Electrical properties of MoS_2 TFTs with different layer thickness

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Molybdenum disulfide(MoS_2) which is one of dichalcogenide materials, indicates semiconducting with a bandgap of 1.2 ~ 1.8 eV and it has unique electrical properties. These materials also apporopriate for flexible and transparent electronics and optical devices. Because of this reason, recently, MoS_2 was used for channel materials of TFTs.

In this paper, we fabricated the thin-film transistors with MoS_2 as a channel material on a SiO_2/Si substrate. MoS_2 layers were exfoliated by mechanical exfoliation method, and transferred onto SiO_2/Si substrate. After separating several different thickness of MoS_2, the thickness and numbers of layer of MoS_2 were checked by Atomic Force Microscopy(AFM), Raman spectroscopy and Photoluminescence(PL) measurement.

Thin-film transistors with different number of MoS_2 layer(1-layer, 3-layer, 6-layer, 10-layer) as a channel region were fabricated by photolithography using electron-beam evaporator(E-Beam evaporator), and we measured their electrical properties. In conclusion, the highest electron mobility was obtained at 6-layered MoS_2 TFT, and threshold voltages were decreased as thickness of MoS_2 is higher.

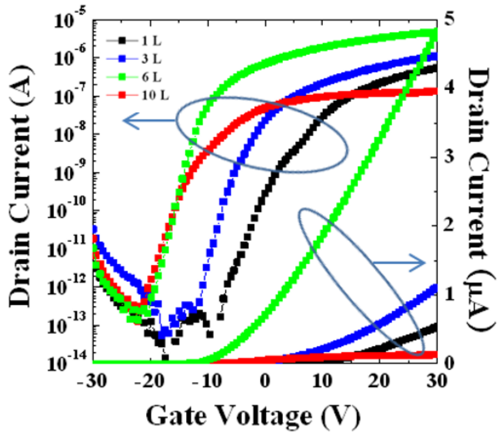

Fig. 1. Transfer characteristics of MoS_2 TFTs at V_{ds} = 0.4 V

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