# Comparative Study of $Al_2O_3$ and $HfO_2$ as Gate Dielectric on AlGaN/GaN Metal Oxide Semiconductor High-Electron Mobility Transistors

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**Abstract :** We have made a comparative study on the influence of $Al_2O_3$ and $HfO_2$ grown using atomic layer deposition (ALD) technique as dielectric in the AlGaN/GaN metal oxide semiconductor high electron mobility transistor (MOS-HEMT) structure. Five samples consisting of 20 nm and 10 nm each of $Al_2O_3$ and $HfO_2$ respectively and a Schottky gate HEMT, were fabricated and measured. The threshold voltage shifts towards negative by 0.1 V and 1.8 V for 10 nm thick HfO2 and 10 nm thick $Al_2O_3$ gate dielectric layers respectively. The negative shift for the 20 nm HfO2 and 20 nm $Al_2O_3$ were 1.2 V and 4.9 V respectively. Higher gm/IDS (transconductance to drain current) ratio was also obtained in $HfO_2$ than $Al_2O_3$. With both materials as dielectric, a significant reduction in the gate leakage current in the order of 10^4 was obtained compared to the sample without the dielectric material.

**Keywords :** AlGaN/GaN HEMTs, Al2O3, HfO2, MOSHEMTs.
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