# Local chemical modification of $MoS_2$ layer using AFM lithography

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As the demand for nano scaled devices is increasing, Two dimensional (2D) materials have been theoretically and experimentally investigated in the last few decades. Among 2D materials, TMD(Transition Metal Dichalcogenide) materials which have layered structure shows extensively magnetic, electrical, and mechanical properties [1]. Especially, hydrogenation of $MoS_2$ by high temperature and $MoS_2$ irradiated by proton shows unexpected ferromagnetic behavior which would lead to new spintronics devices [2].

In this works, we fabricate locally hydrogenated or oxidized $MoS_2$ using AFM lithography and confirm specific magnetic properties. Through Raman measurement, we identify that the pure $MoS_2$ surface modify hydrogenated or oxidized one under different lithographic condition. Also, Magnetic Force Microscopy (MFM) measurement support that hydrogenated or oxidized $MoS_2$ using AFM lithography shows novel magnetic properties comparing with pristine $MoS_2$. This result may attribute to the H or O atoms deposited on $MoS_2$ defect by AFM lithography.

## References

[1] S. Ahmed. *et al*. Journal of Alloys and compounds **746** (2018) 399-404
[2] S.W. Han. et al. Physical Review Letters **110** (2013) 247201-5

## Figures

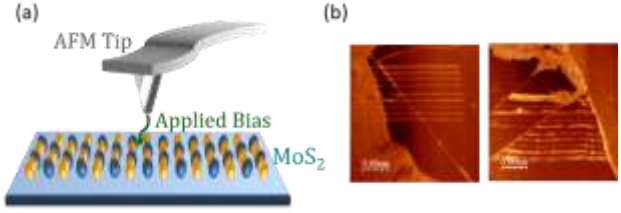


**Figure 1. (a)** Schematic image of AFM lithography method and (b) AFM image of hydrogenated or oxidized $MoS_2$ using AFM lithography

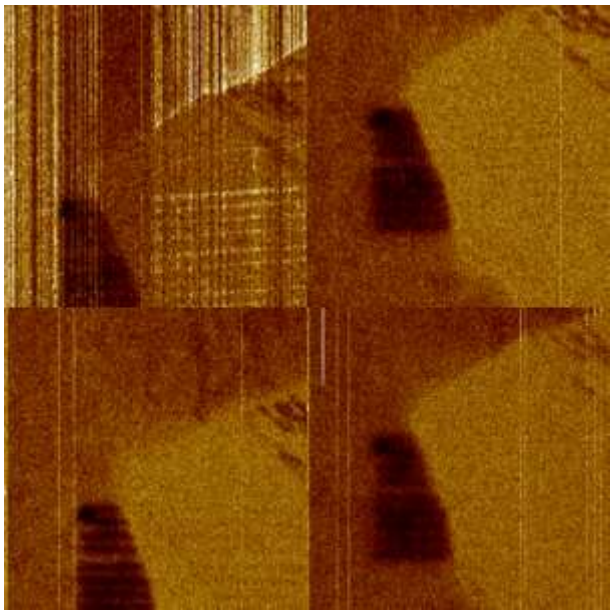

**Figure 2.** MFM image of hydrogenated $MoS_2$ applied 1T or -1T