18[S].—M. E. Rose, *Internal Conversion Coefficients*, Interscience Publishers, Inc., New York, 1958, xxii + 173 p., 31 cm. Price $6.25.

When a nucleus is in an excited state for which the excitation energy is insufficient for the emission of nuclear particles, the de-excitation will proceed predominantly by either one of two competing mechanisms. Either a γ-ray will be emitted or the nuclear excitation will be transferred to one of the orbital electrons resulting in the ejection from the atom of this electron. The latter process is referred to as internal conversion. If N_e is the number of conversion electrons emitted per second and N_q is the number of photons emitted per second, the internal conversion coefficient α is defined as

$$\alpha = N_e/N_q .$$

This book gives a comprehensive account of a ten-year program devoted to the calculation of internal conversion coefficients. It contains a ten-page introduction which gives a precise and thorough account of the physical and numerical approximations made in the course of the calculations of the tables. These in turn constitute the bulk of the work, 164 pages.

The conversion coefficients are strongly dependent on k, where kmc^2 is the transition energy, Z the atomic number, L the angular momentum change, and on $\Delta\pi$, the parity change. The tables list values of α_L and β_L, ($L = 1, 2, 3, 4, 5$), the coefficients for 2^L electric pole and 2^L magnetic pole conversions, respectively, for $k = 0.05(0.05)0.2(0.2)1.0(0.5)2.0$ and $Z = 25(1)95$.

Also included in the tables are values of certain radial matrix elements $R_k(m)$ and $R_k(e)$ for the K shell. These are uncorrected for screening and for finite nuclear size.

The author lists the sources of error in determination of the radial wave functions, which are a fundamental set of intermediate quantities in the calculation of the tables, and expresses the view that all of these errors are small and amount at most to 1–3 per cent. He expresses the view that the irreducible minimum error involved in any calculation of internal conversion coefficients, aside from nuclear structure effects, is just smaller than the experimental error in the best measurements now available.

The author states that, "interpolation in the tables will be necessary only in the energy variable k. For this purpose interpolation on a log α or log β versus log k is advisable since the plots of the conversion coefficients on a log-log scale show very little curvature."

A. H. T.

19[S].—C. H. Westcott, *Effective Cross Section Values for Well-Moderated Thermal Reactor Spectra*, Report AECL No. 670, 1958, 27 p., 27 cm. Available from Scientific Document Distribution Office, Atomic Energy of Canada Limited, Chalk River, Ontario, Canada. Price $1.00.

This report is concerned with the determination of an effective neutron absorption cross section, which cross section is recommended for calculations involving reaction rates. The effective cross section is defined in terms of a neutron density distribution per unit velocity. The neutron spectrum assumed consists of a Maxwellian distribution at a temperature T°K plus an admixture of a $1/E$ distribution of flux per unit energy interval, the admixture being controlled by an epithermal index r. For $r = 0$, the spectrum is a pure Maxwellian.

Using this spectrum, the effective cross section, σ can be written as

$$\sigma = \sigma_{2200}(g + rs)$$

where σ_{2200} is the microscopic absorption cross section at 2200 m/sec. The g and s factors depend on the shape of the absorption cross section as a function of neutron energy. Specifically for nuclides obeying the $1/v$ law over the entire energy range, $g = 1$ and $s = 0$.

The accuracy of the results obtained depends on the input data used which, in general, has been taken from the 1958 revision of the Brookhaven *Neutron Cross Section Compilation*. Tables of σ and g and s factors in 20 centigrade degree steps from 20°C to 760°C are listed for $r = 0.03$ or $r = 0.07$. These values of r correspond to average parameters appropriate for the moderator and fuel rods respectively of the NRX Reactor. In some instances σ for $r = 0$ are given. Elements which follow the $1/v$ law fairly closely in the thermal region do not usually have g values listed. The applicability of the compilation is limited to well moderated reactors and to thin samples in which self shielding has been neglected.

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20[T].—ALVIN GLASSNER, *The Thermochemical Properties of the Oxides, Fluorides, and Chlorides to 2,500° K*, Argonne National Laboratory ANL-5750, U. S. Government Printing Office, Washington, D. C., 1957, vi + 74 p., 27 cm. Price \$.45.

This table gives empirical equations for the thermodynamic properties per mole (heat capacity Cp, enthalpy H, entropy S, and gives free energy F) in the form of power series in the absolute temperature T. The heat capacity at constant pressure is fitted to the equation:

$$C_p = a + (b \times 10^{-3})T + (c \times 10^{-6})T^2 + \frac{d \times 10^5}{T^2}$$

Only three parameters are evaluated; either c or d is set equal to zero. Integration of the heat capacity to give H, S, and F requires two additional constants of integration, A and B. The coefficients are tabulated for solid, liquid, and gaseous states of the elements (Table I—3 p.), the oxides (Table II—4 p.), the fluorides (Table III—5 p.) and the chlorides (Table IV—5 p.). Each of these tables includes, in addition, the heat and entropy of the phase transitions, the entropy at 298°K, and appropriate references to the source material. Tables V, VI, and VII give the enthalpy and free energies of formation of each substance from the elements at 298°K, as well as the coefficients Δa, Δb, Δc, Δd, ΔA, and ΔB needed to calculate values at other temperatures.

The publication concludes with 21 pages of graphs showing the temperature dependence of ΔF_f from 300° to 2500°K.

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