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Ambipolar Characteristics Based on Complementary MoS_2 and WSe_2 Field-Effect Transistors

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Abstract:

Recently, semiconducting two-dimensional (2D) transition metal dichalcogenide (TMD) material-based field-effect transistors (FETs) were studied actively to overcome the short channel effects (SCEs), which are fundamental issues in scaling of logic transistors for the continuation of Moore's law [1,2].

In this work, complementary MoS_2 and WSe_2 FETs were fabricated by selective patterning with alignment technique. WSe_2 and MoS_2 channels were placed on highly doped-Si/SiO_2 substrate using mechanical exfoliation and dry transfer method to utilize p- and n-type channel, respectively. Then, we successfully obtained ambipolar transfer curves from the complementary MoS_2 and WSe_2 FETs. In addition, I_d-V_d and I_d-V_g characteristics of each polarity transistor were analyzed to verify the ambipolar operation and several advantages of the complementary FETs. This work can provide useful information of structure design to investigate proper electrical operation of 2D material-based ambipolar transistors.

Keywords

Semiconducting 2D TMDs materials, MoS2 and WSe2 FETs, Complementary FETs, Ambipolar transistors

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