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Piezoresistive readout and electromechanical response of GaN nanowire resonators[1] JASON GRAY, University of Colorado, KRIS BERTNESS, NORMAN SANFORD, National Institute of Standards and Technology, CHARLES ROGERS, University of Colorado — We report on the fabrication, piezoresistive readout, and frequency response of doubly-clamped c-axis GaN nanowire resonators. The nanowires are single crystal, grown by catalyst- free molecular beam epitaxy, from 150-350 nm in diameter, and 15-18 microns in length. The devices are fabricated using a combination of lithographic patterning and dielectrophoresis to bridge the wires across 10 micron gaps, with an electrostatic gate nearby. The gate induces nanowire vibration, which is electronically read out by measuring current through the nanowire. Wires show resonances from 9-14 MHz with mechanical quality factors, Q, as large as 2200. Intrinsic Q is likely larger than this, however, as we have discovered processing steps that can improve Q, as well as parameter noise in the resonator that artificially broadens the peak. These parameters and their noise provide information about the wire's environment, such as surface and clamping effects. We will discuss these observations, along with fabrication steps and behavior of the resonance under different drive conditions.

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