# Highly Stable Hysteresis-Free Molybdenum Disulfide Field-Effect Transistors

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Molybdenum disulfide ($MoS_2$) has been intensively studied as a great candidate for next-generation nano electronic devices due to its promising n-type semiconducting properties with a finite bandgap.[1,2] One of the main issues of $MoS_2$ FETs is poor electrical and environmental stability. The instability of $MoS_2$ FETs mainly result from the charge trapping on the $MoS_2$ surface which is induced by the organic residues, adsorbed $H_2O$ and $O_2$ molecules.[3,4] Due to the instability caused by extrinsic and environmental effect, revealing intrinsic properties of the $MoS_2$ are still limited.

In this study, we demonstrated highly stable hysteresis-free $MoS_2$ FETs by annealing process and sequential polymer passivation. The fabricated $MoS_2$ FETs showed negligible hysteresis even after 100 days stored in ambient air remaining good electron mobility of ~20 $cm^2/Vs$, good on/off ratio larger than $10^6$, and good subthreshold swing of ~200 mV/dec. This dramatic improvement on the stability was attributed to the removal of existing charge trapping states by annealing process and prevention of adsorption of $H_2O$ and $O_2$ molecules to the $MoS_2$ surface by polymer passivation.

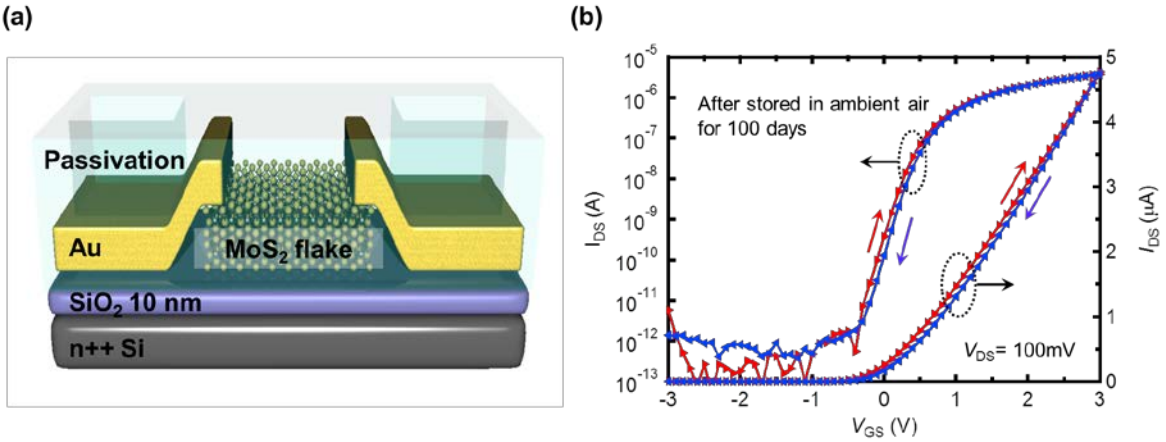


**Fig. 1. (a) A schematic diagram for $MoS_2$ FETs with passivation layer. (b) Transfer characteristics for multilayer $MoS_2$ FETs with passivation layer in the linear regime where $V_{DS}$= 100 mV.**

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**References**

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