Robust HfN Metal Gate Electrode for Advanced MOS Devices Application

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Abstract

A comprehensive study of HfN metal gate electrode for advanced MOS devices application is presented for the first time. It shows HfN is an excellent barrier against oxygen diffusion, has a midgap work function (~4.65 eV) on SiO_2, and exhibits superior thermal stability with underlying gate dielectric. Negligible degradation in EOT, work function, leakage current, and TDDB upon high-temperature treatments (to 1000°C) has been observed in HfN gated MOS devices. These results suggest that HfN electrode is an ideal candidate for ultra thin body fully depleted SOI and symmetric double gate MOS applications.