Self-Aligned Ultra Thin HfO$_2$ CMOS Transistors with High Quality CVD TaN Gate Electrode

Microelectronics Research Center, Department of Electrical and Computer Engineering, The University of Texas, Austin, TX 78758
*Schumacher, Calshad, CA 92009, ** Matsushita, Kyoto, 601-8413, Japan

In this paper, we have demonstrated and characterized self-aligned, gate-first CVD TaN gate n- and pMOS transistors with ultra thin (EOT=11~12Å) CVD HfO$_2$ gate dielectrics. These transistors show no sign of gate deletion and excellent thermal stability after 1000ºC, 30s N$_2$ anneal. Compared with PVD TaN devices, the CVD TaN/HfO$_2$ devices exhibit lower leakage current, smaller CV hysteresis, superior interface properties, higher transconductance, and superior electron and hole mobility.