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MOS Ge Diodes Based on High κ Gate Dielectrics Grown by MBE and ALD KUN YU LEE, W.C. LEE, T.D. LIN, C.S. LEE, Y.C. CHANG, Y.J. LEE, M.L. HUANG, Y.D. WU, M. HONG, Department of Materials Science and Engineering, NTHU, Taiwan, J. KWO, Department of Physics, NTHU, Taiwan — Germanium-based CMOS technology is gaining importance due to its high carrier mobility. In this work high κ gate-dielectrics, Al_2O_3, HfO_2, Y_2O_3 and $Ga_2O_3(Gd_2O_3)$ grown by MBE and ALD were investigated as passivation layers on n type Ge(100). Thermal stability of the MOS diodes was examined after various anneals. Prior to dielectric depositions surface pretreatments were applied to reduce the unwanted GeO_x interfacial layer, and to improve electrical properties. Frequency dispersion of C-V curves was reduced by using a 350^oC preclean process, compared to the sample without precleaning. The leakage current density of ALD grown HfO_2 (6.8nm) is $4.610^{-6}A/cm^2$ with κ of 10.5. The improved CV curve was attributed to less GeO_x formed at substrate and oxide interface, as confirmed by XPS analysis. However, with higher cleaning temperature over 400^oC, the CV curves showed additional inversion capacitance, possibly due to minority carriers from defect states near the interface.

Kun Yu Lee
Department of Materials Science and Engineering, NTHU, Taiwan

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