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Lateral MoS_2 p-n junctions formed by chemical doping method
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— Interests on transition metal dichalcogenides, especially MoS_2, are growing immensely due to its semiconducting nature with visible light range bandgap and strong light absorption property, which can pave the way to replace Si-based electronics and realize flexible and transparent electronics. For more versatile applications and industrialization, however, a proper doping process is required because various devices such as photonics and tunneling devices are composed of p-n junctions. Here, we demonstrated the formation of lateral MoS_2 p-n junction by using partially stacked of hBN and p-doping with AuCl_3 solution. The fabricated devices showed an ideal rectifying behavior with ideality factor about 1. Under the exposure of monochromatic light, it revealed the properties of conventional p-n diode and also highly efficient photonic properties, showing feasibility to be applied for photovoltaic cells and photodetectors. Furthermore, we fabricated novel tunneling devices with similar device structure where local gates are located under MoS_2. Its Fermi level can be effectively controlled by local gate modulation, so that the tunneling current can flow by band-to-band tunneling. This study provides an effective way to realize the practical devices such as photonics and tun

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