Supporting Information

Substitutional Fluorine Doping of Large-Area Molybdenum Disulfide Monolayer Films for Flexible Inverter Device Arrays

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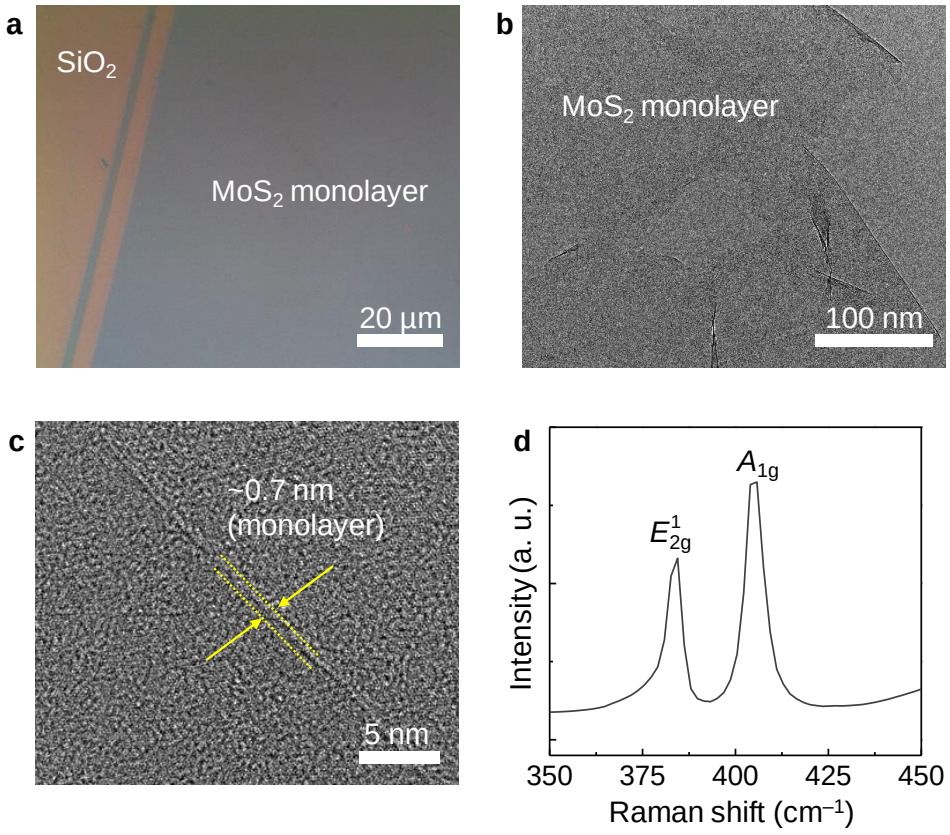

Figure S1. (a) Optical microscopy and (b,c) transmission electron miscopy (TEM) images of CVD-grown MoS_2 monolayer. TEM images indicate that our synthesized large-area MoS_2 film is monolayer. (d) Raman spectrum of a MoS_2 film grown by a CVD.

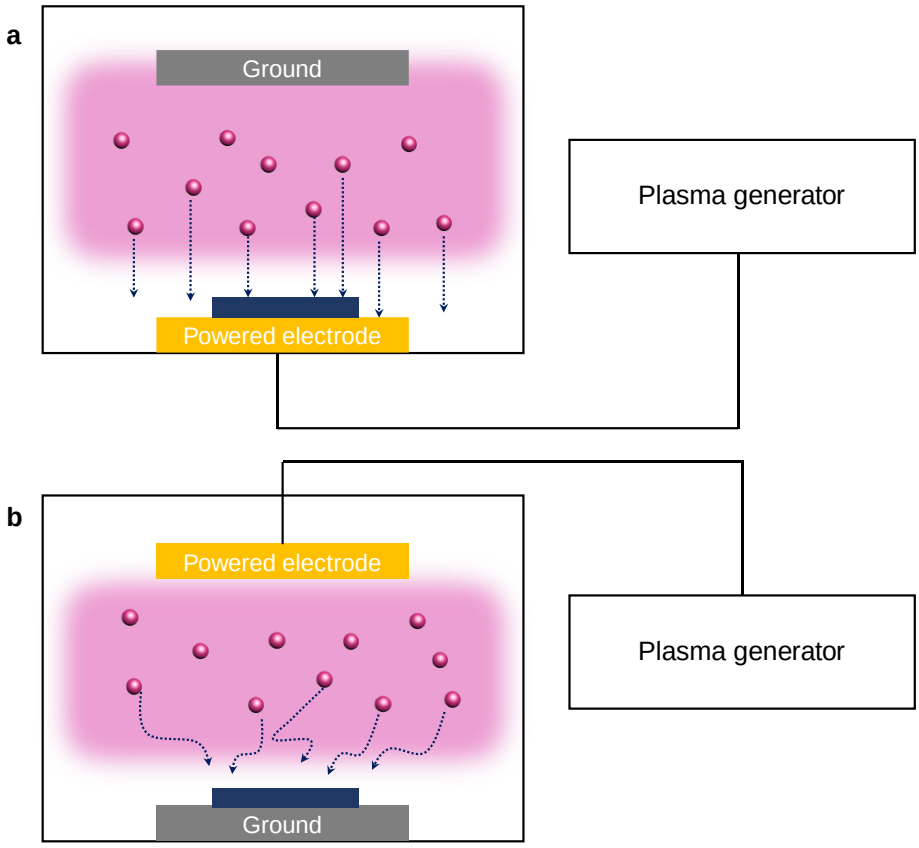

Figure S2. Schematic illustrations of (a) conventional and (b) our plasma treatment systems.

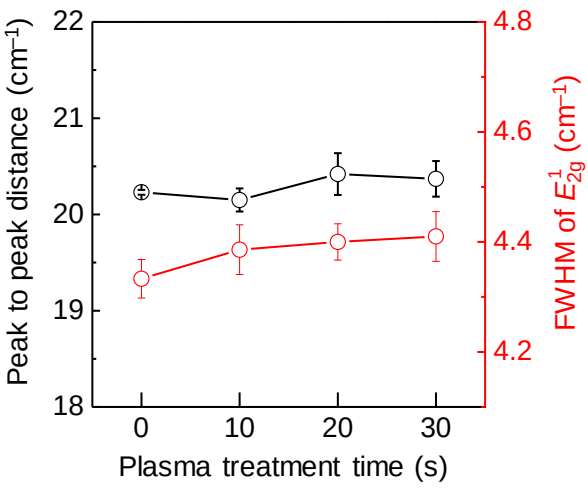

Figure S3. Variations of peak to peak distance ($A_{1g} - E^1_{2g}$) and fwhm of E^1_{2g} peak of the SF_6-treated MoS_2 monolayer with varying plasma treatment time.

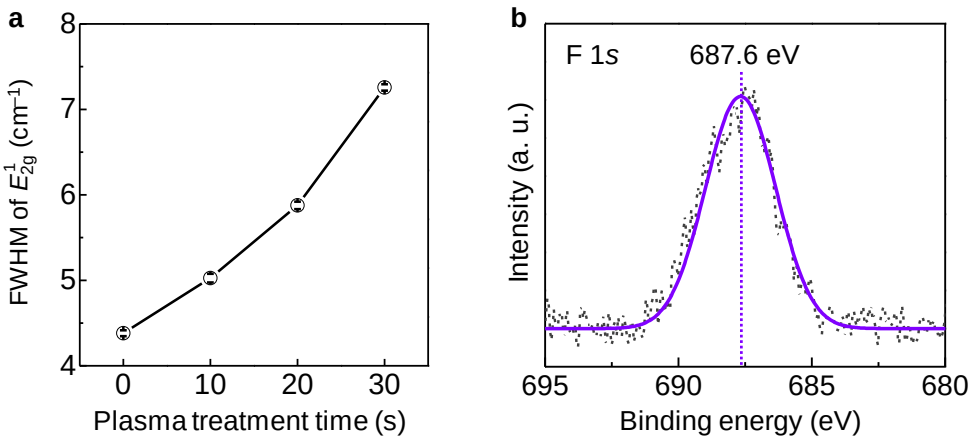

Figure S4. (a) Variations of fwhm of E^1_{2g} peak of MoS_2 monolayer films treated by conventional plasma treatment system with varying plasma treatment time. (b) F 1*s* XPS spectrum of a MoS_2 monolayer film treated by conventional plasma at an applied power of 10 W for 10 sec.

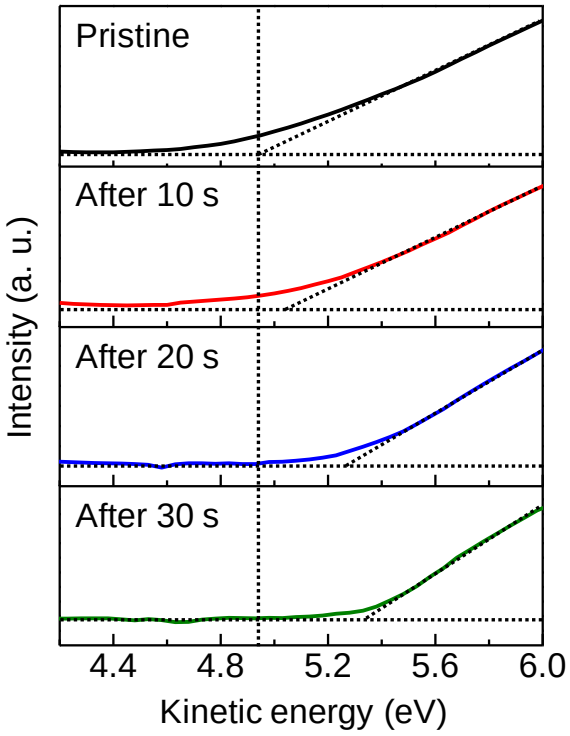

Figure S5. UPS spectra of the pristine and the SF_6-treated MoS_2 monolayer with varying plasma treatment time.

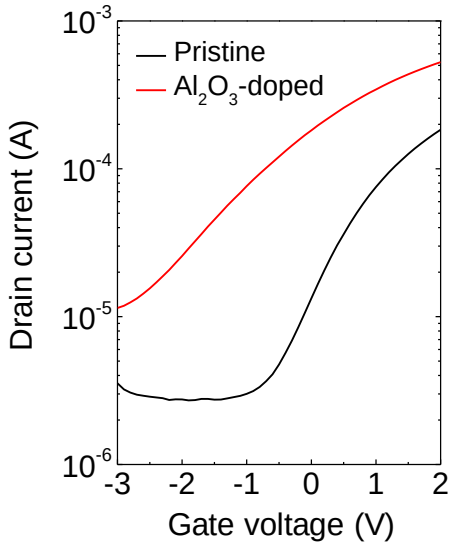

Figure S6. Transfer characteristics of MoS_2 monolayer device before (pristine) and after 20 nm thick Al_2O_3 film deposition. V_{th} shits toward negative gate voltage side, and on current level increases, which indicates the *n*-type doping effect.

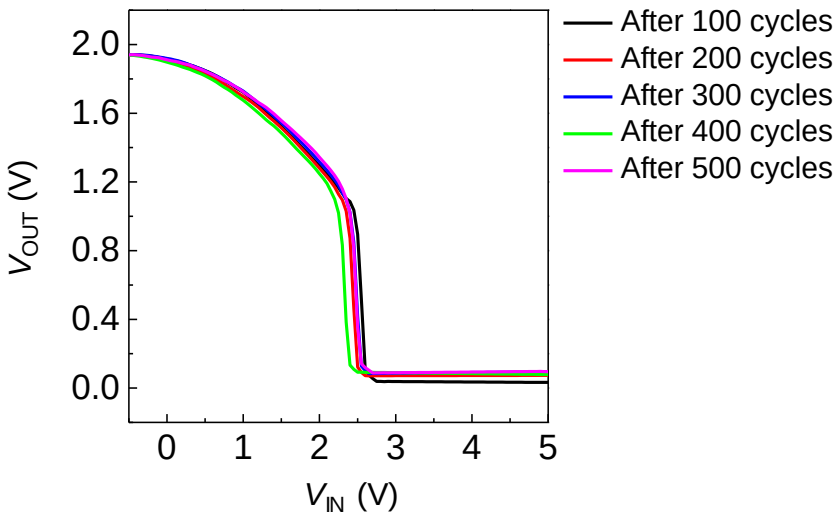

Figure S7. V_{OUT}-V_{IN} curves of the MoS_2 homojunction flexible inverter device applied at V_{DD} = 2 V under repetitive bending cycles with strain of 0.5%. There is almost no change of curves after each cycle.