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MoS_2 Field-effect Transistors with Graphene/Metal Heterocontacts YUCHEN DU, LINGMING YANG, JINGYUN ZHANG, NATHAN CONRAD, HAN LIU, PEIDE YE, Purdue University — MoS_2, as one of the mostly studied transition-metal dichalcogenides, has already revealed a series of new physics and potential device applications. However, the performance of the MoS_2 field-effect transistors is limited by the large contact resistance at metal/MoS_2 interface due to the non-negligible Schottky barrier. In this study, n-type few-layer MoS_2 field-effect transistors with graphene/Ti as the metal contacts have been fabricated showing more than 160 mA/mm drain current at 1 μm gate length and on-off current ratio of 10^7. Different metal contacts (Ti, Ni, Au, and Pd) from low work function to high work function metals on MoS_2/graphene hetero contacts have been performed and studied. Moreover, for the first time, 2D Fermi-level pinning concept is introduced to understand the band alignment of hetero-structured metal/graphene/MoS_2 or other 2D semiconductor interfaces. Temperature dependent, noise, and stress measurement results will also be presented.

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