Homo-junction tunneling transistors formed with chemically doped two-dimensional materials

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Abstract
Two-dimensional (2D) crystals are intensively being studied because of their great potential to be an ultrathin body to realize efficient electrostatic modulation which can enable low voltage semiconductor device operation [1]. Their potential to be an ultrathin body further offers an advantage to result in high quantum tunneling current, since tunneling distance of charge carriers can be significantly reduced when p-n junctions are formed in 2D layered structured crystals. Therefore, 2D structured devices can present a significant advantage in the development of tunneling transistor technology [2] by overcoming the low on-current issue. In this work, we present various results on materials and electrical properties which were obtained from the homogeneous p^+-n^+ junctions which were fabricated by differentially doping few-layer 2D crystals by chemical surface treatments [3,4]. Interestingly, we present negative differential resistance observed at room temperature, by using the tunneling devices fabricated with few layer 2D crystals of molybdenum disulfide (MoS_2) and block phosphorous (BP).

References

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