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Properties of $HfSi_xO_y/HfO_2$ film as a various Annealing Temperature

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Recently, high-k materials are being researched as a replacement for SiO_2 as gate dielectric of metal-oxide-semiconductor (MOS). Among these high-k materials, HfO_2 film has been highlighted due to high dielectric constant, a large band gap. But HfO_2 makes crystallization in low temperature (~500℃). However, Hf-silicate has higher thermal stability when it contacts with Si and a relatively high dielectric constant k.

In this work, we investigated the physical and electrical properties of $HfSi_xO_y/HfO_2$ films. $HfSi_xO_y/HfO_2$ film was deposited on the Si substrate by atomic layer deposition(ALD). To research effect of annealing temperature, Gate dielectric was annealed by furnace in N_2 ambient for 1hour min. Annealing temperature is as-deposited, 500, 600℃.

In order to study the electrical properties of gate dielectric, $HfSi_xO_y/HfO_2$ films were measured by X-ray diffraction(XRD) and probe station. Measured information by XRD confirmed crystallization. Capacitance-voltage curves represented capacitance value. EOT and dielectric constant (k) were calculated these values. According to increase annealing temperature, capacitance values are increased and hysteresis is improved. $HfSi_xO_y/HfO_2$ films will be applicable to TFT gate oxide applications.