

## Engineering local strain for single-atom nuclear acoustic resonance in silicon

Laura A. O'Neill, Benjamin Joecker, Daniel Schwienbacher, Andrew D. Baczewski, and Andrea Morello

Mechanical strain plays a key role in the physics and operation of nanoscale semiconductor systems, including quantum dots and single-dopant devices. In O'Neill et al. [1] we described the design of a nanoelectronic device, where a single nuclear spin is coherently controlled via nuclear acoustic resonance (NAR) through the local application of dynamical strain. To enhance the NAR drive we proposed a AlN piezoelectric actuator, compatible with standard silicon metal-oxide-semiconductor processing. To optimize the device layout and benchmark AlN as a material for this nanoscale regime, we present novel intermediate device layouts and corroborating finite element simulations to investigate the thin film, high aspect ratio material parameters of AlN.

[1] O'Neill et al. Appl. Phys. Lett. 119, 174001 (2021)