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Adiabatic Electron-Phonon Coupling in the A15 Compounds V3Si, V3Ge and V3Co OLIVIER DELAIRE, M. LUCAS, ORNL, J. MUNOZ, M. KRESCH, B. FULTZ, Caltech — The phonon density of states (DOS) of the A15 compounds V3Si, V3Ge, and V3Co was measured as function of temperature between 10K and 1273K with inelastic neutron scattering. The temperature dependence of the phonon DOS strongly departs from the predictions of the quasiharmonic model in the superconducting compounds V3Si and V3Ge, but behaves more normally in the non-superconducting V3Co. Using first-principles electronic structure calculations, the observed anomalies are related to the details of the band structure in these compounds. It is shown that sharp features in proximity to the Fermi level lead to anomalous phonons through a sensitivity to thermal disorder, or adiabatic electron-phonon coupling. In the case of V3Si and V3Ge, a sharp peak in the electronic DOS leads to a stiffening of the phonons with increasing temperature. These results are compared to recent measurements of the phonon DOS and its temperature dependence in the B20 compounds Fe(1-x)Co(x)-Si.

Olivier Delaire
ORNL

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