

Supporting Information

Polarization-Dependent Light Emission and Charge Creation in MoS₂ Monolayers on Plasmonic Au Nanogratings

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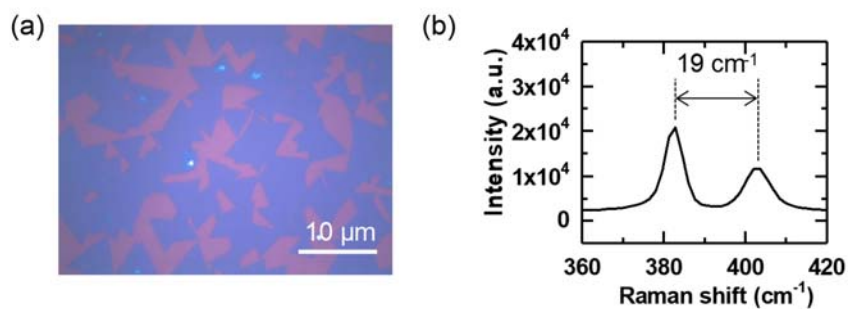


Figure S1. (a) An optical micrograph and (b) a Raman spectrum of MoS₂ flakes on SiO₂/Si substrates. For the growth of MoS₂ monolayers, sodium molybdate solution was coated on hydrophilic SiO₂/Si substrates as molybdenum precursor and the sulfur was supplied by a flow of dimethyl disulfide and with a bubbler. The synthesis was carried out at 800°C with growth temperature while using Ar carrier gas using a chemical vapor deposition technique. The spacing between the two Raman peaks is 19 cm⁻¹, indicating the formation of MoS₂ monolayer flakes.

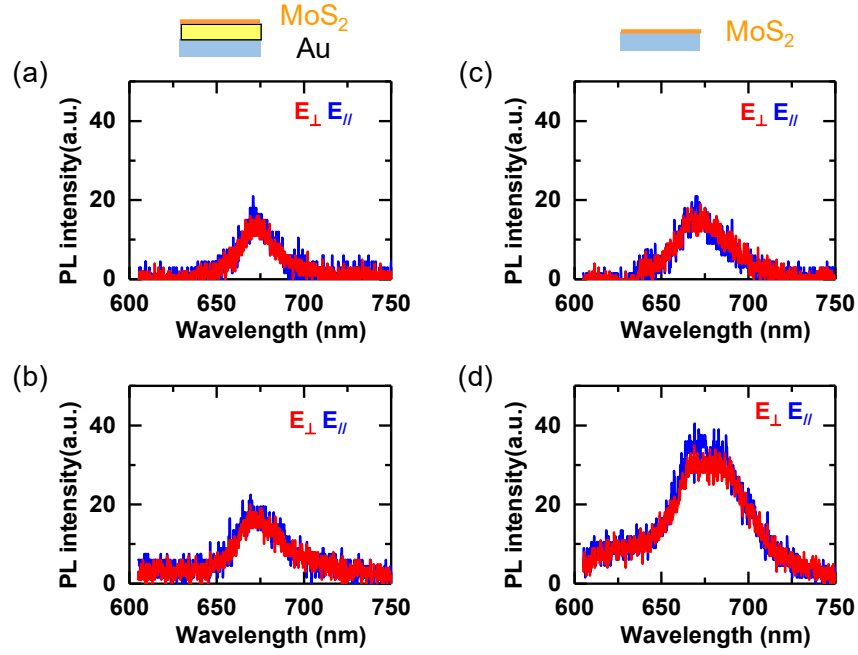


Figure S2. Polarization-dependent PL spectra of MoS₂ monolayer flakes on planar SiO₂/Si substrates (a,b) with and (c,d) without Au thin films, as illustrated above the spectra. The PL spectra were obtained using excitation lasers with wavelength of (a,c) 620 nm and (b,d) 545 nm. Red and blue lines correspond to the spectra with light polarization perpendicular (E_{\perp}) and (b) parallel (E_{\parallel}) to the grating. The laser power density was 4.5 $\mu\text{W}/\mu\text{m}^2$ and 4 $\mu\text{W}/\mu\text{m}^2$ for the excitation sources with wavelength of 620 nm and 545 nm, respectively.

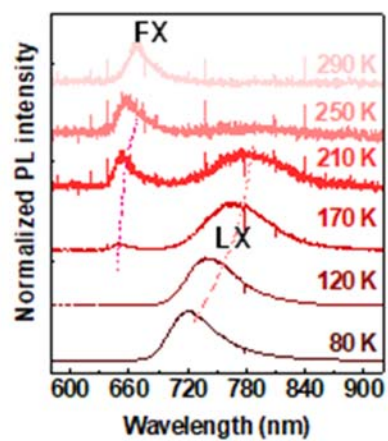


Figure S3. Temperature-dependent PL spectra of MoS₂/AG under 532 nm illumination from 80 K to 290 K. Free exciton (FX) peaks and localized exciton (LX) are dominant at high and low temperatures, respectively.

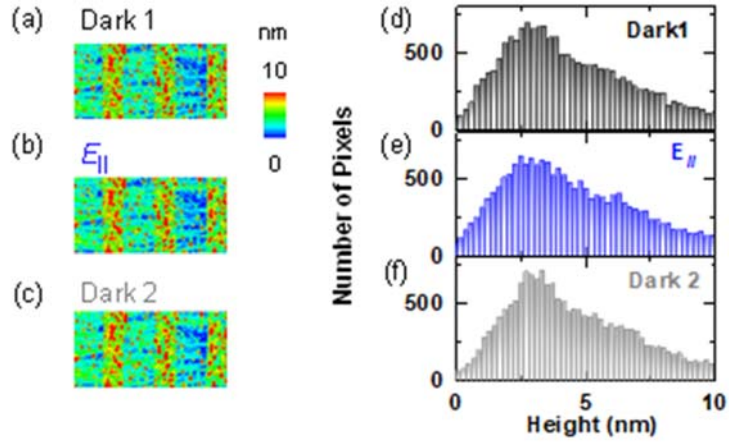


Figure S4. Atomic force microscopy images of MoS₂/AG with dimensions of $1.5 \times 0.75 \mu\text{m}^2$ obtained (a,c) in dark and (b) under illumination of 650-nm-light with 8 mW/cm^2 . The images obtained (a) after storing the sample for more than 3 hours in dark [Dark1], (b) under $E_{||}$ -polarized light illumination [$E_{||}$], and (c) in dark 5 minutes later the $E_{||}$ -polarized light illumination [Dark2]. Histograms of height of the MoS₂ monolayers on AG from the images in (d) a [Dark1], (e) b [$E_{||}$], and (f) c [Dark2].

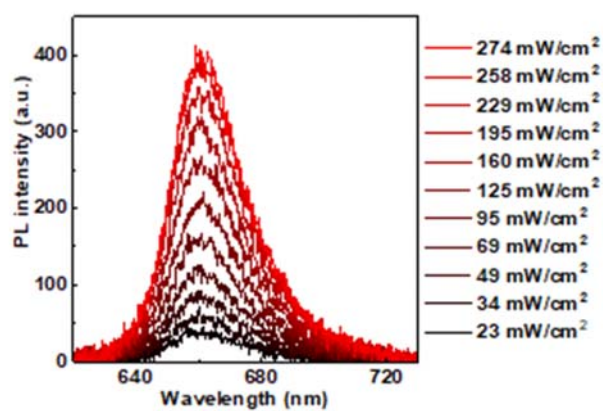


Figure S5. Laser power dependent PL spectra of MoS₂/AG under 532-nm-light irradiation with power density from 23 mW/cm² to 274 mW/cm². The laser beam spot size was 0.1 cm², similar to that used in the KPFM measurements.