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Tunneling in BP-MoS_2 heterostructure[1] XIAOCHI LIU, DESHUN QU, CHANGSIK KIM, FAISAL AHMED, WON JONG YOO, Sungkyunkwan Univ
— Tunnel field effect transistor (TFET) is considered to be a leading option for achieving SS <60 mV/dec. In this work, black phosphorus (BP) and molybdenum disulfide (MoS_2) heterojunction devices are fabricated. We find that thin BP flake and MoS_2 form normal p-n junctions, tunneling phenomena can be observed when BP thickness increases to certain level. PEO:$CsClO_4$ is applied on the surface of the device together with a side gate electrode patterned together with source and drain electrodes. The Fermi level of MoS_2 on top of BP layer can be modulated by the side gating, and this enables to vary the MoS_2-BP tunnel diode property from off-state to on-state. Since tunneling is the working mechanism of MoS_2-BP junction, and PEO:$CsClO_4$ possesses ultra high dielectric constant and small equivalent oxide thickness (EOT), a low SS of 55 mV/dec is obtained from MoS_2-BP TFET.

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Xiaochi Liu
Sungkyunkwan Univ

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