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Negative-thermal-expansion ZrW_2O_8. Elasticity and pressure CRISTIAN PANTEA, ALBERT MIGLIORI, 1, PETER LITTLEWOOD, 2,3, YUSHENG ZHAO, HASSEL LEDBETTER, JASON LASHLEY, TSUYOSHI KIMURA, 1, JOOST VAN DUIJN, 4, GLEN KOWACH, 5, LOS ALAMOS NATIONAL LABORATORY, NM TEAM, CAVENDISH LABORATORY, U.CAMBRIDGE, CAMBRIDGE UK. COLLABORATION, NHMFL, TALLAHASSEE, FL COLLABORATION, DEPT. PHYS.ASTRONOMY, JOHNS HOPKINS U., BALTIMORE, MD 21218, USA COLLABORATION, LUCENT TECHNOLOGIES/BELL LABS, MURRAY HILL, NJ COLLABORATION — The elasticity of the negative thermal expansion (NTE) compound ZrW_2O_8 is rather strange: the solid softens as its volume decreases on warming. Does ZrW_2O_8 also soften when pressure alone is applied? Using pulse-echo ultrasound in a large-volume moissanite anvil cell, we find an unusual decrease in bulk modulus with pressure at 300K. Our results are inconsistent with conventional lattice dynamics, but a framework-solid-based non-linear model with many degrees of freedom predicts elastic softening as increases in either temperature or pressure reduce volume. The pressure-induced phase transition from α-ZrW_2O_8 (cubic) to γ-ZrW_2O_8 (orthorhombic) is found to take place at $\approx$ 0.5 GPa, result confirmed by Raman spectroscopy.

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