Remarks on the Isotopic Volume Effect in Superconductors*

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Abstract

One possible manner in which the change in isotopic volume contributes to the isotope effect in superconductors is discussed with relation to the empirical formula of Olsen *et al.*, $\alpha=0.25+0.1\phi$, which represents a relation between the exponent α in $T_c\propto M^{-\alpha}$ and the volume dependence of the transition temperature, $\phi=\partial\ln[T_c/\theta]/\partial\ln V\cdot\{\ln(0.85\theta/T_c\}^{-1}$. Here, the volume effect being taken into consideration, α is expressed in terms of the mass and volume effects of the Debye temperature θ and those of the phonon mediated electron-electron interaction $N(0)J$ in the BCS relation. In addition to this, the limitations of the argument concerning the relation between the isotope effect and the volume dependence of the transition temperature are briefly examined in connection with the isotopic volume in some isotopic compounds.

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