Phonon dispersions and elasticity of *d*-block transition metal single crystals at high pressure

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The *d*-block transition metals of the periodic table display many interesting yet complex physical properties due to their partially-filled *d* outer electronic shells. In this study, we have used high-pressure diamond anvil cell coupled with meV-resolved inelastic X-ray scattering to tune and investigate the *d*-electron interactions and the atomic vibrations in representative single-crystal transition metals. Optical and acoustic phonon dispersions of the single crystals are directly measured along certain crystallographic directions in helium medium with hydrostatic helium medium. Together with theoretical calculations, these results are used to address the contributions of the electron-phonon coupling and Fermi surface nesting to the Kohn anomaly, and the elastic anomaly associated with the electronic topological transition (ETT) at high pressure. Technical developments and scientific prospects in high-pressure meV-resolved IXS will also be discussed.