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Characteristics of a Mott field-effect transistor (MottFET) based on $\mathbf{La_{1-x}Sr_xMnO_3}$[1] SUYOUN LEE, Korea Institute of Science and Technology, KEUNDONG LEE, Korea Institute of Science and Technology, Konkuk University, HYOJIN GWON, SEUNG-HYUB BAEK, Korea Institute of Science and Technology, BAEHO PARK, Konkuk University, JIN-SANG KIM, Korea Institute of Science and Technology — Recently, the metal-insulator transition (MIT) phenomenon shown in transition metal oxides has attracted much interest due to its superior characteristics such as fast switching speed ($\sim$ femtoseconds), high on/off ratio, and low power consumption. One example is the MottFET, which utilizes the MIT modulated by electric field through the band-filling in a Mott insulator. In this work, we examined MottFET devices based on $La_{1-x}Sr_xMnO_3$(LSMO), which is one of the mostly studied Mott insulators and attractive for the potential application in spintronic devices due to its intriguing properties such as colossal magnetoresistance (CMR) and half-metallicity. For the devices with the composition near the boundary of the metal-insulator transition, we confirmed that the conductivity of the channel could be modulated by a gate electric field of moderate strength. In addition, for the future application in spintronic devices, we investigated the dependence of device characteristics on the magnetic field. As the applied magnetic field increased, we found that the current-voltage characteristic showed anomalous behavior, which might be attributed to the electron-electron interaction, spin ordering, and the magnetic impurities in the channel.

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