



**Figure 1: Wrinkle-induced scale-dependent mechanical properties in atomically-thin materials.** (a) SEM image of an  $\text{Al}_2\text{O}_3$  nanocantilever ( $t=28\ \text{nm}$ ,  $L=W=20\ \mu\text{m}$ ) with random wrinkles, scale bar  $10\ \mu\text{m}$ . (b) Thermomechanical motion spectra of a wrinkled nanomechanical resonator ( $t=28\ \text{nm}$ ,  $L=W=20\ \mu\text{m}$ ) 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 ( $t=28\ \text{nm}$ ,  $L=W=20\ \mu\text{m}$ ). (d) Fundamental resonance frequencies of the wrinkled nanomechanical resonators ( $t=28\ \text{nm}$ ,  $L=20\ \mu\text{m}$ ) in relation to the film width, suggesting a scale-dependent set of mechanical properties.