

SUPPLEMENTARY INFORMATION

Effect of Al₂O₃ passive layer on stability and doping of MoS₂ Field-Effect Transistor (FET) biosensors

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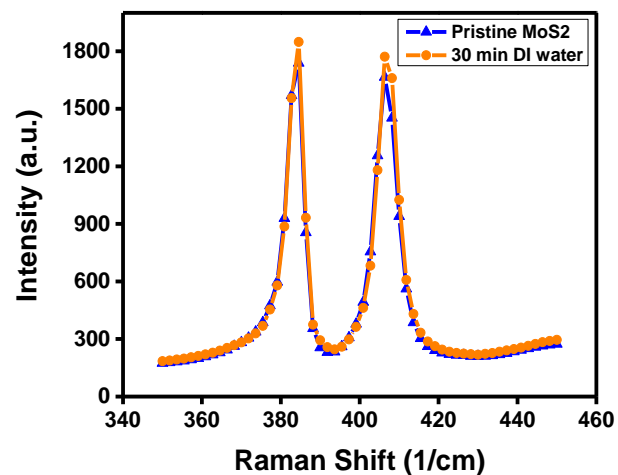
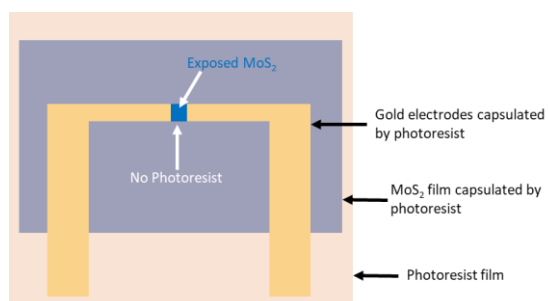


Figure S1. Raman spectra of MoS₂ before and after 30-min incubation in DI water.

a)



b)

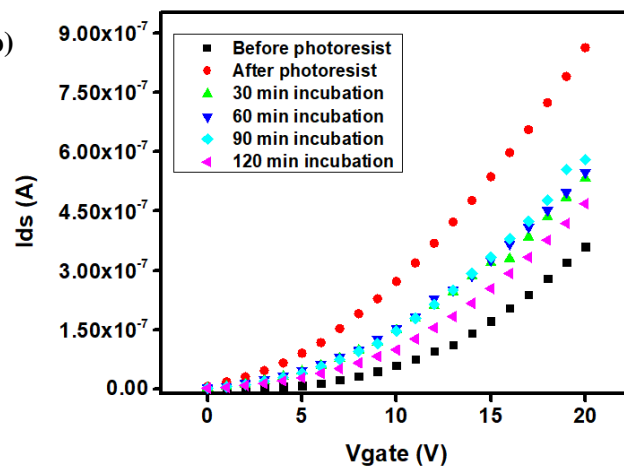


Figure S2. S1813-MoS₂ based device (a) schematic and (b) field-effect transistor characteristics after in DI water (pH=7).

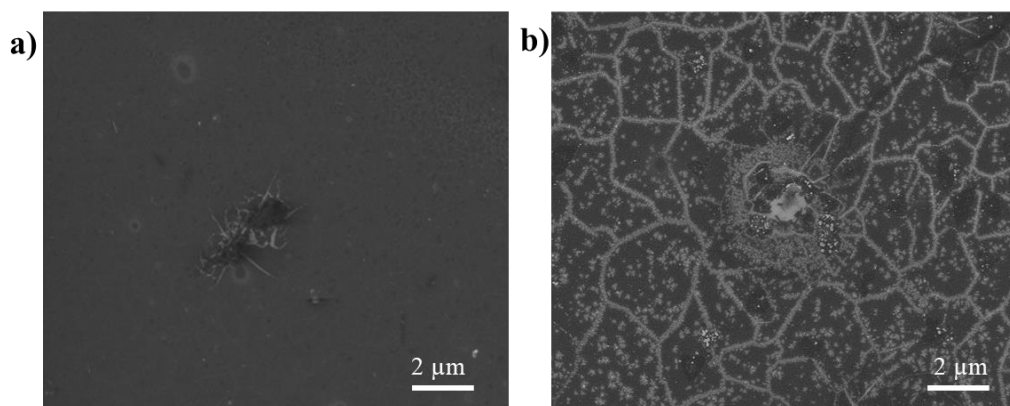


Figure S3. SEM image of same location a) before; b) after 10 min incubation in 5 mM AuCl_3 solution.

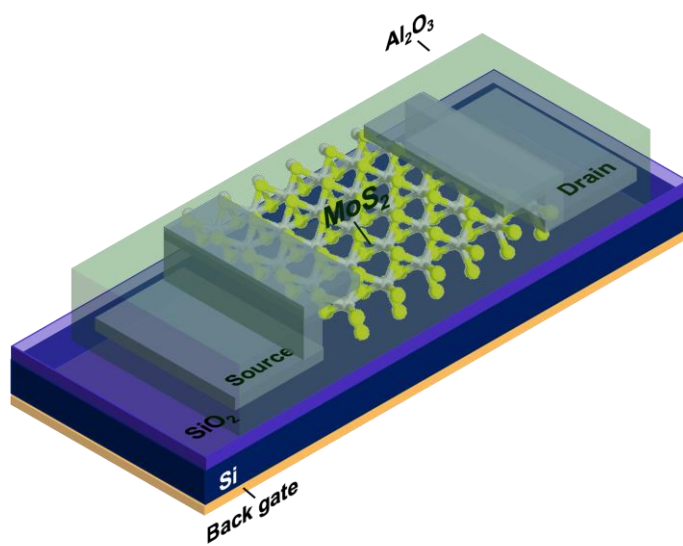


Figure S4. Schematic of MoS_2 -based FETs with Al_2O_3 passive layer.



Figure S5. Optical image of the sensor (a) before and (b) after Al_2O_3 deposition (c) L1: SiO_2 and L2: Al_2O_3 thickness measured by ellipsometer.

Table S1. Performance summary of MoS_2 -based FET biosensors.

Materials	Target analyte	Concentration range	Sensitivity	LOD	Reference
MoS_2 nanosheets	Prostate-specific antigens (PSA)	$10^{-6} \sim 125$ ng/mL	0.1295 nA/ng·mL $^{-1}$	10^{-5} ng/mL	[1]
Exfoliated MoS_2	Glucose	300 nM \sim 30 mM	260.75 mA/mM	300 nM	[2]
CVD MoS_2	Bladder cancer biomarkers NMP22 and cytokeratin 8 (CK8)	$10^{-15} \sim 10^{-9}$ mg/mL	-	0.027 and 0.019 aM	[3]
Commercial MoS_2 nanosheets	C-reactive protein (C-RP)	100 fg/mL \sim 10 ng/mL	176 nA/g·mL $^{-1}$	8.38 fg/mL	[4]
Printed few-layer- MoS_2	Streptavidin	1 \sim 300 fM	-	1 fM	[5]
Microprinting MoS_2	Tumor necrosis factor-alpha (TNF- α)	60 fM \sim 6 pM	$0.14 \pm 0.02\%$ /fM	-	[6]
Mechanical exfoliated multilayer MoS_2	PSA	375 fM \sim 3.75 nM	-	-	[7]
Mechanically exfoliated MoS_2	PSA	100 fg/mL \sim 1 ng/mL	-	100 fg/mL	[8]
CVD MoS_2	HIgG	$10^2 \sim 10^6$ ng/mL (667 pM \sim 6.67 μ M)	0.053 per Log (ng/mL)	83 ng/mL	This work

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