# Lattice dynamics in elemental metals with incommensurate crystal structures

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In recent years, surprisingly complex crystal structures have been discovered in pure elements at high pressure. In particular, incommensurately modulated structures and incommensurate host-guest composite structures have been observed in various elements across the periodic table, e.g., Rb, Ba, Sc, Te, P, and I. While considerable progress has been made in determining the detailed crystal structures of these complex phases at high pressure, the mechanisms that lead to their formation and stability are not yet fully understood. Experimental data on the lattice dynamics of the complex phases will be a key ingredient to address these issues, and inelastic x-ray scattering (IXS) spectroscopy is the technique of choice to study phonons throughout the Brillouin zone on minute samples in diamond anvil high-pressure cells. We have performed IXS experiments on single crystals of the incommensurate-composite phases Rb-IV and Ba-IV as well as the incommensurately modulated phase Te-III. A summary of recent results will be presented and I will show how such experiments help us to better understand the properties of these fascinating elemental phases. Finally, I will show the potential of using IXS to determine phonon densities of states in systems where single crystals are not available at high pressure, using Te as an example.

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