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## Thermodynamic Stability and Interface Chemical Reaction in HfO<sub>2</sub> Laminate Films

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In metal-oxide-silicon field-effect transistors (MOSFET) devices, high-*k* materials have been studied for film thickness and thermal stability on Si. Recently, HfO<sub>2</sub> system has been widely studied since their suitable dielectric constants can effectively reduce the leakage current and it has been known to be thermodynamically stable in contact with Si.

HfO<sub>2</sub>-Al<sub>2</sub>O<sub>3</sub> laminate and Hf-Al-O films were deposited on SiO<sub>2</sub> layers at 300 °C using Atomic Layer Deposition (ALD) technique. Changes of film structures and chemical states in HfO<sub>2</sub>-Al<sub>2</sub>O<sub>3</sub> laminate and Hf-Al-O films by rapid thermal annealing at 900 °C for 30 sec were investigated by synchrotron x-ray photoelectron spectroscopy (XPS). These XP spectra were obtained at the U7 undulator beamline of the Pohang Light Source.

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