Supporting Information of

Laser induced assembly of plasmonic nanoparticles on two-dimensional nanosheets for organic photovoltaics

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1. GO-NPs assemblies

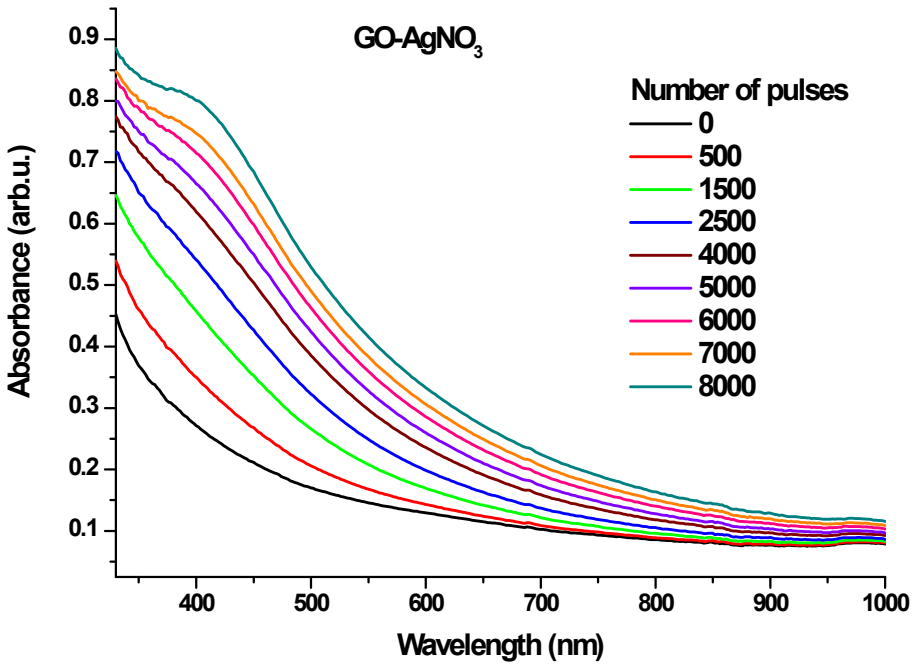


Fig. S1: UV-vis absorption spectra of pristine GO-$AgNO_3$ dispersions in water, irradiated with different numbers of 100mJcm^{-2} UV pulses.

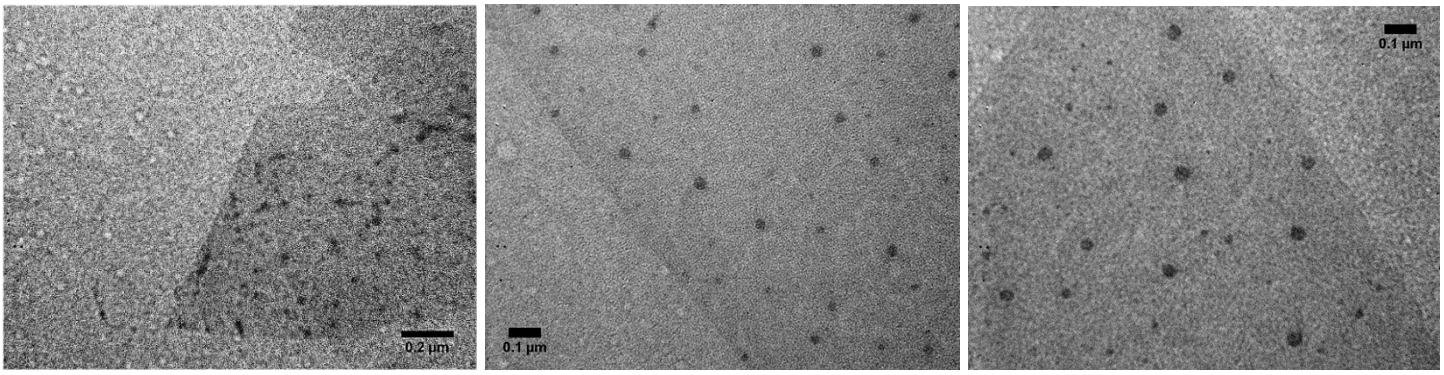


Fig. S2: TEM images of GO-Ag assemblies

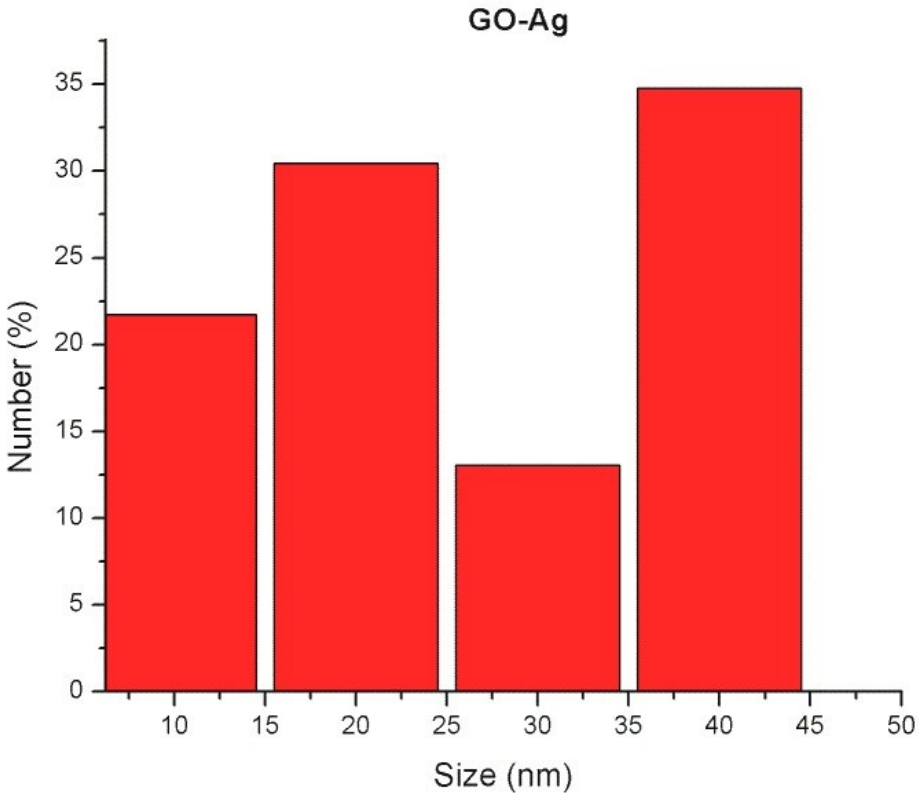


Fig. S3: Size distribution GO-Ag assemblies, produced by a single, of 100mJcm^{-2}, UV pulse.

2. WS_2-NPs assemblies

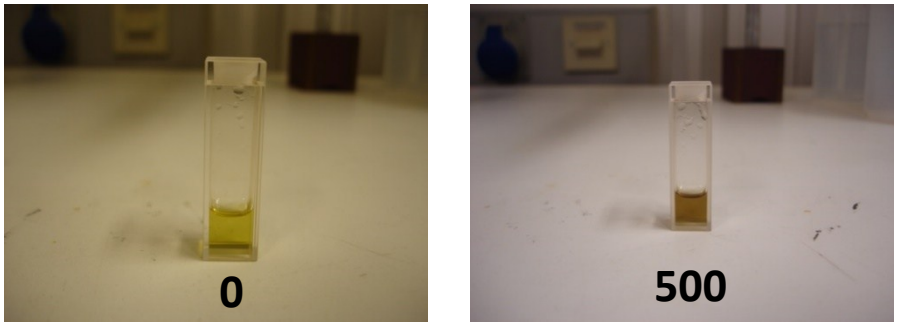


Fig. S4: Pictures of the reference and laser treated WS_2-$AgNO_3$ dispersions, irradiated with 500, 100mJcm^{-2}, UV pulses.

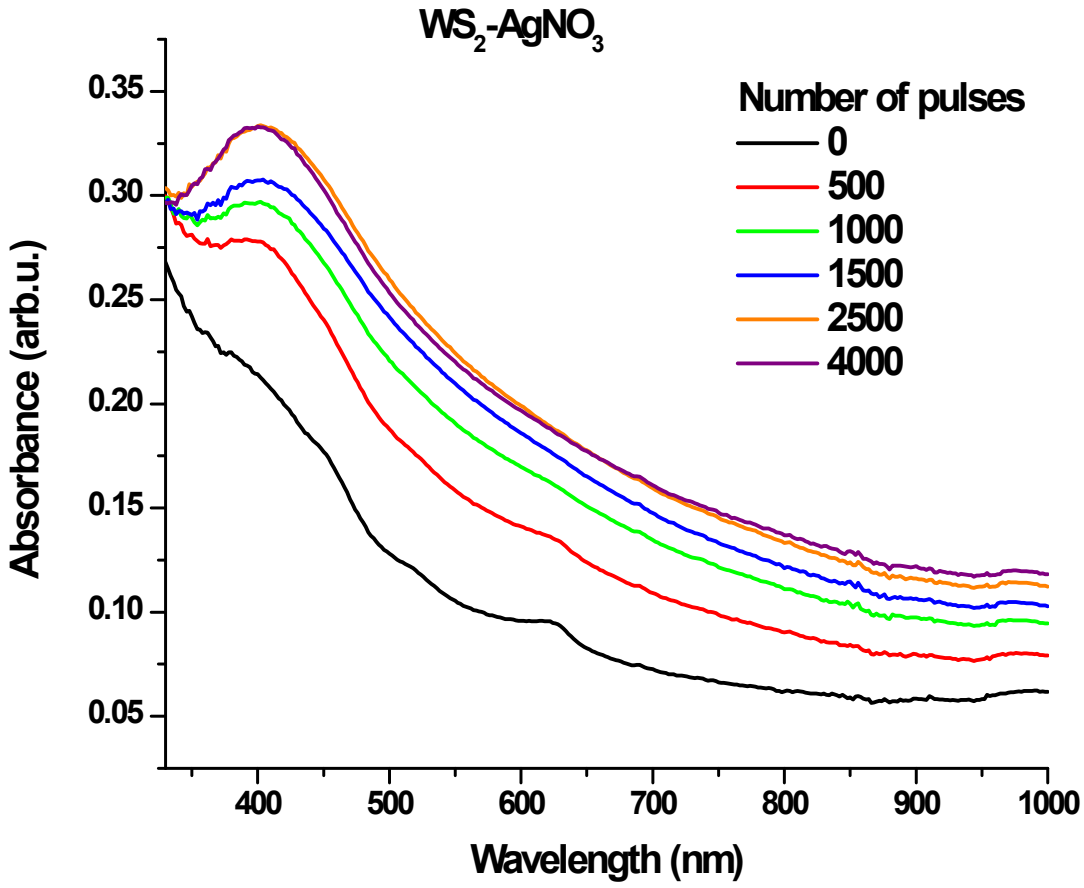


Fig. S5: UV-vis absorption spectra of pristine WS_2-$AgNO_3$ dispersions in water, irradiated with different numbers of 100mJcm^{-2} UV pulses.

3. MoS_2-NPs assemblies

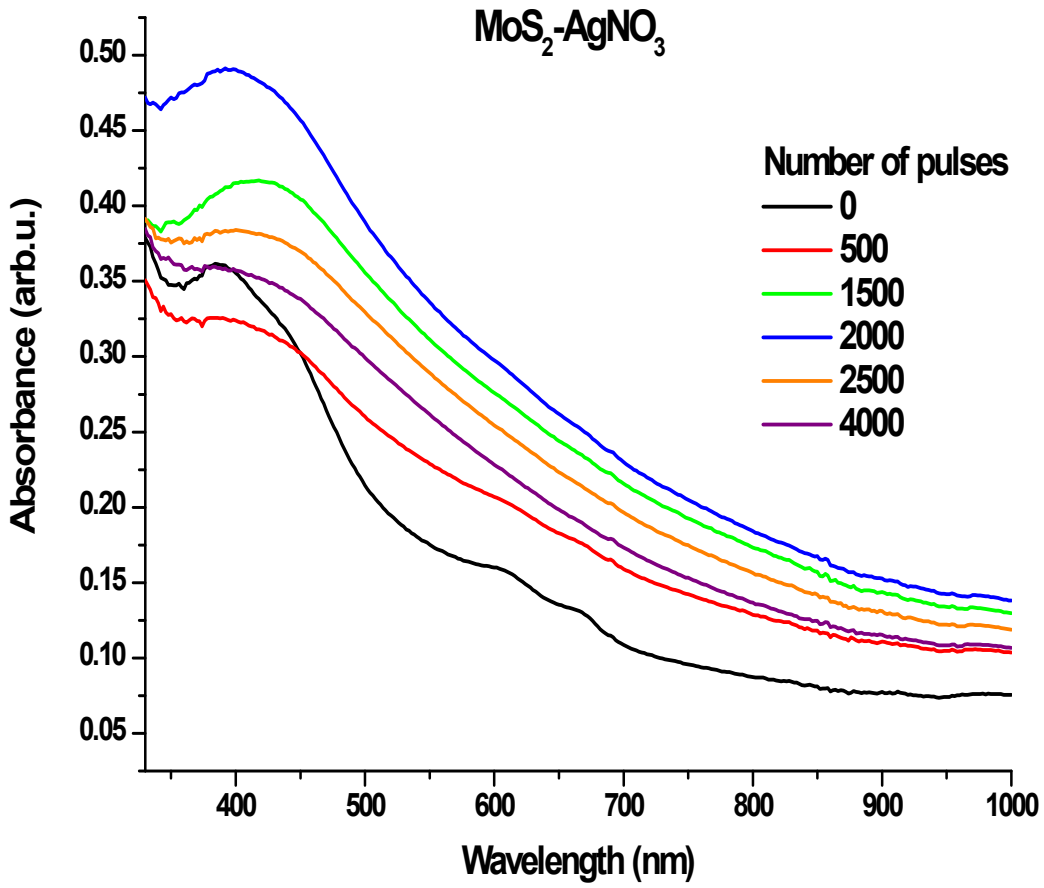


Fig. S6: UV-vis absorption spectra of pristine MoS_2-$AgNO_3$ dispersions in water, irradiated with different numbers of 100mJcm^{-2} UV pulses.

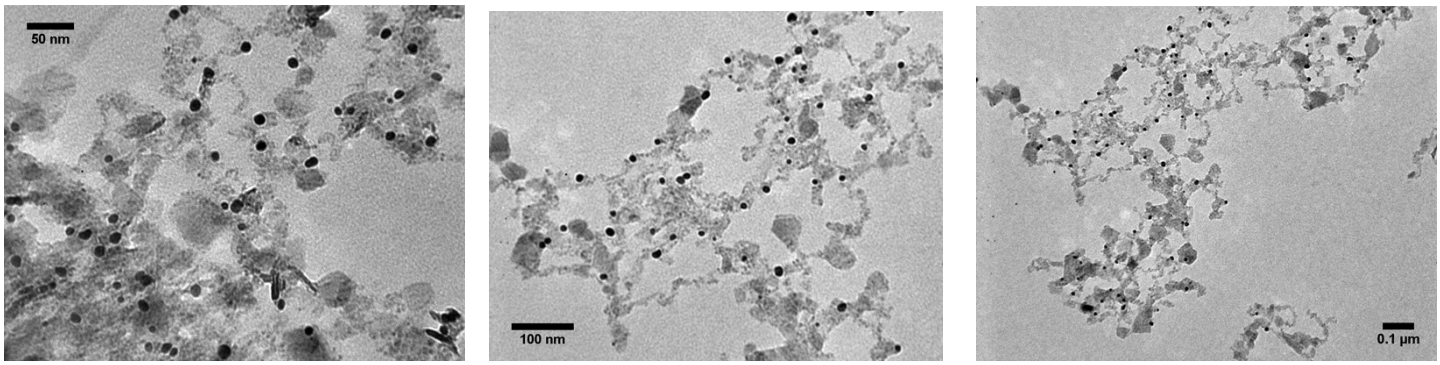


Fig. S7: TEM images of MoS_2-Au assemblies

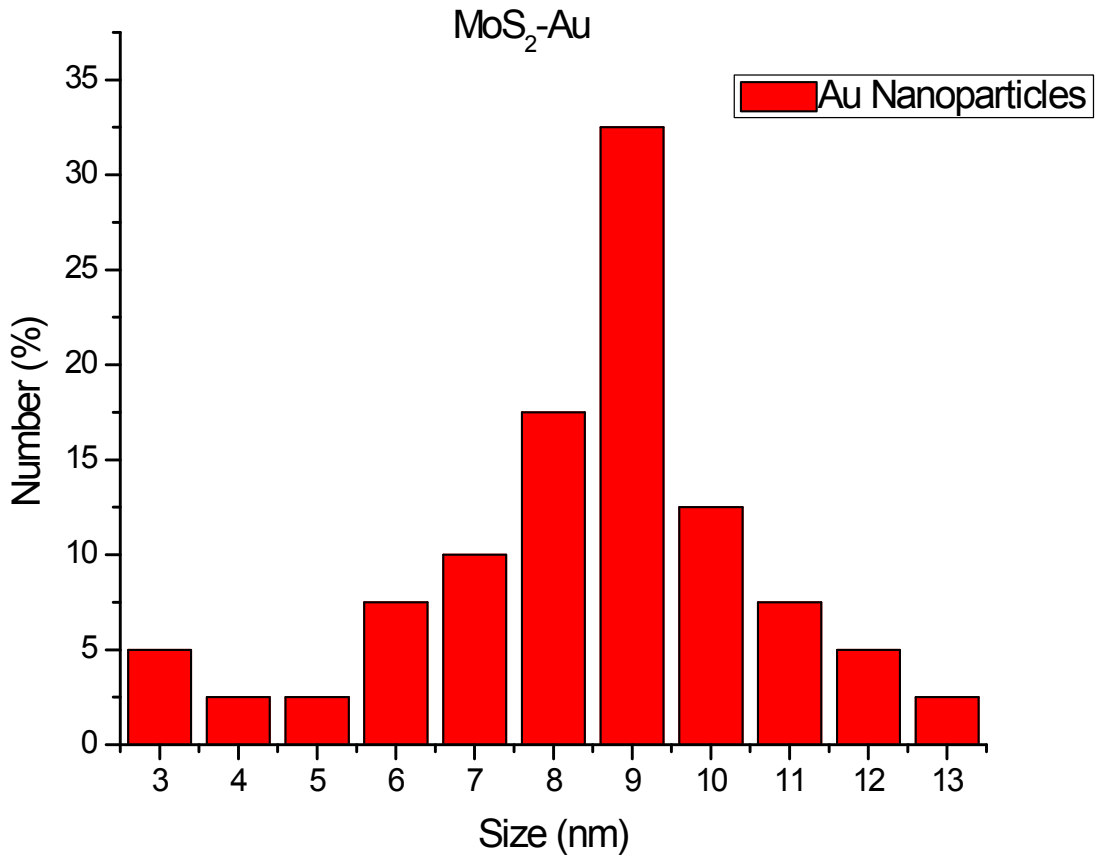


Fig. S8: Size distribution of MoS_2-Au assemblies, produced by a single, of 100mJcm^{-2}, UV pulse.

3. BN-NPs assemblies

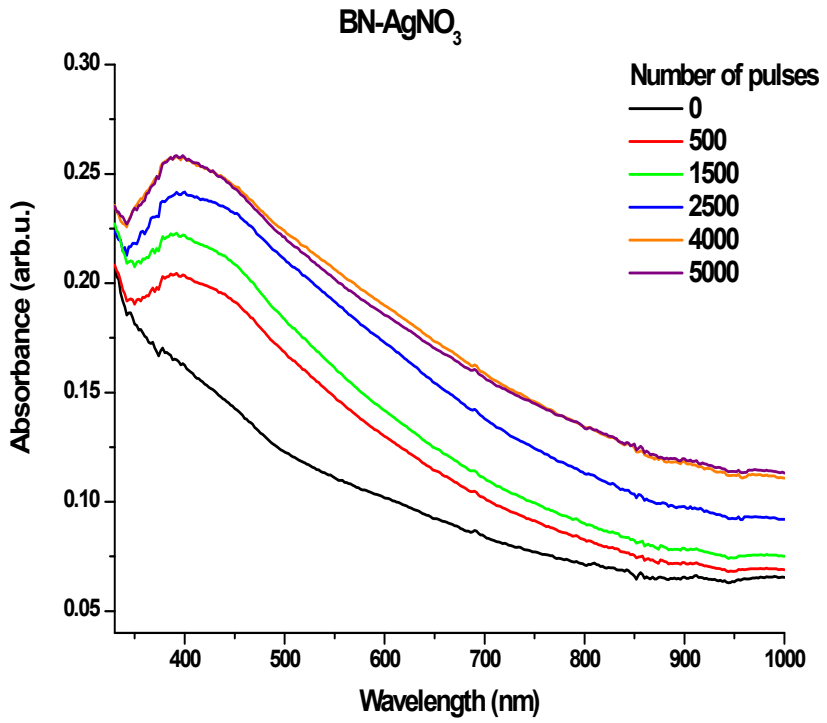


Fig. S9: UV_VIS spectra of BN-$AgNO_3$ dispersions in water, irradiated with different numbers of 100mJcm^{-2} UV pulses.

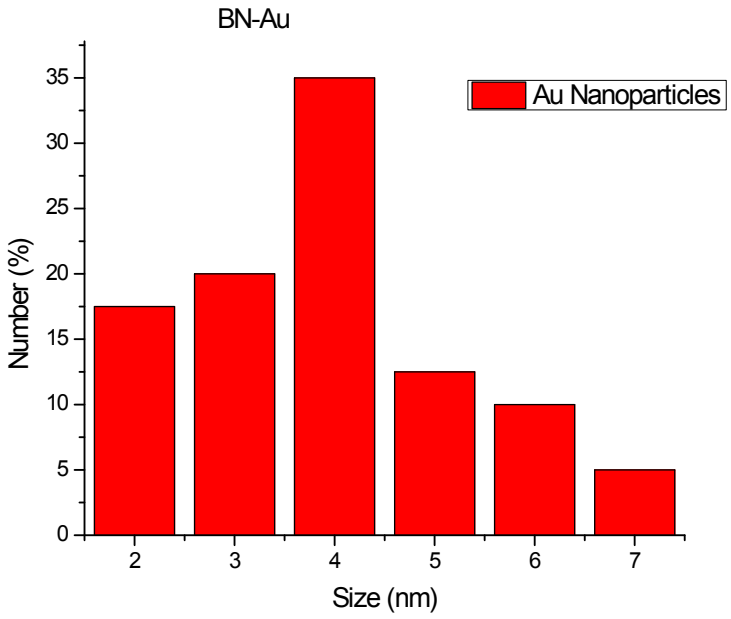


Fig. S10: Size distribution of BN-Au NPs, produced by a single, of 100mJcm^{-2}, UV pulse.

4. Raman Characterisation

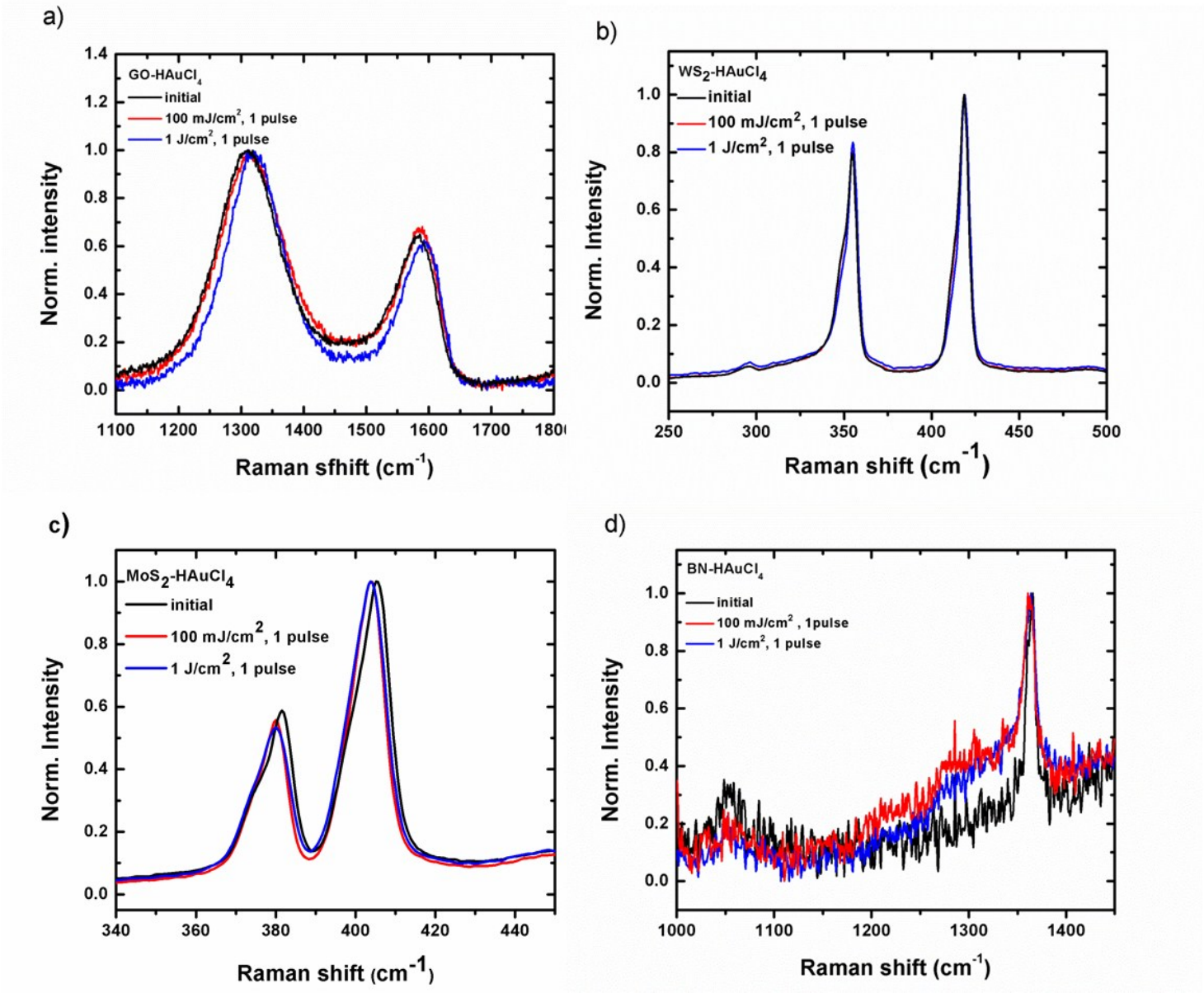


Figure S11. Normalized Raman spectra of a) GO, b) WS_2, c) MoS_2 and d) BN NS before and after laser induced decoration with Au NPs.

5. Cyclic Voltammetry Measurements

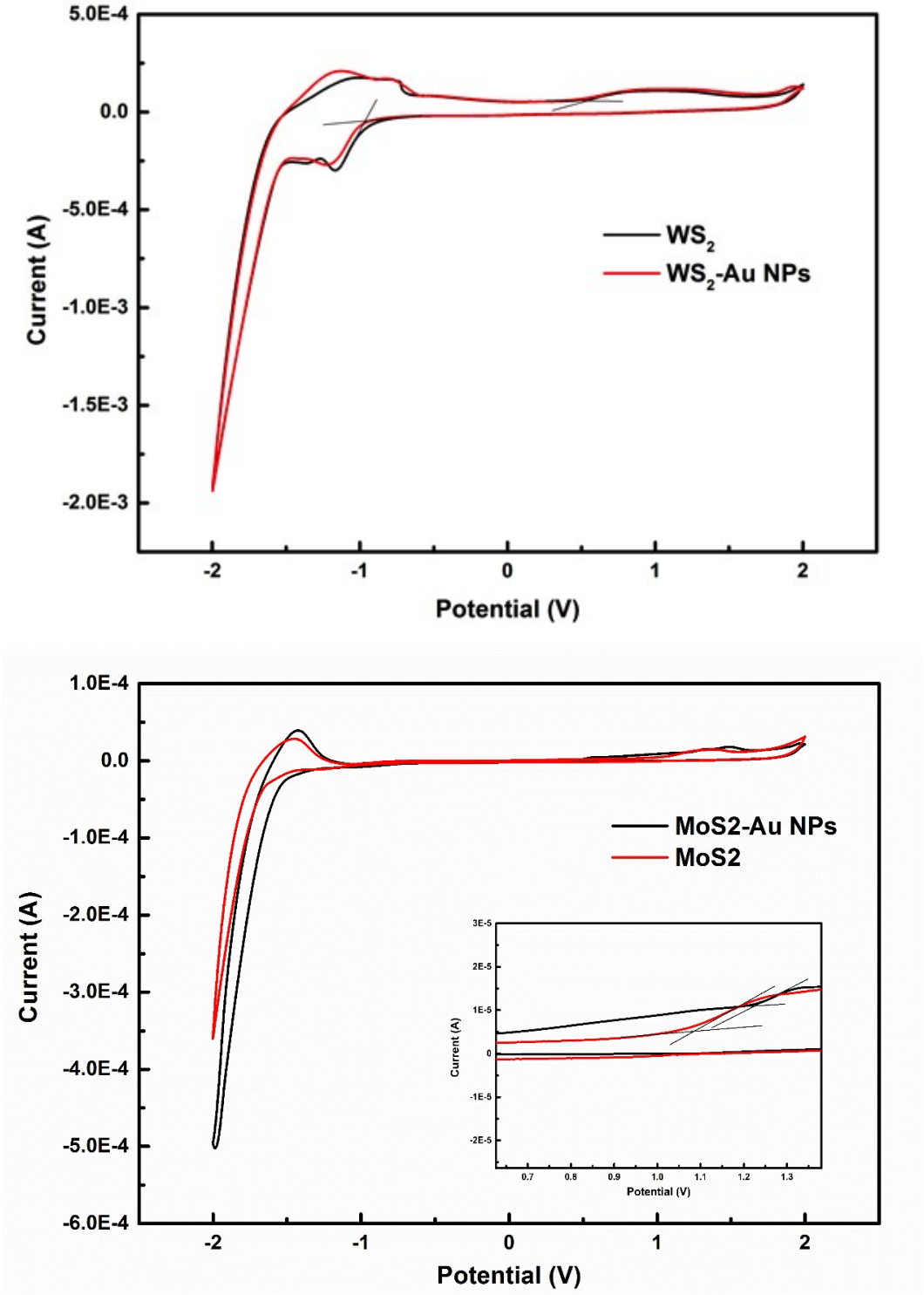


Fig. S12: (Top) Cyclic voltammogram of WS_2 and WS_2-Au NPs in CH_3CN using 0.1 M TBAPF6 as electrolyte. Scan rate was set at 100 mV s^{-1}. (Bottom) Cyclic voltammogram of MoS_2 and MoS_2-Au NPs in CH_3CN using 0.1 M TBAPF6 as electrolyte. Scan rate was set at 10 mV s^{-1}.

6. Optical Absorption of OPV Blends

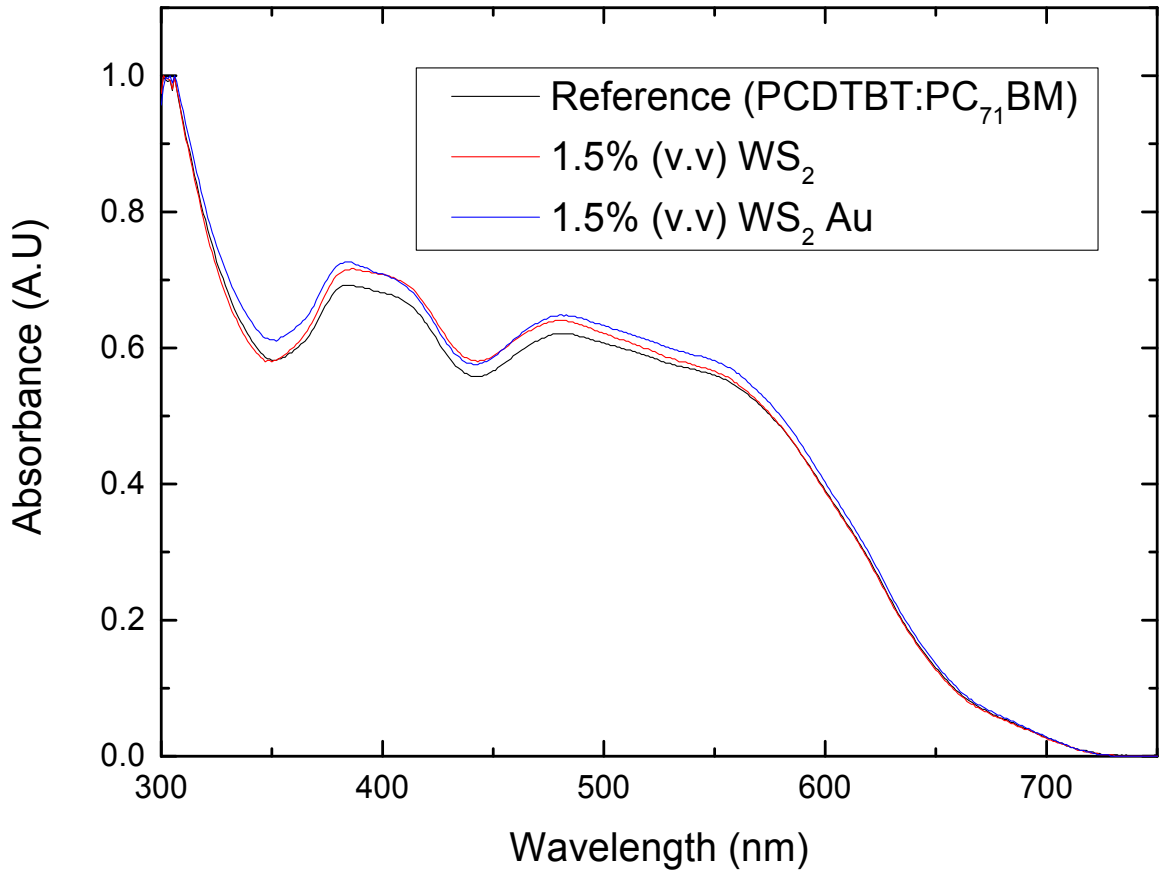


Fig. S13: Absorption spectra of PCDTBT:PC71BM (Reference cell), ternary Solar cell with 1.5% (v/v) WS2 and ternary Solar cell with 1.5% (v/v) WS2 Au NPs.

7. Atomic Force Microscopy of OPV Blends

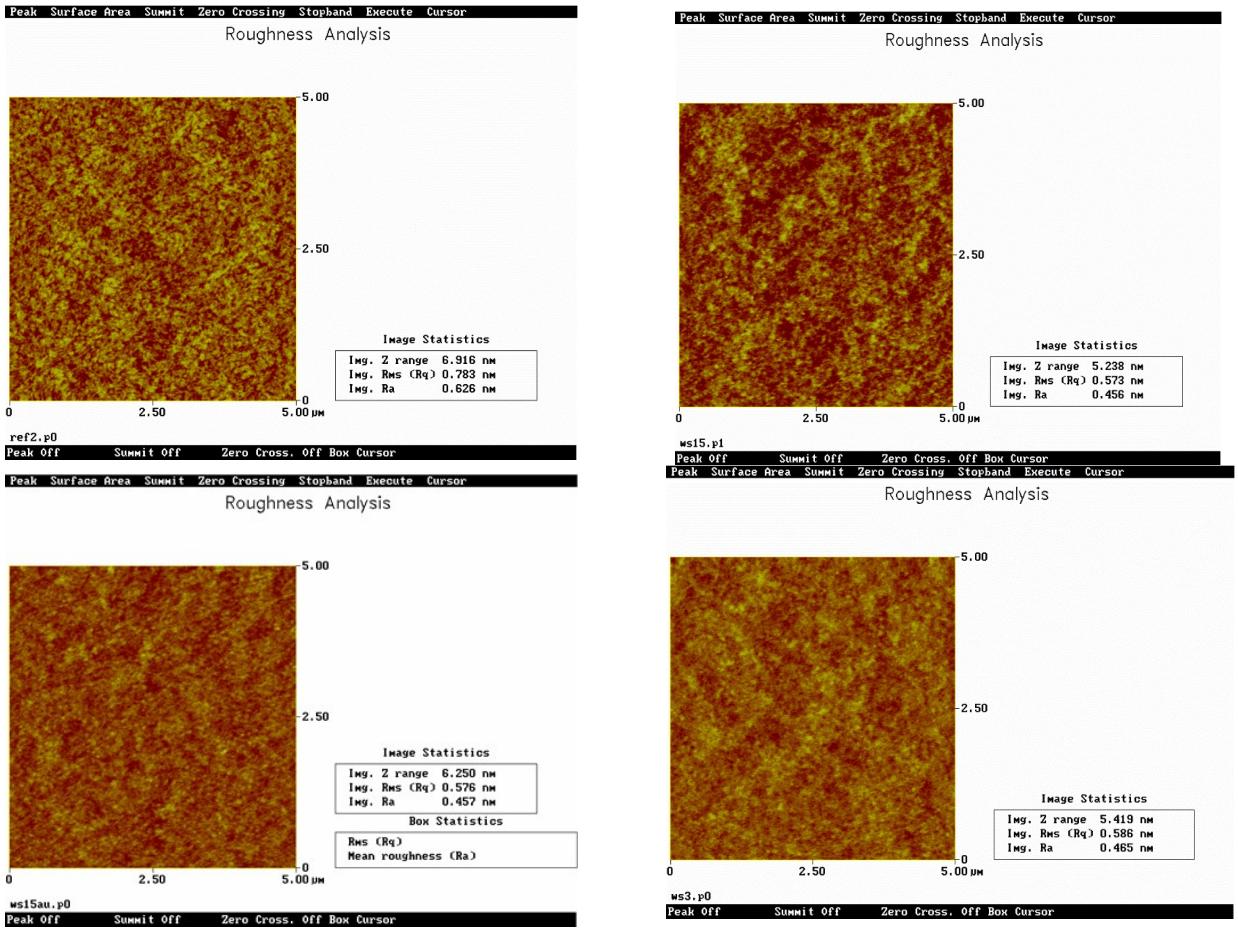
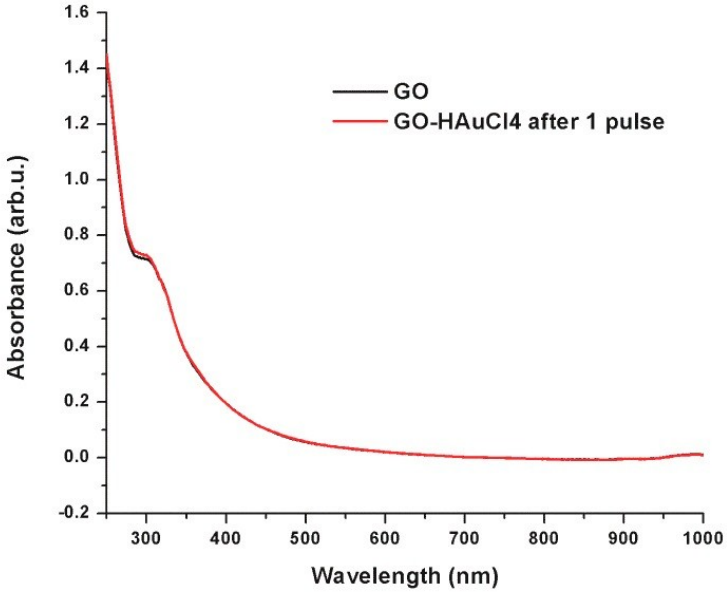


Figure S14: AFM images of four different devices tested a) PCDTBT:$PC_{71}BM$, b) PCDTBT:1.5% (v/v) WS_2:$PC_{71}BM$, c) PCDTBT:1.5% (v/v) WS_2-Au NPs:$PC_{71}BM$ and d) PCDTBT:2.5% (v/v) WS_2:$PC_{71}BM$. The rms roughness is 0.783 nm, 0.573 nm, 0.576 nm and 0.586 nm respectively.

8. UV-VIS and XPS spectra of GO-NPs assemblies



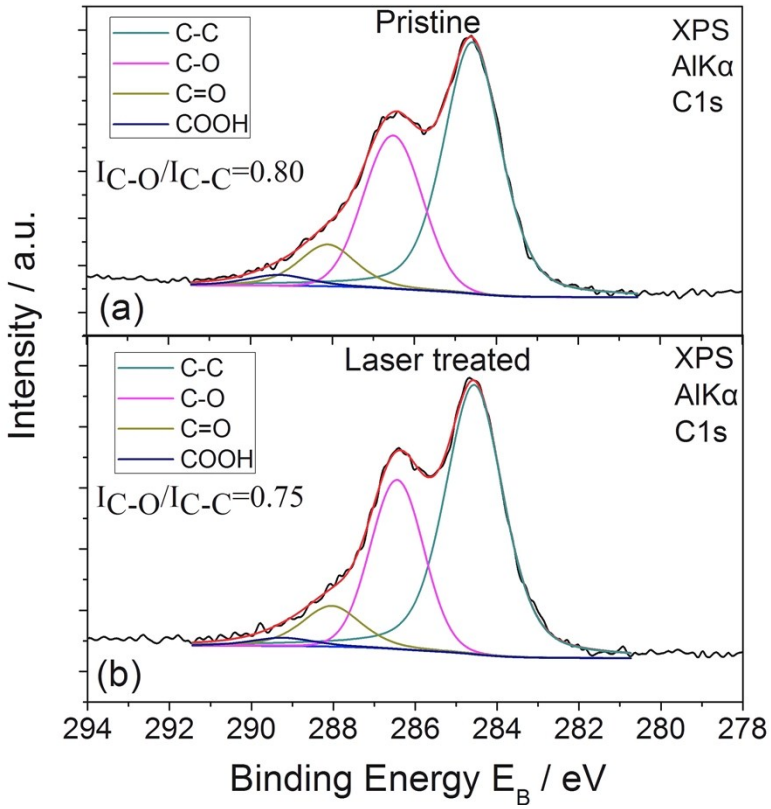


Figure S15: (Top) UV-Vis spectra Of GO and GO-Au NPs, produced by a single, of 100mJcm^{-2}, UV pulse. (Bottom) High resolution C1s, XPS spectra of GO and GO-Au NPs.

9. Energy level diagram of active OPV blends

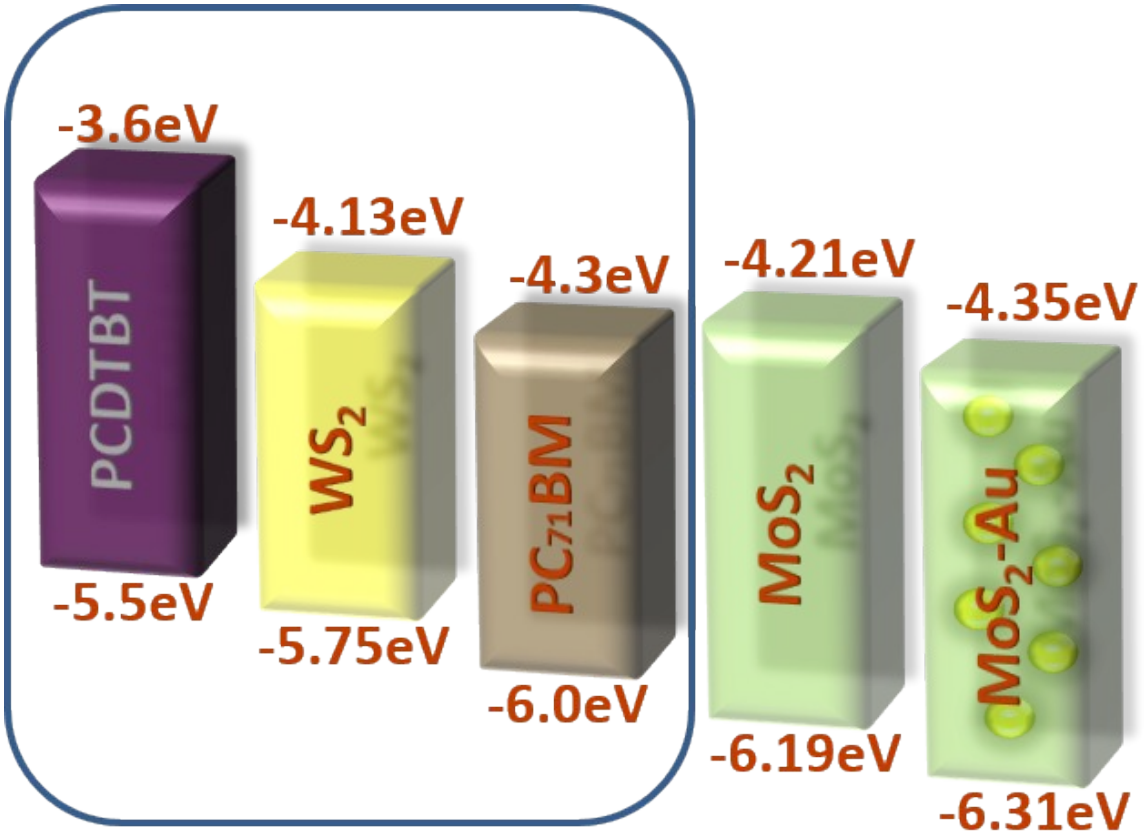


Figure S16: Energy level diagram of the materials investigated for ternary OPV devices.