Investigations on Al-Oxynitride as interfacial buffer for PrO$_x$ on SiC and Si

PrO$_x$ is one of the candidates for both the electric field scaling at the interface between semiconductor and insulator in high power applications and the realizing of further shrinking of equivalent oxide thickness (EOT) in microelectronic devices. However, the chemical reactivity of the PrO$_x$/SiC and PrO$_x$/Si interfaces causes a destructive interaction yielding silicate and graphite formation after direct deposition of PrO$_x$ onto SiC and Si, respectively. This leads to high leakage current and interface state density values as well as to a limitation of the reduction of the EOT due to an interfacial layer with small permittivity values.

Therefore we introduced an additional chemically inert layer. In our studies based on spectroscopic investigations of Al-oxynitride (AlON) we recognized a stable AlON/3C-SiC interface even for annealing steps up to 900°C.

We will present results of electrical characterizations of PrOx/AlON/Si stacks with different thickness of PrO$_x$. Compared to stacks without AlON we find a strong improvement in the leakage current density by several orders of magnitude, reduced interface state densities and even smaller interfacial layer formation. We will combine these results with spectroscopic (XPS) investigations on these series. We also report on first improvements in electrical parameters of PrO$_x$/AlON stack on 4H-SiC.

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