

A COMPARISON OF FULLY DEPLETED SOI-CMOS TRANSISTORS IN FIPOS AND SIMOX SUBSTRATES.

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Oxygen-implantation (SIMOX) and oxidation of porous silicon (FIPOS) are both promising routes for the production of high quality SOI wafers. In order to maximise the performance of SOI-CMOS transistors, the silicon film under the gate should be fully depleted, which requires the use of thin-film SOI material. We have produced 1 micron thin-film SOI-CMOS transistors in both SIMOX and FIPOS wafers, using a common mask set. LOCOS isolation was used on the SIMOX wafers and on the FIPOS wafers the SOI islands defined the active areas directly. The silicon film thicknesses were approximately 140 nm for the SIMOX wafers and 100nm for the FIPOS wafers

The basic characteristics of transistors in the two types of material are similar, with high gains and current drives, near ideal subthreshold slopes and low junction leakages. In both cases the characteristics are free from the "kink" seen in partially depleted devices. Both types of n-channel device exhibit slight negative output resistance at high gate voltages.

Low field inversion mobilities are comparable for the two types of SOI. For SIMOX material the n- and p-channel mobilities are 580 and 220 $\text{cm}^2/\text{V/s}$ respectively; for FIPOS the figures are 520 and 235 $\text{cm}^2/\text{V/s}$. The back channel mobilities of SIMOX transistors are over 90% of the front channel values; for FIPOS the back channel mobilities are lower at 55-60% of the values for the front channels. The values of ΔL , for both front and back channels and for both types of material, show that no anomalous lateral diffusion of source/drain dopants has occurred. We will also present data comparing ring oscillator gate delays for both types of SOI.

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