

Demonstration of BEOL-Compatible Ferroelectric 6.5 nm HZO Capacitor with High Endurance and Retention

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Abstract

In this study, we have successfully fabricated a metal-ferroelectricity-metal (MFM) capacitor with an ultrathin 6.5 nm HZO using Molybdenum (Mo) as electrodes. We propose a novel atomic layer deposition (ALD) scheme to overcome the challenge of oxidation of the bottom Mo electrode. The fabricated sample annealed at 400 °C demonstrated a 2Pr value of 54.3 $\mu\text{C}/\text{cm}^2$ at an operating voltage of 2V, which meets the stringent requirements of Back-End-of-Line (BEOL) integration. Furthermore, in endurance testing, the sample maintained a 2Pr value of 52.2 $\mu\text{C}/\text{cm}^2$ even after 10^{10} cycles ($\Delta 2\text{Pr}/2\text{Pr}_{\text{pristine}} \approx 4\%$ from pristine to 10^{10} cycles).

Keywords - Ferroelectric capacitor, Hafnium Zirconium oxide (HZO), Back-End-Of-Line (BEOL), Endurance