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 Ta_2O_5, TaO_xN_y, HfO_2, Al_2O_3 and Ta_2O_5/Al_2O_3 stack layer integrated in 0.13 μm 8-level Cu-metallization technology using Cu barrier as both top and bottom electrodes. Ta_2O_5 exhibits excellent voltage and temperature linearity of capacitance. Al_2O_3 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/V^2.