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Hydrostatic Pressure Study of GaN-Based FETs[1] Y. ZHANG, B. NIELSEN, E.E. MENDEZ, Stony Brook University, J. JIMENEZ, TriQuint Semiconductor — Because of their large breakdown voltage and high saturation velocity, GaN-based field effect transistors (FETs) are best suited for applications that require high power and high frequency, but they face serious reliability problems. In these FETs the charge in the channel results from spontaneous and piezoelectric polarization, so any stress produced during device operation can change the charge in the channel and affect the device's electrical performance. With the aim of better understanding the role of stress, we have studied the current-voltage characteristics of GaN FETs under hydrostatic pressure up to 10 kbar. N-channel FETs were fabricated from GaN-$Al_{0.28}Ga_{0.72}N$ structures grown on SiC substrates. The source-drain current was measured for voltage up to 15V, at various gate voltages, from turn-on (typically -3V) up to 1V. We have observed that for a given source-drain voltage the current increased monotonically with pressure. At 10 kbar, the increase in the saturation current relative to 1 atm was found to be device-dependent, but typically between 5% and 15%. These results, along with the pressure effects on the devices' intrinsic short term degradation and on strongly degraded GaN FETs devices, allow us to speculate about the possible origin of device degradation.

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