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Adiabatic Electron-Phonon Interaction at High Temperature in A15 Compounds JORGE MUNOZ, OLIVIER DELAIRE, MATTHEW LUCAS, MAX KRESCH, BRENT FULTZ, California Institute of Technology — Inelastic neutron scattering was used to measure the phonon densities of states of the A15 compounds V_3Si , V_3Ge , and V_3Co at temperatures from 10 to 1273 K. It was found that phonons in V_3Si and V_3Ge , which are superconducting at low temperatures, exhibit an anomalous stiffening with increasing temperature, whereas phonons in V_3Co have a normal softening behavior. First-principles calculations show that this anomalous increase in phonon frequencies at high temperatures originates with an adiabatic electron-phonon coupling mechanism. The anomaly is caused by the thermally induced broadening of sharp peaks in the electronic density of states of V_3Si and V_3Ge , which tends to decrease the electronic density at the Fermi level. These results show that the adiabatic electron-phonon coupling can influence the phonon thermodynamics at temperatures exceeding 1000 K.

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