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Bismuth contacts on ultrapure monolayer transition metal dichalcogenides (TMDs)

Two-dimensional (2D) monolayer semiconductors such as transition metal dichalcogenides (TMDs) have attracted intense attention in electronics and optoelectronics due to their exotic properties[1]. For fundamental research and most applications, it's necessary to combine high-quality contacts on ultrapure semiconductors to build efficient connections with external circuits, especially for low-temperature scenarios[2]. However, achieving this remains elusive to date. Here, we report a high-quality device construction by combing high-quality material growth, van der Waals assembling and recently reported semimetallic Bismuth contacts[3], which could efficiently operate from 300 K to 1.6 K. We also developed a general analysis model to unveil a panorama understanding of a set of microscopic device parameters.

References

[1] Chhowalla M et al. Nature Reviews Materials 1.11 (2016): 1-15.
[2] Schulman et al. Chemical Society Reviews 47.9 (2018): 3037-3058.
[3] Shen et al. Nature 593.7858 (2021): 211-217.

Figures

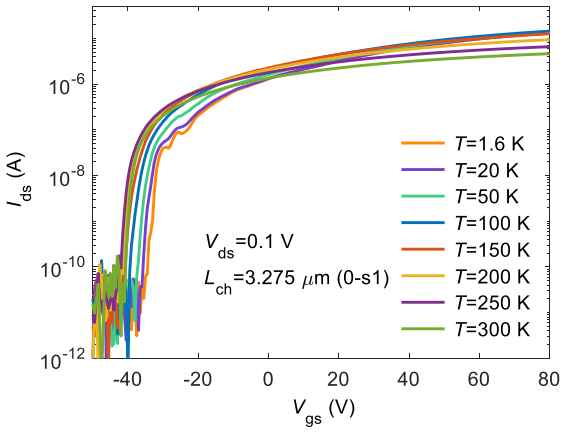

Figure1: Transfer curve of monolayer MoSe2 with Bismuth contact FET in the temperature range from 1.6 K to 300 K.