Characterization and Comparison of High-k Metal-Insulator-Metal (MiM) Capacitors in 0.13 μm Cu BEOL for Mixed-Mode and RF Applications

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Abstract
In this paper, we report high-k MiM capacitors including Ta2O5, TaOxNy, HfO2, Al2O3 and Ta2O5/Al2O3 stack layer integrated in 0.13 μm 8-level Cu-metallization technology using Cu barrier as both top and bottom electrodes. Ta2O5 exhibits excellent voltage and temperature linearity of capacitance. Al2O3 shows low leakage, but poor voltage and temperature linearity. Voltage linearity could be significantly affected by high-k deposition temperature. We present high-k MiM capacitors with voltage linearity as low as 25 ppm/V and 13 ppm/V2.