

Figure 1: Wrinkle-induced scale-dependent mechanical properties in atomically-thin materials. (a) SEM image of an Al_2O_3 nanocantilever (t=28 nm, L=W=20 μ m) with random wrinkles, scale bar 10 μ m. (b) Thermomechanical motion spectra of a wrinkled nanomechanical resonator (t=28 nm, L=W=20 μ m) measured at the fundamental mode with optical interferometry. The dash lines are the curve fitting to a harmonic resonator model. (c) Histogram of the fundamental resonance frequencies of the smooth and wrinkled nanomechanical resonators (t=28 nm, L=W=20 μ m). (d) Fundamental resonance frequencies of the wrinkled nanomechanical resonators (t=28 nm, L= 20 μ m) in relation to the film width, suggesting a scale-dependent set of mechanical properties.

Work performed at the Center for Nanoscale Materials, a U.S. Department of Energy Office of Science User Facility, was supported by the U.S. DOE, Office of Basic Energy Sciences, under Contract No. DE-AC02-06CH11357.