E 4 Isotope Effect in Superconductors

Experimental values of α in $M^\alpha T_c$ = constant, where M is the isotopic mass.

Substance	α	Substance	α
Zn	0.45 ± 0.05	Ru	0.00 ± 0.05
Cd	0.32 ± 0.07	Os	0.15 ± 0.05
Sn	0.47 ± 0.02	Mo	0.33
Hg	0.50 ± 0.03	Nb_3Sn	0.08 ± 0.02
Pb	0.49 ± 0.02	Mo_3Ir	0.33 ± 0.03
Tl	0.61 ± 0.10	Zr	0.00 ± 0.05

After a tabulation by J. W. Garland, Jr., Phys. Rev. Letters **11**, 114 (1963), with revisions suggested by Dr. V. Compton.

ORETICAL SURVEY

A theoretical understanding of the phenomena associated with superconductivity has been reached in several ways. Certain results follow directly from thermodynamics. Many important results can be described by phenomenological equations: the London equations and the Landau-Ginzburg equations. A successful quantum theory of superconductivity was given by Bardeen, Cooper, and Schrieffer, and has provided the basis for advanced work. Josephson and Anderson discovered the importance of the phase of the superconducting wavefunction.

Thermodynamics of the Superconducting Transition

The transition between the normal and superconducting states is thermodynamically reversible, just as the transition between liquid and vapor phases of a substance is reversible. Thus we may apply thermodynamics to the transition, and we thereby obtain an expression for the entropy difference between normal and superconducting states in terms of the critical field curve H_c versus T. This is analogous to the vapor pressure equa-