Gruneisen parameter behaviour in the critical region of metal cerium

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In [1] the fundamental problem of critical state theory concerning the variety of its manifestatins is solved. It is shown that the type of critical behaviour is determined by stability coefficients (the CS's) $\left(\frac{\partial T}{\partial S}\right)_V = \frac{T}{C_V}$ and $\left(-\frac{\partial P}{\partial V}\right)_S$. As it turned out, the quantity $\left(-\frac{\partial T}{\partial V}\right)_S$, related to the CS's, defines the behaviour of Gruneisen parameter G. G is important characteristic of solid. It is associated with its frequency spectrum and defines the anharmonicity of vibration.

The stability theory enables to connect G with stability coefficients and fluctuations in a system by means of $\left(-\frac{\partial T}{\partial V}\right)_S$. Lemmas by Gibbs establish the relationship between stability coefficients and fluctuations of energy and density. It founds to use G as additional characteristic of phase transition and critical state.

There was performed the computation of G for critical region of phase $\gamma \rightleftarrows \alpha$ transition in metal cerium based on the Rainford-Edwards model [2]. It is shown, that with account taken of vibrational energy of metal crystal lattice in the model G passes explicit minima in critical region.

1. Soldatova E.D. // Cond. Matt. Phys. – 1999. – **2**. – P. 603 – 616.
2. Rainford B.D., Edwards D.N. // J. Mag. and Mag. Mater. – 1987. – **63-64**. – P. 557 –559.