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Optomechanics and integrated photonics and in aluminum nitride[1] A. VAINSENCHER, J. BOCHMANN, D.D. AWSCHALOM, A.N. CLELAND, Department of Physics and California Nanosystems Institute, University of California, Santa Barbara — Integrated photonic devices based on silicon have proven enormously successful, with low loss and high confinement optical and optomechanical devices. We show that aluminum nitride is also an excellent material for photonic integrated circuits, with an extremely wide bandgap and very significantly strong piezoelectric and electro-optic effects. Optical-grade AlN can be deposited on substrates with a CMOS-compatible process. We demonstrate integrated photonic circuits and optomechanical devices based on this novel material. Operating in the optical telecommunications band, we demonstrate ring resonators with ultrahigh optical Q factors as well as one-dimensional optomechanical crystals operating in the resolved sideband regime with localized 4 GHz mechanical modes. This talk will present recent results with the eventual goal of integrating these devices with superconducting quantum bits.

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