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# Lithography-free microfabrication of AlGaN/GaN 2DEG strain sensors using laser ablation and direct wire bonding

Karen M. Dowling[1], Hongyun So[2,a)] Anju Toor[3], Caitlin A. Chapin[4], and Debbie G. Senesky[1,2]

[1]Department of Electrical Engineering and [2]Aeronautics and Astronautics, Stanford University, Stanford, CA 94305, United States

[3]Department of Mechanical Engineering, University of California, Berkeley, CA 94720, United States

[4]Department of Mechanical Engineering, Stanford University, Stanford, CA 94305, United States

**Abstract**

This work presents a simple and rapid lithography-free (i.e., maskless) microfabrication process for strain-sensitive aluminum gallium nitride (AlGaN)/GaN sensors. We microfabricated an AlGaN/GaN strain sensor through laser ablation of the underlying Si (111) substrate and direct bonding of aluminum wires to the AlGaN surface, creating a Schottky contact to the two-dimensional electron gas (2DEG). We measured the sensor's current-voltage operation while displacing the center of the membrane up to 106.7 μm and characterized its sensitivity at from 0.5 to 2 V bias (i.e., 5 to 100 nA/μm). This work advances the development of AlGaN/GaN-on-Si microelectronics (e.g., pressure sensors, accelerometers, and gyroscopes) using the simplified fabrication process, which eliminates lithography, metallization, and etching, and reduces the manufacturing time (5 min) and cost, as well as the need for cleanroom environments.

**Keywords:** *Gallium nitride, Microfabrication, Strain sensor, Laser ablation, Direct wire bonding*

[a)] Author to whom correspondence should be addressed. E-mail: hyso@stanford.edu.