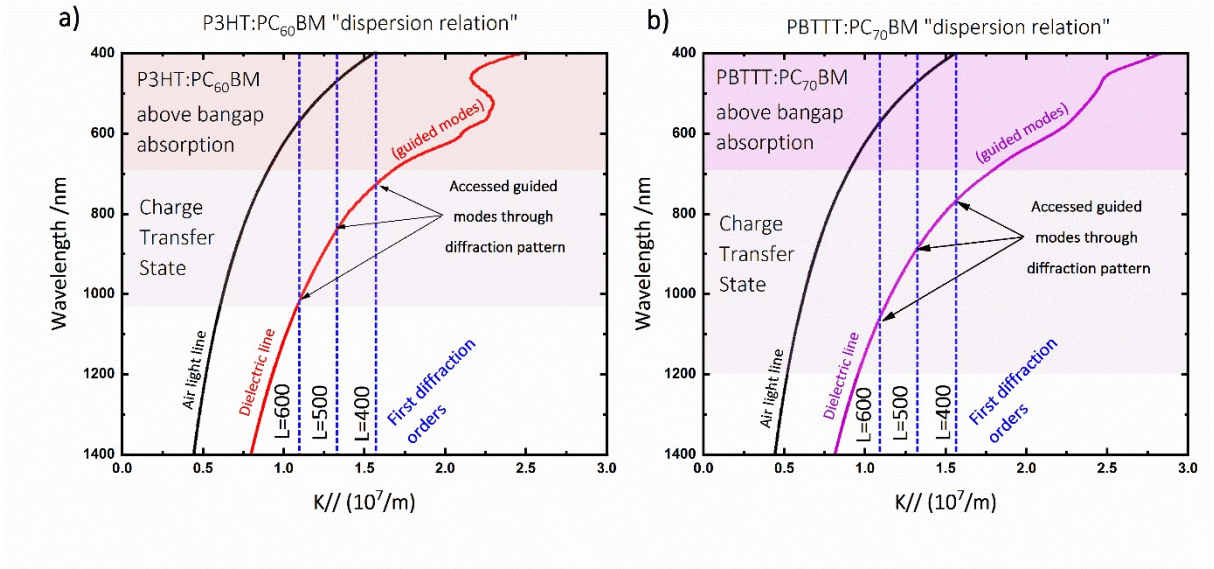

Figure S1. Dispersion relation of the wavelength vs parallel wavevector of the incident light for a) P3HT:PC_{61}BM and b) PBTTT:PC_{71}BM blends. The first diffraction orders of the photonic crystal arrays with lattice parameters of 400, 500 and 600 nm (blue dashed lines) grants to the incident light the necesary momentum to couple to the guided modes within the semiconductor material in the CTS range of absorption (a) red and b) purple lines).

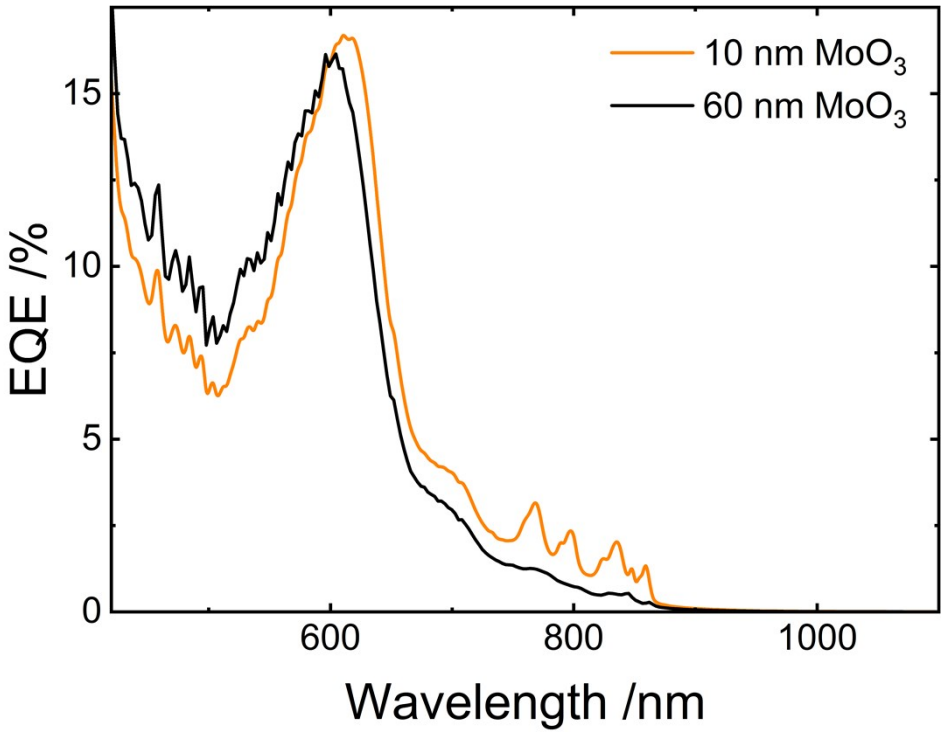

Figure S2. EQE response for different MoO_3 thicknesses on an L500 P3HT:PC_{61}BM sample.

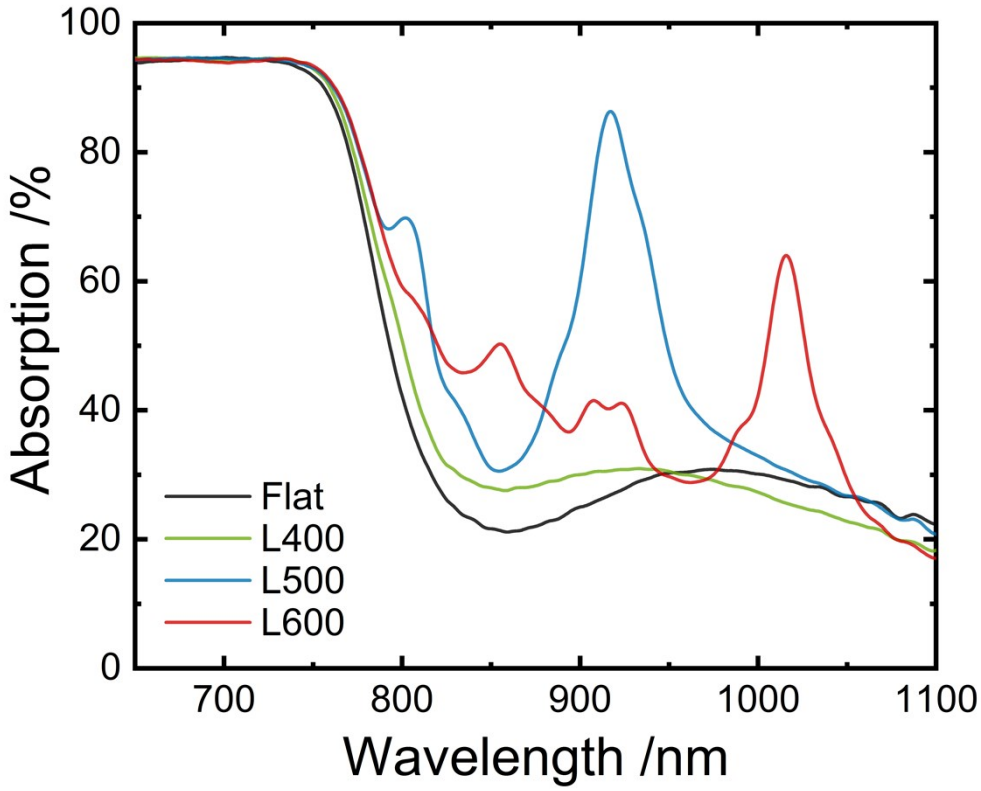

Figure S3. Absorption spectrum of PBTTT:PC_{71}BM devices both nanostructured and flat.

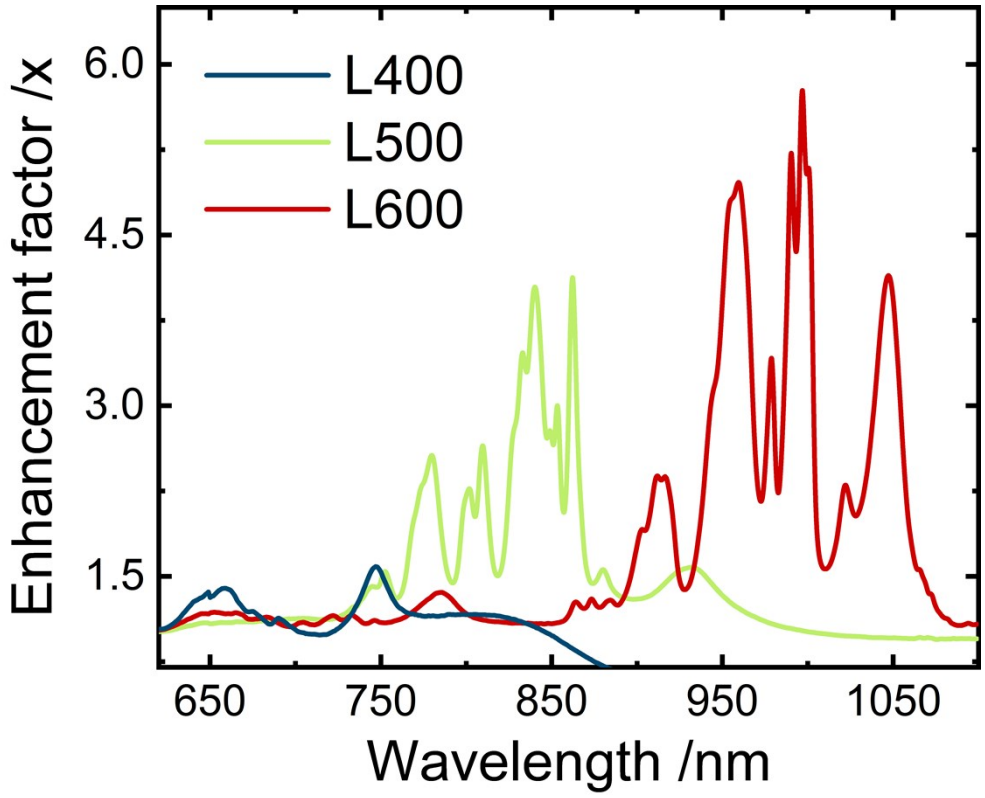

Figure S4. Enhancement factor on the EQE for different P3HT:$PC_{61}BM$ nanostructured devices when compared to a flat device.

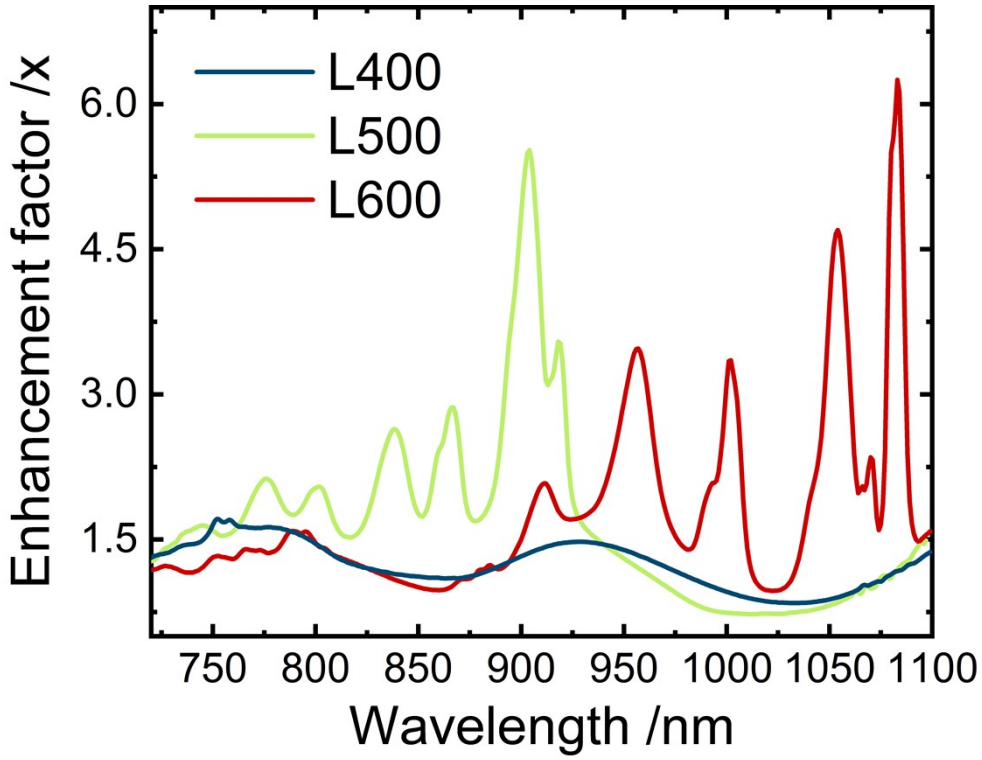

Figure S5. Enhancement factor on the EQE for PBTTT:$PC_{71}BM$ nanostructured photodetectors when compared to their flat counterparts.

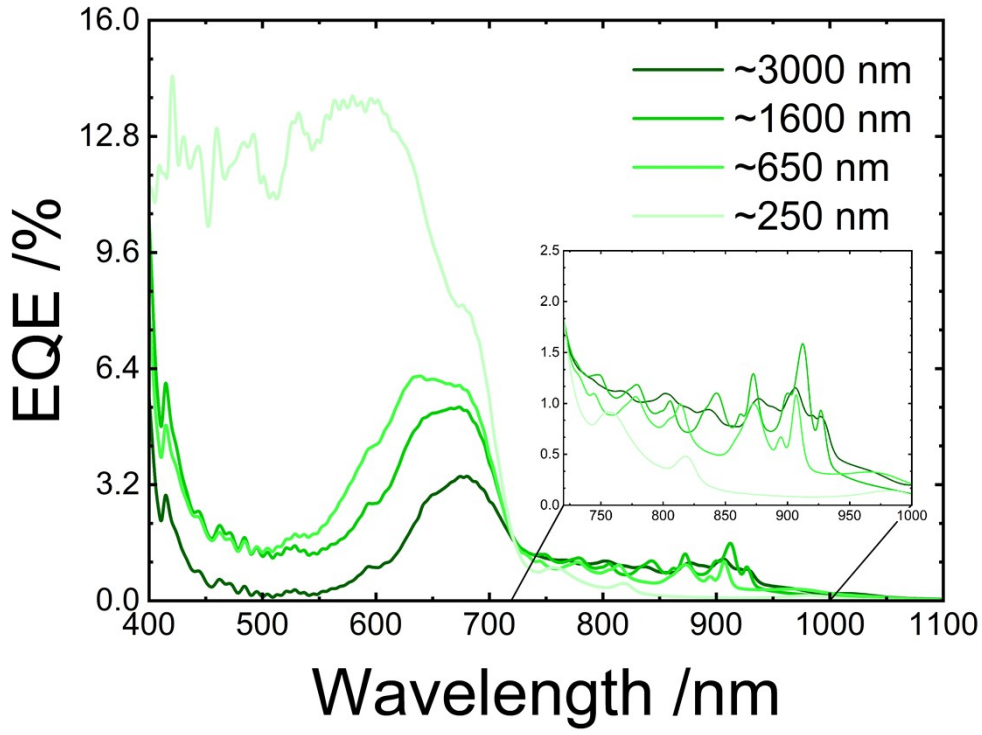

Figure S6. EQE response of L500 PBTTT:$PC_{71}BM$ photodetector for different active layer thicknesses and zoomed region.

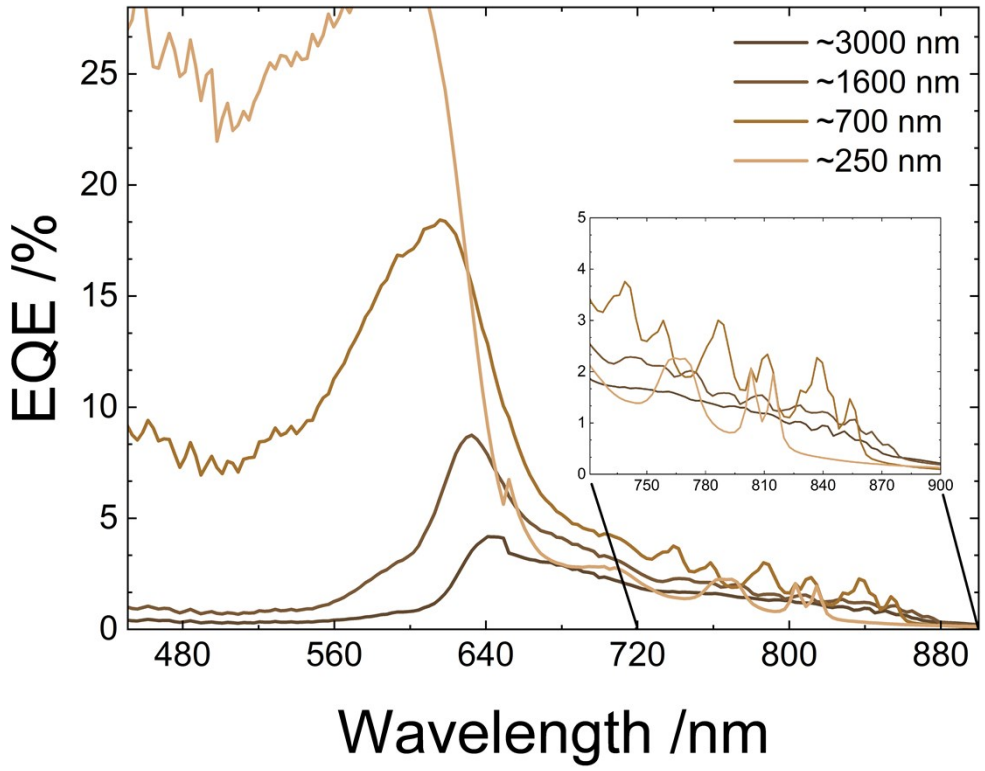

Figure S7 EQE response of L500 P3HT:$PC_{61}BM$ photodetector for different active layer thicknesses and zoomed region.

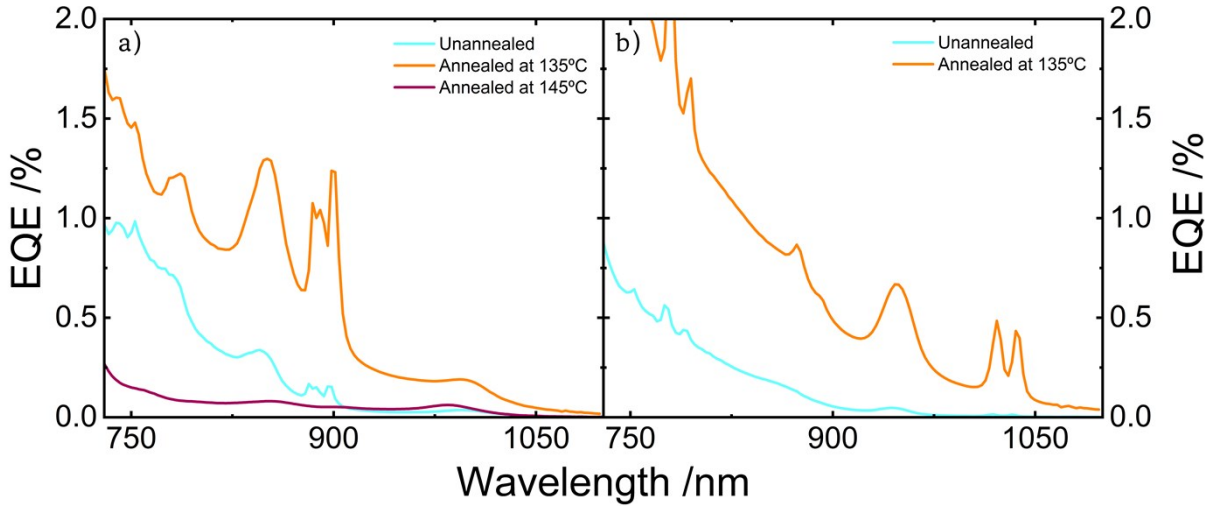

Figure S8. EQE response for differently annealed nanostructured PBTTT:$PC_{71}BM$ devices, a) L500 b) L600..

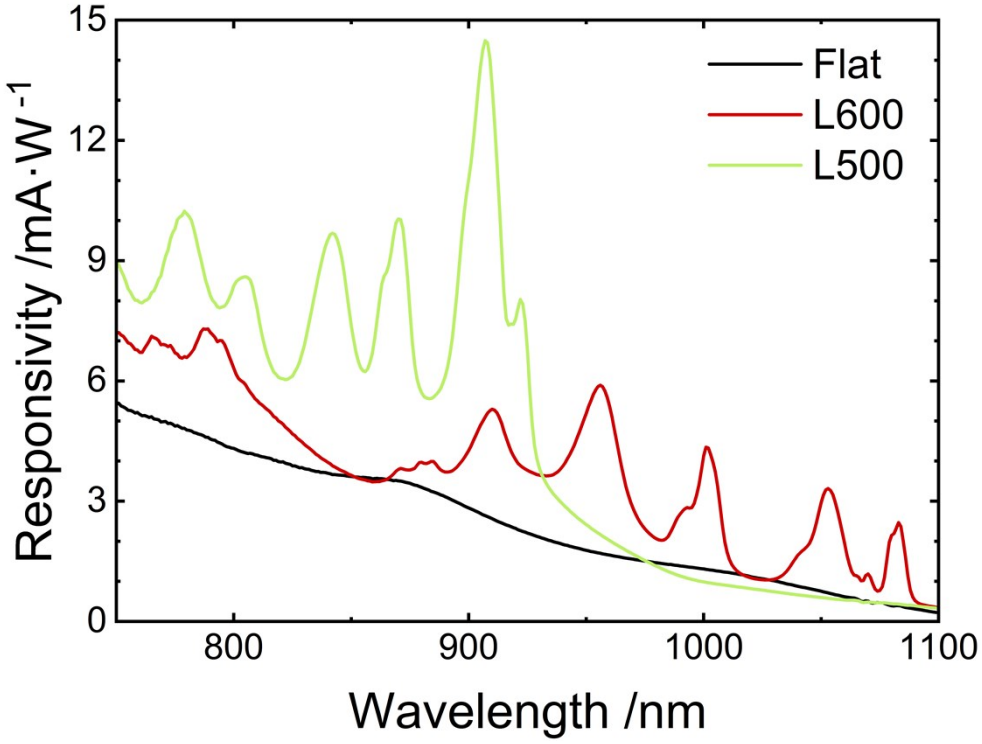

Figure S9. Responsivity of PBTTT:$PC_{71}BM$ photodetectors at different wavelengths for both nanostructured and flat devices.

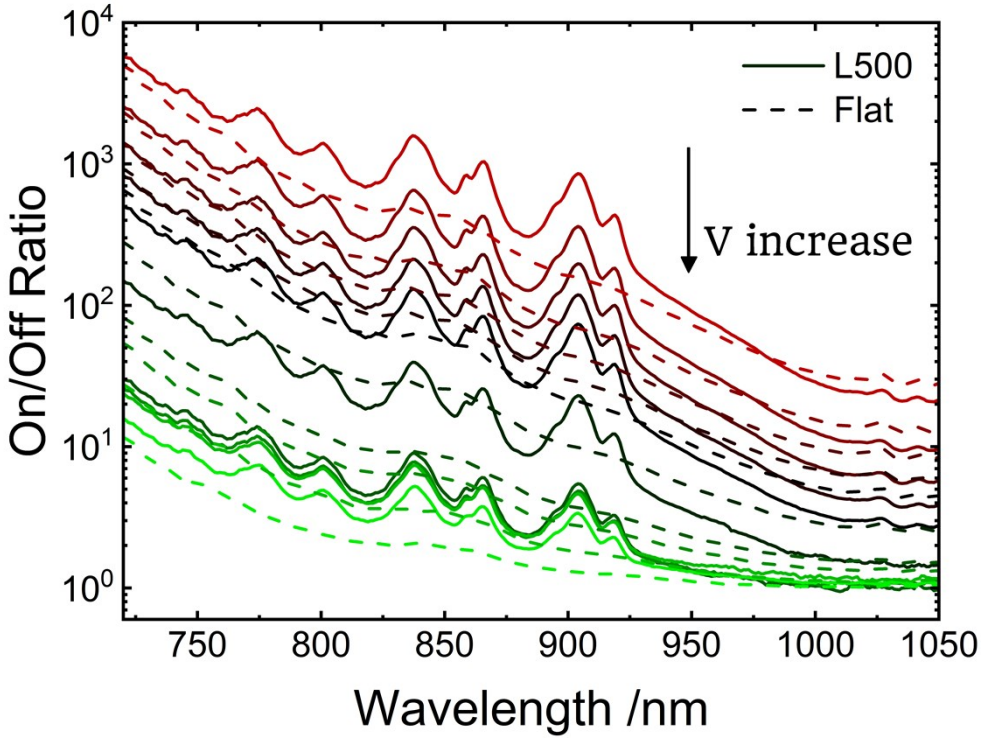

Figure S10. On off ratio of flat (dashed line) and L500 nanostructured devices at different wavelengths for various reverse V bias voltages from 1 V to 23 V.

Feature Depth

We have explored features with depths 300 nm, 100 nm and 60 nm. The samples with 300 nm depth were shorted and could not be electrically measured. The samples with 100 nm exhibited better electrical performance but the sharp features were only observable in the 60 nm imprinted feature depth as shown in the following figure. We attributed this improvement to the presence of a good conformal layer of MoOx in the 60 nm case that could not be achieved in steeper holes.