

Comparative study of ultra-thin HfSi_xO_y and $\text{HfSi}_x\text{O}_y/\text{SiO}_2$ gate dielectrics grown by self-limiting surface reaction between $\text{Hf}(\text{NC}_2\text{H}_5)_4$ and $\text{Si}(\text{OC}_4\text{H}_9)_4$ precursor

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Ultra-thin HfSi_xO_y and $\text{HfSi}_x\text{O}_y/\text{SiO}_2$ films were grown on Si surface by ALCVD using a precursor combination of $\text{Hf}(\text{NC}_2\text{H}_5)_4$ and $\text{Si}(\text{OC}_4\text{H}_9)_4$ at 300 °C. We investigated the correlation between physico-chemical and electrical properties of the grown films. The film structure and thickness were characterized by TEM, XRR, XPS, and specular ellipsometry (SE). GI-XRD system of Pohang Light Source (PLS) 8C1 and 10C1 beam-line was employed to address the phase separation of the 8 nm films. For electrical characterization of the silicate films, capacitance-voltage (C-V) and current-voltage (I-V) measurements were performed. $\text{HfSi}_x\text{O}_y/\text{SiO}_2$ bi-layer films of ~1.7 nm SiO_2 layer, showed significantly improved electrical properties.