Abstract Submitted
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Theory of hot-carrier-induced phenomena in GaN high-electron-mobility transistors[1] YEVGENIY PUZYREV, Department of Physics and Astronomy, Vanderbilt University, BLAIR TUTTLE, Department of Physics, Penn State Behrend College, RONALD SCHRIMPF, DANIEL FLEETWOOD, Department of Electrical Engineering and Computer Science, Vanderbilt University, SOKRATES PANTELIDES, Department of Physics and Astronomy, Vanderbilt University — It has long been known that GaN high-electron-mobility transistors can degrade significantly under hot electron stress. Meneghesso et al [1]. showed that GaN-based HEMTs are most prone to degradation in a state with high electric field and low current. More recently, an increase in the yellow luminescence was observed under similar stress conditions [2]. Hot electrons can provide sufficient energy to cause a pre-existing defect to convert into a metastable configuration, release a hydrogen atom, or cause migration of pre-existing defects. We show that, among the possible known defects in GaN, the hydrogenated Ga vacancy has the properties that are needed to account for both the electrical degradation and the luminescence data.

[1] G. Meneghesso, et al., IEEE Trans. Dev. Mater. Reliab. **8**, 332 (2008).
[2] C.-H. Lin, et al., Appl. Phys. Lett. **95**, 033510 (2009).

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Yevgeniy Puzyrev
Department of Physics and Astronomy, Vanderbilt University

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