

Measurement of the Thermal Conductivity of High Thermal Conductivity Thin Films in CMOS

Sok Won Kim^{C.S} and Yong Soo Kim

Department of Physics, University of Ulsan, Ulsan, Korea

Won Kyu Lee

School of Mechanics and Automotive Engineering, University of Ulsan, Ulsan, Korea

As the integration density of electronic circuits increases, the heat generated per area increases rapidly therefore the effective emission of heat is strongly required. Among the materials and material structures investigated for the replacement in CMOS transistors, several tens of nanometer thickness of HfSiON, HfO₂, HfAl_xO_y, Hf_xAl_y films have emerged as the most promising candidates due to their thermodynamic stability with silicon and compatibility with poly-silicon processing. In this study, several kind of such hafnium compound thin films were deposited on silicon wafer and the through-plane thermal conductivity was measured using the thermo-reflectance method which utilizes the reflectance variation of the films surface produced by the periodic temperature variation. The results showed that the thin films have high thermal conductivity and effectively dissipate the heat generated in the electronic circuit such as CMOS and memory devices.