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Phonon dispersion relations in cerium under pressure across the volume-collapse gamma-alpha transition MICHAEL KRISCH, European Synchrotron Radiation Facility , DANIEL FARBER, Lawrence Livermore National Laboratory, R. XU, University of Illinois at Urbana-Champaign, D. ANTONANGELI, Université Pierre et Marie Curie, C. ARACNE, Lawrence Livermore National Laboratory, A. BERAUD, European Synchrotron Radiation Facility , T.-C. CHIANG, University of Illinois at Urbana-Champaign — Cerium is a rare-earth metal with many of its physical and chemical properties governed by the complex behavior of its 4f electron in contributing to the bonding of the crystal structure. Specifically, its gamma-alpha volume-collapse transition under pressure is the only known solid-solid transition in an element with the phase boundary ending at a critical point, and the detailed mechanism is still not fully understood. We report recent inelastic x-ray scattering measurements of phonon dispersion relations of cerium at room temperature as a function of pressure up to 25 kbar. The phonon dispersion relations show abrupt changes across the gamma-alpha transition at $\sim$7 kbar and continue to evolve at higher pressures. Various thermodynamic quantities associated with the transition are deduced. These results will be discussed in light of existing theories and models.

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