

High-Quality Ultra-thin HfO₂ Gate Dielectric MOSFETs with TaN Electrode and Nitridation Surface Preparation

Rino Choi, Chang Seok Kang, Byoung Hun Lee, Katsunori Onishi,
Renee Nieh, Sundar Gopalan, Easwar Dharmarajan, and Jack C. Lee

Microelectronics Research Center, R9950, Department of Electrical and Computer Engineering
The University of Texas at Austin, Austin, Texas 78758, (512) 471-1627

Abstract

Surface preparation technique using NH₃ anneal has been investigated to reduce interface reaction and consequently the equivalent oxide thickness (EOT) of hafnium oxide for alternative gate dielectric application. MOSCAPs and MOSFETs were fabricated on the NH₃ nitrided substrates with HfO₂ dielectric and TaN gate electrode. Using this nitridation technique, EOT of as thin as 7.1Å with 10⁻²A/cm² at -1.5V was obtained. Furthermore, excellent device characteristics, and reasonable reliability have been achieved.