

Supplementary Information

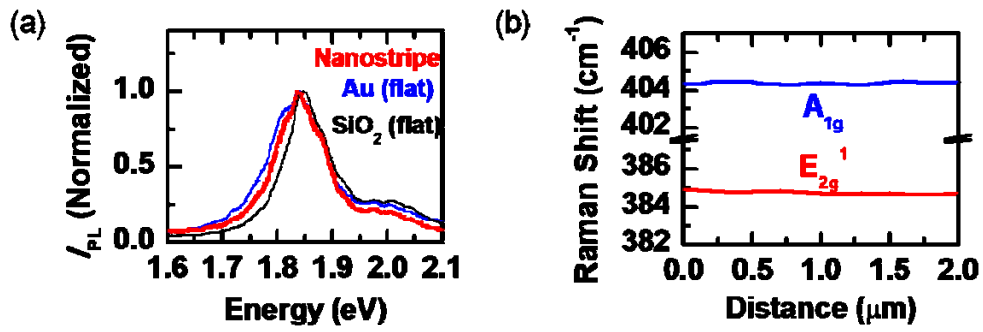
# Light-Induced Surface Potential Modification in MoS<sub>2</sub> Monolayers on Au Nanostripe Arrays

Soyeong Kwon,<sup>1</sup> Min Hee Kwon,<sup>1</sup> Jungeun Song,<sup>1</sup> Eunah Kim,<sup>1</sup> Youngji Kim,<sup>2</sup> Bo Ra Kim,<sup>1</sup>  
Jerome K. Hyun,<sup>2</sup> Sang Wook Lee,<sup>1</sup> and Dong-Wook Kim<sup>1,\*</sup>

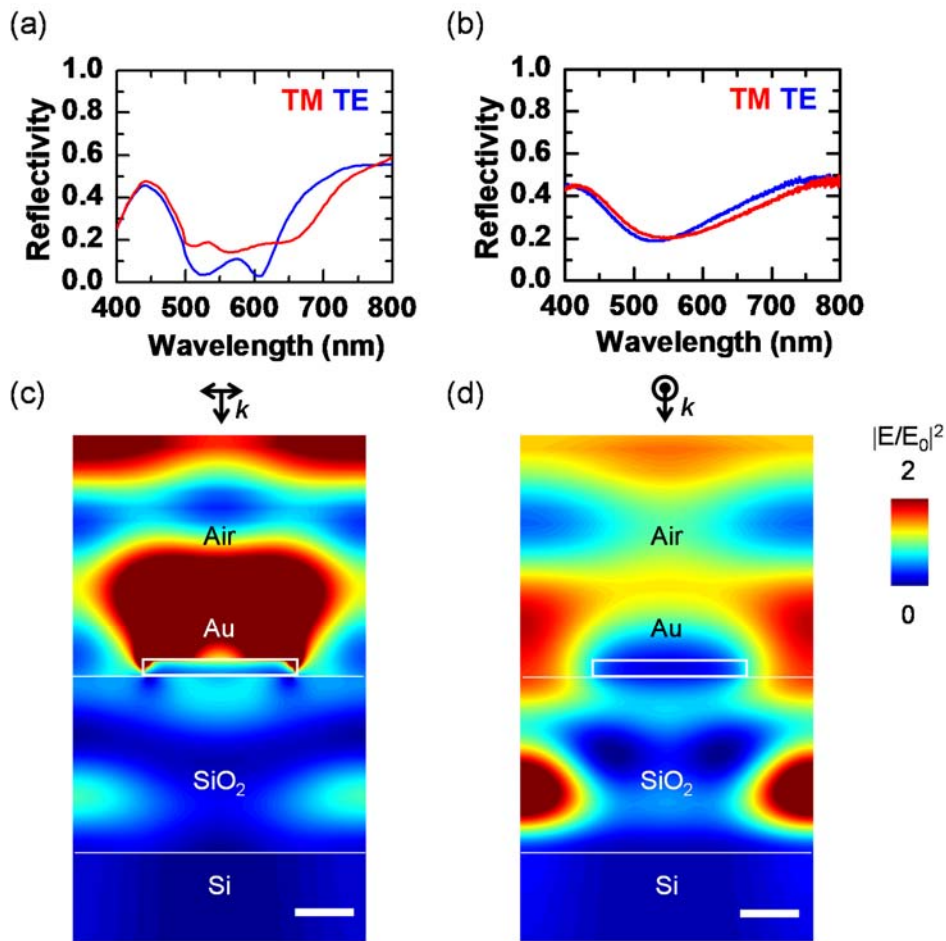
<sup>1</sup> Department of Physics, Ewha Womans University, Seoul 03760, Korea

<sup>2</sup> Department of Chemistry and Nano Science, Ewha Womans University, Seoul 03760, Korea

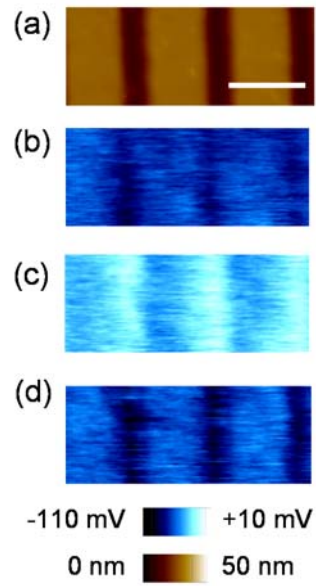
\* Correspondence and requests for materials should be addressed to D.W.K. (email:  
[dwkim@ewha.ac.kr](mailto:dwkim@ewha.ac.kr))



**Figure S1.** (a) Normalized micro-photoluminescence (PL) intensity spectra of three kinds of samples: MoS<sub>2</sub> monolayers on the Au nanostripe array (red), a flat Au thin film (blue), and a flat SiO<sub>2</sub>/Si substrate (black). (b) The E<sub>2g</sub><sup>1</sup> and A<sub>1g</sub> mode peak locations of the MoS<sub>2</sub> monolayer on the Au stripe array as a function of distance of the laser beam spot during the micro-Raman measurements. The laser beam was scanned across the stripe array (data acquisition step: 0.1 μm). A 532-nm-wavelength laser source with the beam diameter of ~ 1 μm was used for both of the PL and Raman measurements.



**Figure S2.** Reflectivity spectra of the Au stripe array, obtained by (a) finite-difference time-domain (FDTD) calculation and (b) measurement, for normal incident TM- and TE-mode light illumination. A home-built microscope coupled to a spectrometer was used to measure the reflectivity. The beam spot size was as small as 2-3  $\mu\text{m}$ . The cross-sectional electric field intensity distribution maps from the FDTD simulations under (c) TM- and (d) TE-mode light at a wavelength of 532 nm (scale bar: 100 nm). Both calculations and measurements did not show any clear distinction between the TM- and TE-mode reflectivity spectra. No clear polarization dependence suggests that surface plasmon polariton excitation is not expected in our stripe array sample.



**Figure S3.** (a) An AFM topography image of a MoS<sub>2</sub> flake on an Au stripe array, (b) a  $V_{S,D}$  map, (c) a  $V_{S,L}$  map under illumination of TE-mode light, and (d) a  $V_{S,D}$  map after the light exposure (scale bar: 0.5  $\mu\text{m}$ ). The  $V_{S,D}$  maps in (b) and (d) were obtained before and after the  $V_{S,L}$  mapping measurement in (c), respectively. No notable difference can be seen in the  $V_{S,D}$  maps before and after the light illumination. If light-induced gas desorption and resulting surface potential change occur, such recovery of the  $V_{S,D}$  cannot be observed.