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Thermodynamics of Pu

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We review the connection between entropy, free energy, elastic properties, and phase transitions. Recent elastic modulus measurements versus temperature and time in both pure and Ga stabilized fcc Pu are presented. These data are compared to recent results for the negative-thermal-expansion material ZrW₂O₈, where, for the first time we show the pressure dependence of the elastic moduli using a unique pulse-echo system. The pressure-induced phase of ZrW₂O₈, and the high-pressure phases of Pu provide some clues relating thermal expansion to strong temperature dependences of moduli. These unusual temperature dependences also hint at aging effects.

Keywords : Plutonium, Ultrasound, Pressure