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Phonon Softening and Bandgap Engineering in Strained Monolayer MoS_2[1] HIRAM CONLEY, KIRILL BOLOTIN, Department of Physics and Astronomy, Vanderbilt University — By straining monolayer MoS_2 with a 4 point bending apparatus, both phonon softening and a shrinking band gap were observed. Raman spectrum demonstrates phonon softening for both bi and single layer MoS_2 flakes, with a breaking of the E^1_{2g} degeneracy at large strain. Photoluminescence data shows that the band gap of single layer MoS_2 decreases by 50 meV per % strain. The direct band gap of bilayer MoS_2 decreases by the same rate as for monolayer MoS_2 while the indirect band gap of bilayer MoS_2 decrease by 120 meV % strain. This work clearly demonstrates that MoS_2's band gap and phonons are tunable by strain engineering suggesting a possibility of devices with mechanically tunable optical and electrical properties.

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