

Atomic Layer Chemical Vapor Deposition and Characterization of Hafnium Silicate Films

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Atomic layer chemical vapor deposition (ALCVD) of hafnium silicate films using a precursor combination of tetrakis(diethylamido)hafnium (TDEAHf) and tetra-n-butyl-orthosilicate (TBOS) was studied as alternative for conventional SiO₂ gate dielectric. ALCVD temperature window in our study was 290–350 °C with a growth rate of 1.1 Å/cycle. We investigated the effect of deposition conditions, such as deposition temperature, pulse time of precursor and purge injection, on film growth. The saturated composition of Hf/(Hf+ Si) ratio was 0.37 and impurity concentrations were less than 0.1 atomic %. Au/Hf-silicate/Si capacitors were fabricated using gold (Au) ex-situ thermal evaporation. The capacitance and leakage current density of Au/Hf-silicate/Si structures were analyzed before and after N₂ rapid thermal annealing (RTA).

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