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# An update on contact reactions with TMDs

Transition metal dichalcogenides (TMDs) are promising for applications in various electronic and photonics devices. $MoS_2$, as one of the most studied TMDs, demonstrates impressive subthreshold slope, $I_{on}/I_{off}$ ratio and mobilities. However, the contact resistance of the highest-performance metal contacts to $MoS_2$ based devices is orders of magnitude higher than that required for state-of-the-art logic circuits. Recent studies have noted that the contact resistance can be impacted by the deposition ambient of the metal contacts.[1] Various metal contact (Au, Ti, Ir, Cr, and Sc) on $MoS_2$ have been studied to understand their interface chemistry and the origin of Fermi level pinning under different deposition ambients. But the interface chemistry of now popular Ni and Ag contacts on $MoS_2$ has not been systematically reported. CVD $MoS_2$ films tend to have more intensive defects than the $MoS_2$ bulk crystal. This difference in defect density could potentially impact the interface chemistry of the metal contacts on $MoS_2$ and thus probably lead to different device performance. We will present an update of our prior study of deposition ambient effects [2,3] incorporating recent results with Ag and Ni contacts.[4] This work was supported in part by NEWLIMITS, a center in nCORE, a Semiconductor Research Corporation (SRC) program sponsored by NIST through award number 70NANB17H041.

## References

[1] C. English et al., Nano Lett. 2016, 16 (6), 3824-3830.
[2] C. Smyth et al., J. Phys Chem. C. 2016, 120, 14719-14729.
[3] R.M. Wallace, GrapheneforUS Conference (2019)
[4] X. Wang, at al., Submitted (2020)

## Figures

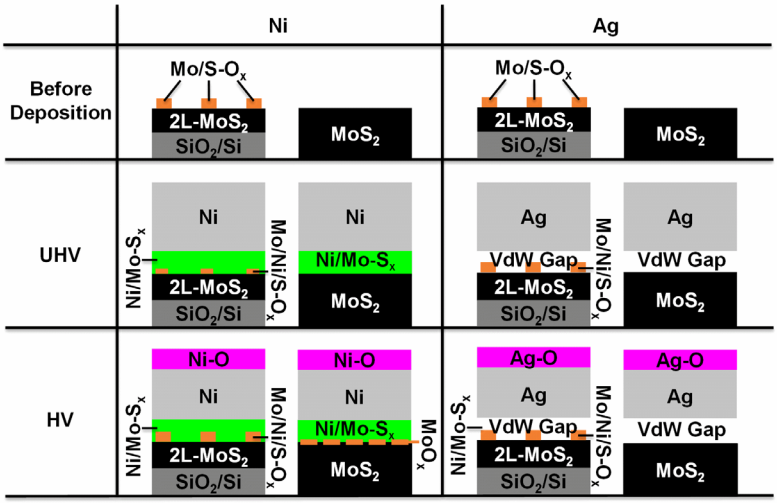


**Figure 1:** Schematic representations of the interface chemistry formed between contact metals (Ni, and Ag) and $MoS_2$ substrates ($MoS_2$ bulk, and 2L-$MoS_2$ film).