Supplementary Information

Air-stable, efficient electron doping of monolayer MoS_2 by salt–crown ether treatment

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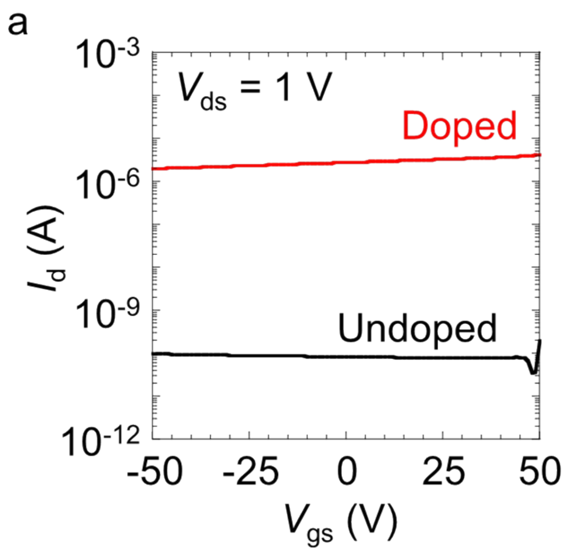

Figure S1. (a, b) The transfer (a) and output (b) curves for undoped and doped monolayer WS_2 using 100 mM dopant solution.

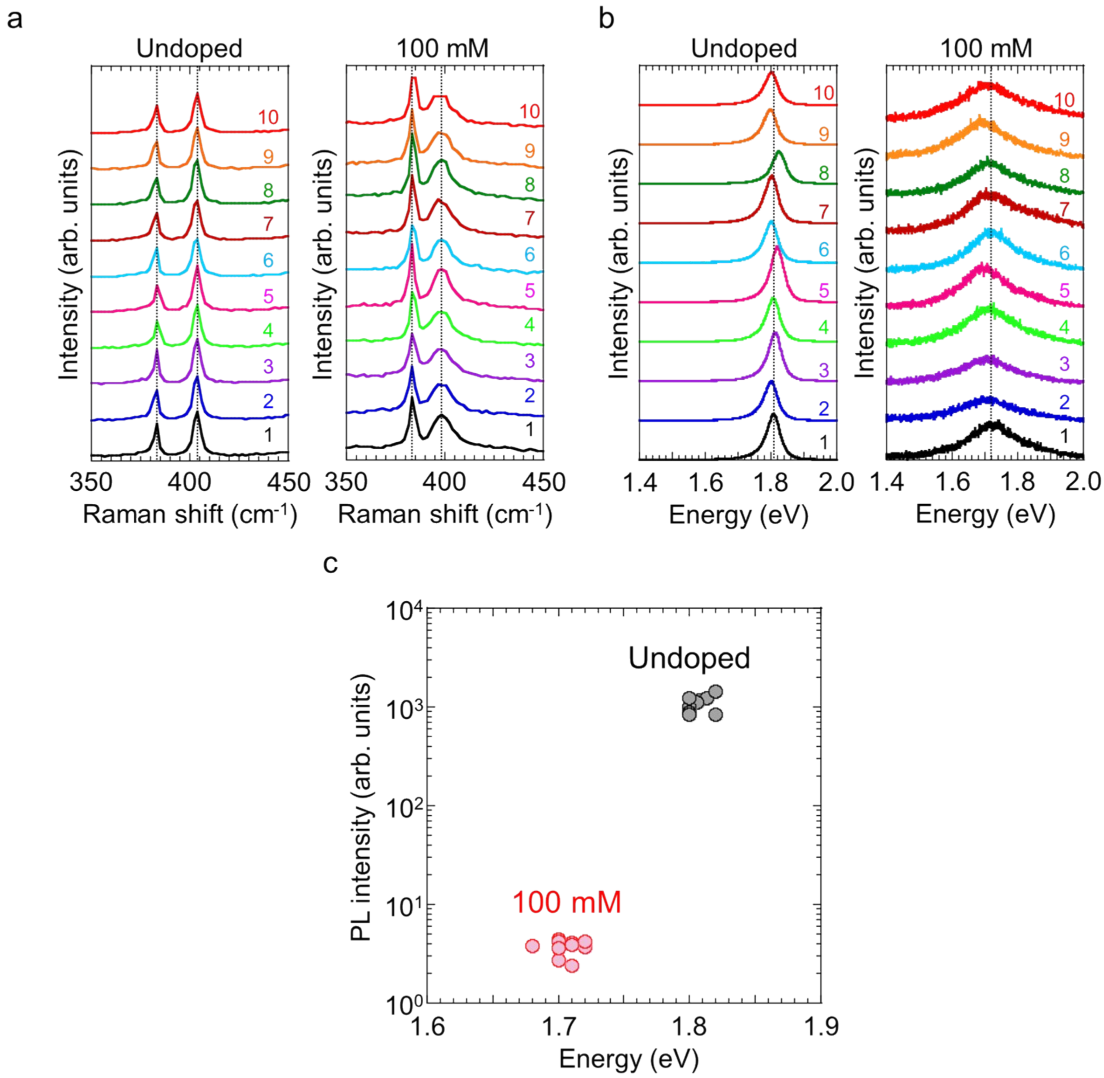

Figure S2. (a, b) Raman (a) and PL (b) spectra of undoped and doped MoS_2 crystals taken at different 10 points. (c) Distributions of PL peak energy and intensity of undoped and 100 mM doped MoS_2 taken at different 10 points.

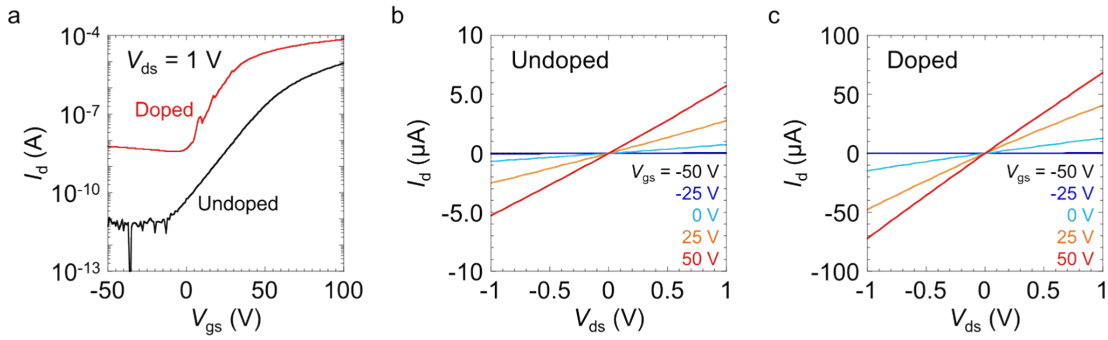

Figure S3. (a) Transfer curves of the device with photoresist coating only in the middle of the channel before and after the doping using 100 mM dopant solution drawn on a logarithmic scale. (b, c) Output curves of the device with a photoresist coating only in the middle of the channel: (b) before and (c) after the doping process using 100 mM dopant solution.

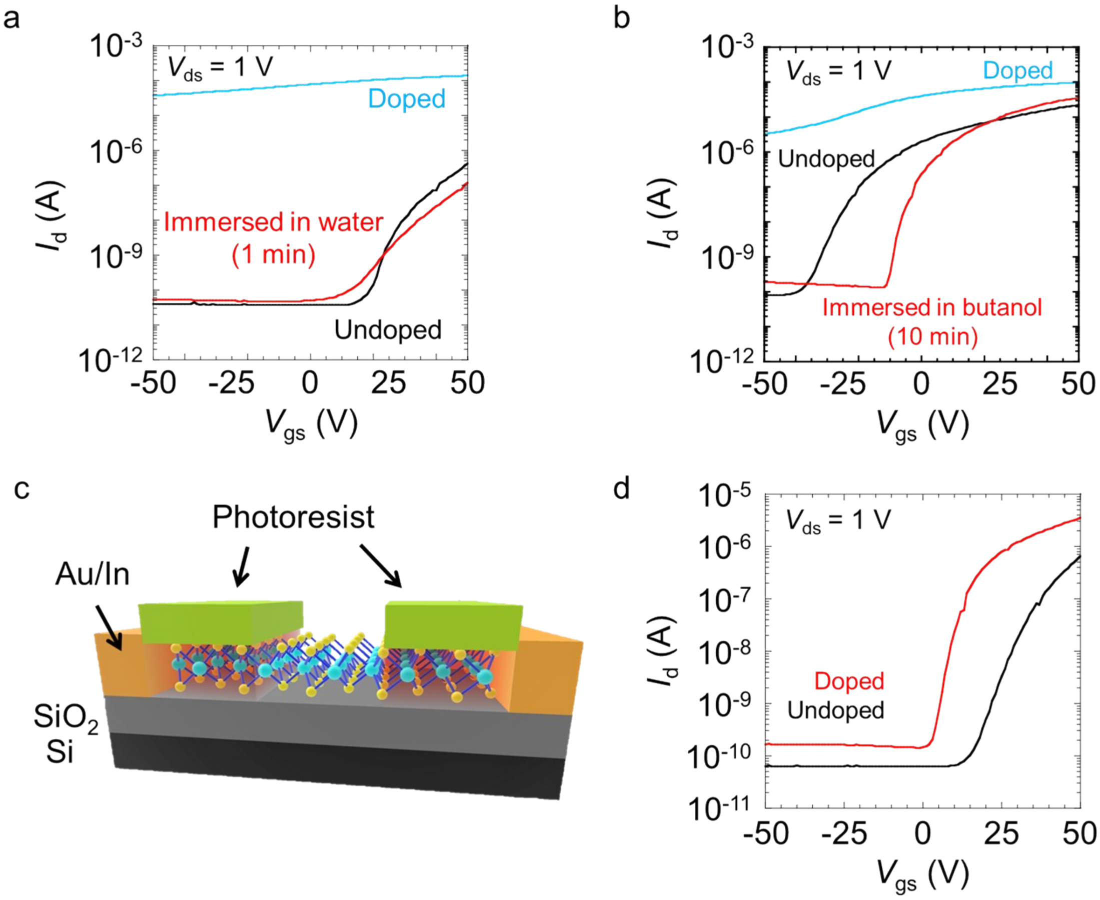

Figure S4. (a, b) Reversible transfer characteristics of a KOH/benzo-18-crown-6-doped device using 100 mM (a) or 10mM (b) dopant solution. The transfer curves returned to those of undoped sample after immersion in water (a) or butanol (b). (c, d) Schematic (c) and transfer characteristics (d) of an $n^+/i/n^+$ patterned device using 100 mM dopant solution with photoresist coating only close to the source and drain electrodes.

Table S1. Comparison of the carrier density and air stability of chemically doped monolayer (ML) and few-layer (FL) MoS_2 using different n-type dopants. The carrier densities were estimated by Hall effect for this work, by the electric-field effect with the parallel plate model for Ref. 1, 2, 5, and the shift of threshold voltage for Ref. 3, 4, 6.

	Dopants	Materials	Carrier density (cm^{-2})	Air stability
This work	KOH/benzo-18-crown-6	ML MoS_2	~3.4×10^{13}	~24 days
Fang *et al.*[1]	Potassium	FL MoS_2	~1.0×10^{13}	
Kiriya *et al.*[2]	Benzyl viologen	FL MoS_2	~1.2×10^{13}	~9 days
Andleeb *et al.*[3]	*p*-Toulene sufonic acid	FL MoS_2	~2.5×10^{12}	~10 days
Rai *et al.*[4]	Amorphous titanium suboxide	ML MoS_2	~7.4×10^{12}	~30 days
Rosa *et al.*[5]	Poly(vinyl-alcohol)	FL MoS_2	~4.0×10^{12} (~8.0×10^{12} after annealing)	~16 hours (> 30 days with Al_2O_3 encapsulation)
Zhang *et al.*[6]	Pentamethylrhodocene dimer	ML MoS_2	~2.4×10^{12}	

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