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Improved Performance in MoS_2 Field-Effect Transistors Contacted by Highly Doped Graphene Electrodes and Passivated by Hexagonal Boron Nitride[1] MEEGHAGE PERERA, HSUN-JEN CHUANG, ZHIXIAN ZHOU, Wayne State University — A major challenge for developing semiconducting transition-metal-dichalcogenide (TMD)-based electronic devices is that TMDs tend to form a substantial tunneling or Schottky barrier (SB) with most metals commonly used for making electrical contacts, while low resistance Ohmic contacts are needed for exploring intrinsic transport properties of the channel material, and performance limits of realistic devices. We have fabricated low-resistance contacts to MoS_2 field-effect transistors by using graphene as work function tunable electrode material. To minimize the Schottky barrier height at the MoS_2/graphene junction and the contact resistance, both electrostatic and surface charge transfer doping methods were used to selectively dope the graphene electrodes. Substantial improvement of device performance was observed in devices with highly n-doped graphene electrodes. Four-probe electrical transport measurement was performed on MoS_2 devices with the active channel stacked between atomically flat hexagonal boron nitride (hBN) to further investigate the intrinsic performance limit of MoS_2 as a channel material.

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