

Atomic layer deposition으로 증착된 Ta₂O₅ 박막의 전도기구에 대한 UV ozone annealing 효과

Effects of UV ozone annealing on conduction mechanism in Ta₂O₅ thin films deposited by atomic layer deposition

업다일, 전인상, 노상용, 황철성, 김형준
서울대학교 재료공학부
(edi0308@snu.ac.kr)

High dielectric constant materials (high K) have attracted a great deal of interest because of the dramatic scaling down of DRAM capacitor reaching its physical limit in terms of reduction of thickness. Among high-K materials that can replace silicon dioxide, tantalum pentoxide (Ta₂O₅) thin film, with their high dielectric constant (~25) and good step coverage, is the candidate of choice.

In this work, High-k Ta₂O₅ dielectric films were grown by an atomic-layer-deposition technique and treated under various UV ozone condition. The electrical and structural properties of each sample were investigated by HRTEM, I-V measurement, AES. From the HRTEM pictures, the UV ozone treatment was useful in crystallization, but it made current through the grain boundary. All samples exhibited Pool-Frenkel emission characteristic partially. The energy levels Φ_T of traps were 0.61~0.65eV in all samples. The UV ozone treatment in the middle of Ta₂O₅ deposition appeared to most effective in reduction of leakage current and oxygen vacancy. The UV ozone treatment after deposition of Ta₂O₅ film was thought to reduce the oxygen vacancy in surface layer of Ta₂O₅ film, therefore it made the Ta₂O₅ film show direct tunneling characteristic. The UV ozone treatment after deposition had little effect in case the sample had been treated under UV ozone treatment in the middle of deposition.