Impact of work-function variation on the performance of silicon-on-insulator feedback field-effect transistor

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Contact Oxidized Few layer p-type WSe2 Field Effect Transistors

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We demonstrate a contact doping technique applied to the ultra-thin (2~5 nm) tungsten diselenide (WSe_2) channel formed in field effect transistors (FET) by applying the selective oxidation process to the contact regions. We were able to achieve high performance p-type FET electrical properties with an on/off ratio of 10^8, a field effect mobility of 155 cm^2/Vs and a contact resistance of 1 $k\Omega\,\mu m$. Importantly, Schottky barrier heights (SBH) and Fermi level pinning factors of the contact doped WSe_2 FET were measured by employing various work function metals (In, Pd) as the electrodes.

Keywords : Tungsten diselenide, WSe2, doping, oxidation, oxygen plasma

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SOI FBFET has received lots of attention because it has not only super steep switching characteristic (i.e., its subthreshold slope ~ 1 mV/decade at 300 K), but also it requires simple design rules [1]. However, as the minimum feature size for the SOI FBFET has been scaled down to nanometer-scale regime, the process-induced random variation has become significant. This work has made a precise investigation of work-function variation, one of the most significant random variation sources [2] in order to understand and suppress the WFV-induced V_{TH} variation (σV_{TH}) in the SOI FBFET.

Keywords : Positive feedback, steep switching, random variation