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Fabrication and characterization of cryogenic complementary devices on Si/SiGe heterostructures T.M. LU, Princeton University, C.-H. LEE, National Taiwan University, D.C. TSUI, Princeton University, C.W. LIU, National Taiwan University — We have fabricated cryogenic complementary devices using undoped Si/SiGe heterostructures which contain an electron quantum well and a hole quantum well. The highest temperature in the fabrication process is as low as 440 $^\circ$C, preserving the quality of the epitaxial films. By properly biasing the gate voltage, two-dimensional (2D) electrons and holes are induced capacitively in the quantum wells. The electron mobility, $\sim 2\times 10^4$ cm^2/Vs, is significantly lower than that in a heterostructure without any hole quantum well. Nevertheless, the induced 2D electrons show the integer and fractional quantum Hall effect characteristics. The mobility of the 2D holes is $\sim 7\times 10^3$ cm^2/Vs, consistent with previous reports, and is limited by alloy scattering. A proof-of-principle inverter is demonstrated.

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