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Single-crystalline rutile TiO_2 nanowires by mass selected Ni catalyst: Synthesis and electrical properties MYUNG HWA KIM, CHRISTOPHER LARSON, JEONG MIN BACK, XIHONG CHEN, MARTIN MOSKOVITS, ALEC WODTKE, Department of Chemistry & Biochemistry, University of California at Santa Barbara — We present a novel method for growing high quality TiO_2 nanowires using mass-selected Ni clusters of nanometer sizes produced by magnetron sputtering and also show their electric field-effect functions. Single-crystalline TiO_2 nanowires(NWs) are grown by atmospheric pressure physical vapour deposition(APPVD) process, using TiO and Ti metal powders as a Ti source and Ni nanoparticles as a catalyst, respectively. For the TiO_2 NWs growth, first, the Ti metal layer with a thickness of ∼50nm was then deposited on the SiO_2/Si substrate by the e-beam evaporation technique and subsequently, the mass selected Ni clusters by using magnetron sputtering source combined with a quadrupole mass filter was deposited onto the Ti layer. APPVD growth was then performed in a horizontal quartz tube furnace at 800°C-950°C by introducing high purity Ar carrier gas (99.999%) with the flow rate of 300 sccm for 2 hours. The $I-V$ curves are linear over the entire annealing temperature range at 200 ∼500°C, showing that the electrodes form good ohmic contacts with the nanowires. The Ivs V_G curves for various values of V_{SD} and gate dependent $I-V$curves of a TiO_2 nanowire configured as a back-gated FET are also obtained and will be discussed.

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