LOW-ENERGY X-RAY INTERACTION COEFFICIENTS: PHOTOABSORPTION, SCATTERING, AND REFLECTION*

E = 100–2000 eV $\quad$ Z = 1–94

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The primary low-energy x-ray interactions within matter are photoabsorption and coherent scattering, which can be efficiently described for photon energies outside the threshold regions by using atomic scattering factors. These may be uniquely determined through quantum dispersion relations from photoabsorption data. With the available fittings of the photoabsorption cross sections and with a new compilation of such data for the region 30–300 eV, continuous sets of the photoabsorption cross sections from 30 to 10 000 eV have been determined for 94 elements. With these, for the region 100–2000 eV, atomic scattering factors which are independent of scattering angle and which include the relatively strong anomalous dispersion structures have been obtained. Methods are reviewed and currently important examples of the application of atomic scattering factors to the detailed characterization of selected x-ray mirror monochromators and of Bragg multilayer and crystal analyzers for low-energy x-ray analysis are presented.

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I. INTRODUCTION

For a precise description of the interaction of low-energy x-rays it is usually necessary to extend the conventional x-ray physics. As a background for this work the authors have found to be invaluable the excellent texts of Compton and Allison, *X-Rays in Theory and Experiment*;[1] R. W. James, *The Optical Principles of Diffraction of X-Rays*;[2] and W. Heitler, *The Quantum Theory of Radiation*.[3] These texts address the x-ray interaction physics in the photon energy region above 1 keV. The primary x-ray interactions for the low-energy region of 100–2000 eV are somewhat simpler in that only coherent scattering and photoabsorption are significantly involved. Incoherent scattering is negligible. At the atomic level these processes are effectively characterized through a complex *atomic scattering factor*, f, which may be defined by

$$\mathscr{E} = \mathscr{E}_e f = \mathscr{E}_e(f_1 + if_2), \tag{1}$$

where $\mathscr{E}$ is the amplitude scattered by the atom and $\mathscr{E}_e$ is the amplitude that would be scattered if the atom were replaced by a single, free Thomsonian electron. The components may be given by

$$\mathscr{E}_e = \mathscr{E}_0(r_0/R)P(2\theta), \tag{2}$$

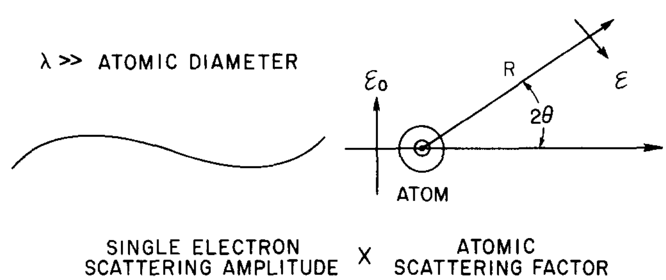
where $\mathscr{E}_0$ is an incident electric field amplitude, R is the radial distance to the point at which $\mathscr{E}$ is measured, r_0 is the classical electron radius (e^2/mc^2), and the polarization factor $P(2\theta)$ is equal to unity or cos 2θ depending upon whether the direction of $\mathscr{E}_0$ is perpendicular or parallel to the plane of scattering. As indicated in Fig. 1, the total angle of scattering is given here as 2θ. (Note: This definition is conventional for scattering angles used in the crystallographic literature. We are anticipating here the use of angle θ as a grazing incidence reflection angle upon a plane of atoms, or as a Bragg reflection angle.) The x-ray wavelengths of interest here (region 10–100 Å) are large compared with atomic dimensions and the atomic electrons may be considered to scatter essentially as an "atomic dipole." We therefore assume that the atomic scattering factors are *independent* of the *angle* of scattering. For example, for the total intensity scattered by a *single* atom for an incident unpolarized intensity of $I_0(I_0/2$ in each polarization component) we obtain from Eqs. (1) and (2)

$$I = I_0\left(\frac{r_0}{R}\right)^2 (f_1^2 + f_2^2)\,\frac{1 + \cos^2 2\theta}{2}, \tag{3}$$

for which the dependence upon angle θ is the result of polarization only.

To describe an interaction within a system of atoms, the total complex scattered amplitude will be a sum of the complex amplitudes contributed from all of the atoms that have been irradiated. The relative roles of coherent scattering and photoabsorption will depend upon the geometric ordering and distribution of the atoms within the system. These relative roles differ very much from each other; for example, (1) for transmission through a system of particles of dimensions that are large compared with the x-ray wavelengths, (2) for transmission through a uniform, amorphous material, (3) for specular reflection (as in total external reflection) from a smooth interface, or (4) for Bragg reflection from an ordered system of atomic planes.

An important assumption in this work is that low-energy x-ray scattering by individual atoms within a system is essentially unaffected by the condensed state of the system and can indeed be described by the *atomic* scattering factors. As discussed in Section II, the atomic scattering factors for the low-energy x-ray region of interest here can be uniquely determined through the quantum dispersion relations by the photoabsorption spectrum of the particular atom. The component f_2 is directly proportional to the photoabsorption cross section, and f_1 is given by a dispersion integral which involves the oscillator density term which is proportional



$$\mathcal{E}(\theta,\lambda) = -\left[\mathcal{E}_0\left(\frac{r_0}{R}\right)P(2\theta)\right](f_1(\lambda) + if_2(\lambda))$$

Fig. 1. Low-energy x-ray scattering. The amplitude scattered by an atom may be described by an atomic scattering factor, $f_1 + if_2$, multiplied by the amplitude that would be scattered by a single Thomsonian electron in the same x-radiation field. Here r_0 is the classical electron radius; R the radial distance to the point of measurement; and $P(2\theta)$ the polarization factor that is equal to unity or cos 2θ, depending upon whether the incident electric vector (of magnitude $\mathscr{E}_0$) is perpendicular or parallel to the plane of scattering. For the low-energy x-ray region for which the wavelengths are large compared with the atomic dimensions, the scattering of each atomic electron at any angle is the same as for the forward direction. The atomic scattering factor is thus independent of the angle of scattering, 2θ.

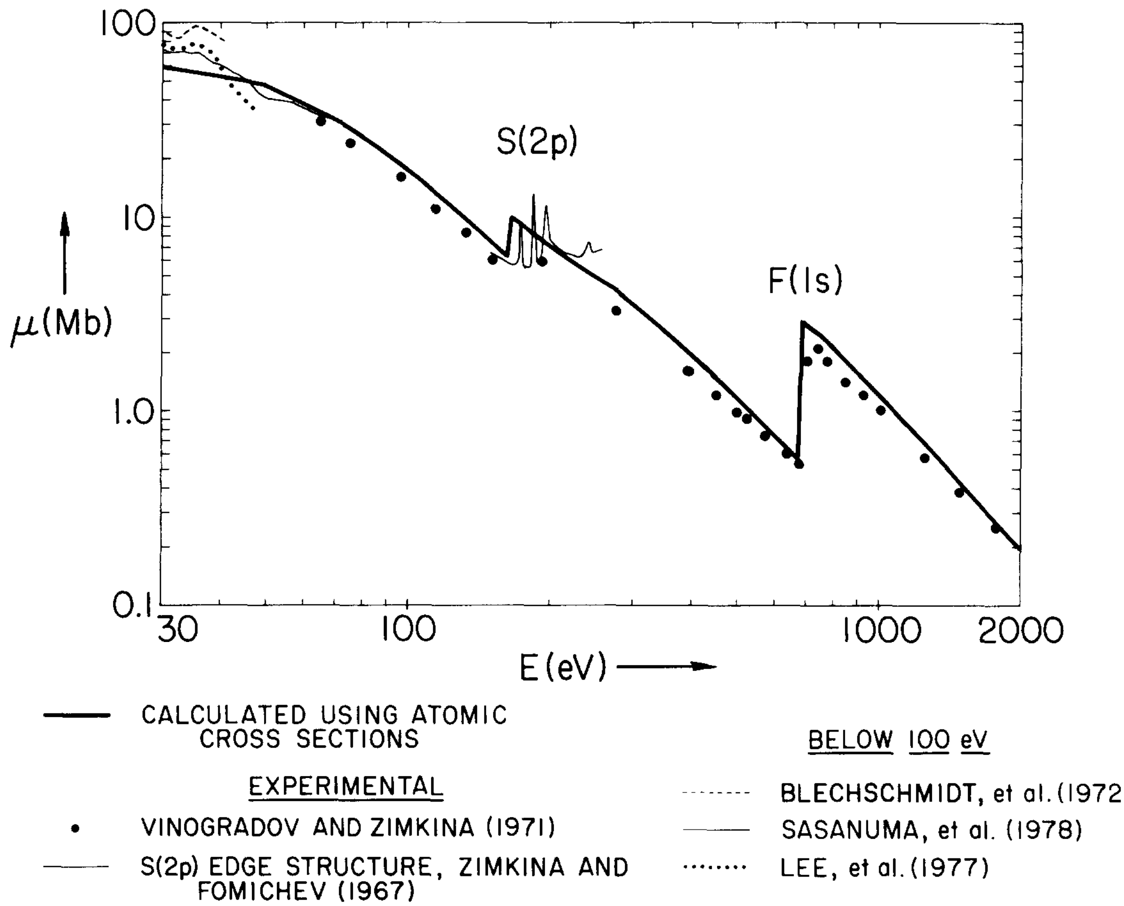


Fig. 2. Experimental photoabsorption data for the SF_6 molecule compared with that predicted by a direct sum of the neutral atom photoabsorption cross sections calculated for sulfur and fluorine by a Hartree-Slater, central-field model with no core relaxation (by Reilman and Manson[14]). This is a typical example of the atomic-like absorption of molecular systems for the region above ~50 eV and outside the threshold-energy regions.

to the atomic photoabsorption cross section. The important question, therefore, is whether or not the photoabsorption cross sections depend upon the state of the system, for example, molecular or solid. Many of the available experimentally determined photoabsorption data have been measured from transmission through solid samples. The question whether such data are atomic-like has been addressed recently by many authors.[4-7] A comprehensive treatment of the effects of the molecular state upon photoabsorption has been presented recently in an excellent monograph by Berkowitz, *Photoabsorption, Photoionization and Photoelectron Spectroscopy.*[8] These reports (along with many referenced therein) suggest that the photoabsorption spectra above about 50 eV are atomic-like except in the photon energy regions near thresholds. Below 50 eV the absorption process may directly involve valence orbitals or bands, and thus be appreciably sensitive to the condensed state of the system. At the higher-energy thresholds, the final states in the photoabsorption process may involve molecular orbitals. Also in the threshold regions there may be resonance absorption structures that are sensitive to the condensed state such as, for example, EXAFS (Extended X-Ray Absorption Fine Structure)[8] and excitonic structures (electron–hole interactions).[9]

Blechschmidt et al.,[10a] using the synchrotron radiation continuum source of the Deutsches Elektronen Synchtrotron (DESY), have reported that the solid and gaseous absorption spectra for SF_6 are essentially the same for the XUV region (above 50 eV) but are markedly different for the VUV region (below 50 eV). In Fig. 2 we have presented their data along with those of others[10-13] for the photon energy region of 30–2000 eV. The solid and gaseous measurements of the molecular orbital absorption structure at the $S(2p)$ threshold by Blechschmidt et al. are essentially identical to those for the vapor-state measurements of Zimkina and Fomichev which have been plotted here. Superimposed upon

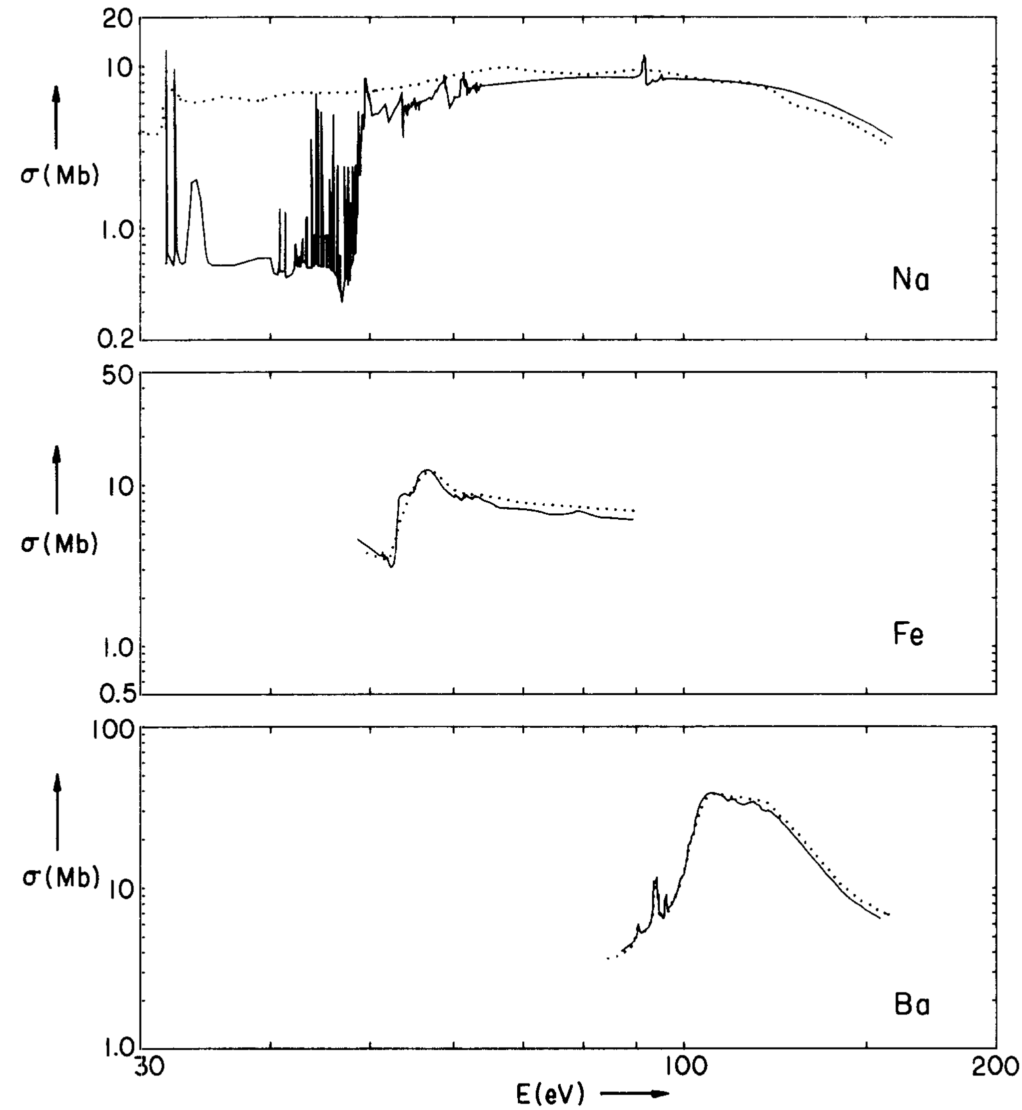


Fig. 3. Comparison of the experimental photoabsorption spectra for sodium, iron, and barium for the vapor and solid states (Refs. 15–17). Because the mass thicknesses for the vapor-state measurements were not accurately known, these data were normalized to solid-state values (dotted lines) in the megabarn region. It is typical that for energies above about 50 eV, and outside threshold regions, the photoabsorption by solids is atomic-like. ——, vapor; · · ·, metal.

these data is an "atomic-like" absorption spectrum for SF_6 generated by using the atomic photoabsorption cross sections for neutral atoms of sulfur and fluorine as calculated by Reilman and Manson,[14] who have used a Hartree–Slater central-potential, single-electron model. Figure 3 shows other examples of the atomic-like characteristics of photoabsorption above about 50 eV which compare measurements on the vapor state with these on the solid state of sodium, iron, and barium.[15-17] The vapor measurements, which were reported only as relative values, have been normalized here to those of the solids (dotted lines).

In Section II we summarize the results of the quantum dispersion theory which establish that f_1 and f_2 can be determined uniquely from the photoabsorption cross-section data. An estimate is made of the extent of the photon energy range that is required for the calculation of the desired atomic scattering factor component f_1 through the dispersion integral. In Section III we outline our procedures for the compilation, interpolation–extrapolation, and averaging of the available photoabsorption data. In Section IV the numerical procedures that have been followed for the calculation of f_1 are outlined. Finally, in Section V, methods for applying the atomic scattering factors to the calculation of the characteristics of x-ray mirror specular reflection and of x-ray Bragg reflection by crystal and multilayer analyzers are presented. These methods are applied to a series of examples of considerable practical importance in current low-energy x-ray analysis.

II. DEFINING THE ATOMIC SCATTERING FACTORS

The dispersion equations[1-3] which permit the calculation of the atomic scattering factor components from the atomic photoabsorption cross sections μ_a are derived in the Appendix. They are

$$f_1 = Z + C\int_0^\infty \frac{\epsilon^2 \mu_a(\epsilon)d\epsilon}{E^2 - \epsilon^2} \tag{4}$$

and

$$f_2 = (1/2)\pi C E \mu_a(E), \tag{5}$$

where E is the incident photon energy, the constant C is equal to $(\pi r_0 hc)^{-1}$ with r_0 the classical electron radius, h is Planck's constant, and c is the velocity of light. The anomalous dispersion integral term in Eq. (4) has a significant value for essentially the entire low-energy x-ray region. It becomes very large (and negative) for E-values near the ionization thresholds. Only for the high photon energies, far from thresholds, can the Thomsonian term Z (total number of electrons) be used as a good approximation for f_1. Very near the absorption edges, f_1 cannot be given precisely by Eq. (4)—even if threshold variations in $\mu_a(E)$ are well known—because the effect of "damping" has been neglected in the dispersion integral, which can become large at the thresholds (see the Appendix).

As recently discussed by Cromer and Liberman[18] and by Jensen,[19] the relativistic quantum dispersion theory will yield the semiclassical Kramers–Kronig relations as given in Eqs. (4) and (5) *but* with two small correction terms to be subtracted from f_1 given by

$$\Delta f_r = \frac{5}{3}\frac{|E_{tot}|}{mc^2} + \frac{Z}{2}\left(\frac{E}{mc^2}\right)^2, \tag{6}$$

where E is the photon energy, E_{tot} is the total energy of the atom (negative), and mc^2 is the rest mass energy of the electron. The first correction term, derived by Cromer and Liberman, depends upon Z only and has been tabulated by them for $Z = 3$ to $Z = 98$.[18] We have fitted their data with sufficient accuracy with the polynomial

$$\frac{5}{3}\frac{|E_{tot}|}{mc^2} = 2.19 \times 10^{-6} Z^3 + 1.03 \times 10^{-4} Z^2. \tag{7}$$

Except for photon energies near thresholds where the anomalous dispersion term can be of large negative value and f_1 can then approach zero value, these relativistic correction terms are usually of no significance in the low-energy x-ray region. In this work, therefore, for the photon energy region of 100–2000 eV we assume that f_1 and f_2 can be uniquely determined by the photoabsorption cross sections through the dispersion relations of Eqs. (4) and (5). (Note: The atomic cross section μ_a (cm^2/atom) may be related to the mass absorption coefficient μ (cm^2/g) or to the linear absorption coefficient, μ_l (cm^{-1}) for an absorber containing a single element

$$\mu_a = (A/N_0)\mu = (A/N_0\rho)\mu_l\,,$$

where N_0 is Avogadro's number, A is the atomic weight, and ρ is the mass density of the absorber in CGS units.)

For the scattering of shorter wavelengths at larger angles, the variation in phase of the scattered amplitudes originating from different points within the atomic electron distribution will introduce a small angle-dependent reduction of the atomic scattering factor. A very simple and usually sufficiently accurate modification of the atomic scattering factor as defined in Eq. (4) which can account for this effect of charge distribution is the replacement of the atomic number Z in f_1 by the angle-dependent *form factor* f_0 for the given atom. This procedure is discussed in the Appendix.

For f_1 values in the region 100–2000 eV, it was determined numerically that the contributions to the dispersion integral for the integration ranges of 0–30 eV and above 50 keV were essentially negligible. In the present calculations, the integration range was taken from 30 eV to 85 keV. A "state of the art" compilation of the available photoabsorption cross-section data in the XUV region as extended down to 30 eV has been established and is described in the following section.

III. SYNTHESIS OF EXTENDED PHOTOABSORPTION CROSS-SECTION DATA

As described above, our determination of atomic scattering factors is based upon the available photoabsorption cross-section data. Because the anomalous scattering contribution to f_1 (the integral term in Eq. (4)) is most sensitive to values of the photoabsorption cross section near the incident photon energy E, and is particularly so for photon energies which are also close to absorption edges, the most critical and accurate photoabsorption data needed for these calculations are those for the low-energy region of interest here, viz., 100–2000 eV. Fortunately, for these photon energies the photoabsorption cross sections are generally most amenable to precise measurement[20] and also to accurate theoretical calculation.[14] (For the lower energies (<100 eV), the preparation and characterization of the required, very thin transmission samples become imprecise and the photoabsorption process becomes appreciably more complex in its theoretical description.)

Recently this laboratory completed a table of the photoabsorption cross sections for all elements up to $Z = 94$ and for the region 100–1500 eV.[20] The values were found from Z-interpolation and -extrapolation from the best available experimentally measured cross sections. The data points were then averaged by fitting to them, between thresholds, normalized segments of theoretical curves. (The theoretical segments were from a Hartree–Slater single-electron model based on Herman-Skillman central potentials calculated by Henry, Bates, and Viegele[21,22] by means of a modified Manson and Cooper code.[23]) The required normalization adjustment of the theoretical segments was generally less than a few percent. Near the absorption edges where both theory and experiment are sensitive to the particular chemical or solid state of a material, simple linear extrapolations to the edges in log μ vs log E were made with the expectation that such values might tend to represent an average through any absorption fine structure.[24] To these data, in the range 100–1500 eV, we have normalized the higher- and lower-energy photoabsorption data.

There are available several excellent theoretical–experimental syntheses of photoabsorption cross-section data above 1500 eV.[22,25–30] We have chosen that of Biggs and Lighthill,[27] who have drawn from the same sources as have the other authors for the high-energy region and have presented four-term polynomial coefficients for fits in the $(1/E)$ variable between thresholds.[31] These parameterized fits were normalized for exact integrations of the dispersion integral in Eq. (4) in the high-energy range of 1500 eV to 85 keV.

Because there was no comprehensive compilation of photoabsorption cross sections in the region 30–300 eV at this time, one was undertaken here for this work. Such a compilation seemed to be timely because, in recent years, a considerable increase in relatively precise new data has occurred, particularly data obtained with synchrotron radiation sources.[32] Again, data for all elements to $Z = 94$ were interpolated and extrapolated from the cross-section curves of nearby elements for which measured data were available. The interpolations or extrapolations were regularly spaced through Z at proportionate positions between corresponding characteristic photoabsorption structures, by means of large log μ vs log E plots. We averaged these data points for the light elements ($Z \leqslant 30$) by fitting to them normalized segments between thresholds as calculated recently by Reilman and Manson[14] with their Hartree–Slater, central-potential, single-electron model.

For 50 laboratory wavelengths in the region 30–10 000 eV, Table I presents the photoabsorption cross sections for 94 elements. Also given are the corresponding f_2-values calculated with the dispersion relation given in Eq. (5) and, on the plots of f_2 given in Table I, data derived from representative experimental photoabsorption cross sections that were used in the fitting. When theoretical curve segments for the *light* elements were employed as averaging fits in the region 30–300 eV, the normalization factors (if not unity) that were used are also noted. For this low-energy region and for the heavy elements where extrapolation or interpolation through Z was required, these segments are indicated in the f_2-plots by *dashed* lines. There are very few accurate theoretical data for this low-energy region for the heavy elements that could be applied for these fittings. References to works used in this compilation for the region 30–300 eV are noted as reported for each element in a separate listing of about 140 references at the end of the tables.

It is interesting to note that the photoabsorption cross sections for $E < 300$ eV and for the higher atomic number elements deviate significantly from the hydrogen-like model predictions. (Because, from Eq. (5), f_2 is proportional to $E\mu(E)$, these differences will also appear in the f_2 tables and plots as presented in Table I with characteristic minima and maxima only slightly shifted from those positions in the corresponding photoabsorption spectra.) In this low-energy x-ray region many absorption edges are no longer sharp, and broad absorption maxima are observed.

In the Xe spectra, for example, the photoabsorption cross sections have a maximum at 100 eV with minima at 50 and 160 eV. Such features are not predicted by hydrogenic models. The rise in the cross section from 50 to 100 eV is the result of the centrifugal potential (that is $\approx l(l+1)/r$) in the effective Hamiltonian of the atom. This results in a delayed onset of the absorption edge. The spectrum reaches its maximum at 100 eV far beyond the threshold. The minimum at 160 eV is known as a *Cooper Minimum*. If nodes exist in the initial wave function (for example for $n < l + 1$), the transition probability for $nl \rightarrow \epsilon(l+1)$ goes through zero above threshold.

For the rare earth elements $_{57}$La to $_{71}$Lu, the dominant absorption in the low-energy x-ray region comes from the transition $4d^{10}4f^{n} \rightarrow 4d^{9}4f^{n+1}$ followed by an autoionization of the $4d^{9}4f^{n+1}$ level. For these rare earth elements, the $4f$-shell has one electron in La and is completely filled in Lu. As can be seen from the plots of f_2, the resonance maxima clearly decrease with increasing atomic number and finally this feature disappears for Lu. This effect, known as *resonance disappearance*, was predicted by Fano, Cooper, and Manson.[23,33]

Resonance disappearance can also be observed in the $3d$-photoabsorption spectra of the transition elements $_{21}$Sc to $_{29}$Cu in the energy range 30–100 eV. The transitions $3p^6 3d^n \rightarrow 3p^5 3d^{n+1}$ and $3p^6 3d^n \rightarrow 3p^6 3d^{n-1}\epsilon f$ are strongly coupled via the "super Coster–Kronig" decay $3p^5 3d^{n+1} \rightarrow 3p^6 3d^{n-1}\epsilon f$. As the $3d$-shell becomes filled, the $3p$–$3d$ resonance maximum should decrease. This effect has been observed. For a comprehensive review and analysis of the photoabsorption structures in the XUV region, see Zimkina and Gribovskii.[34] We have indicated the origins of these structural features in the f_2-plots associated with Table I.

IV. CALCULATION OF THE f_1-VALUES

For each photon energy an integration of the anomalous dispersion term in Eq. (4) from 30 eV to 85 keV was carried out to determine an f_1-value. As noted above, the polynomial fits of Biggs and Lighthill[27,31] for the photoabsorption cross sections were normalized and applied in Eq. (4) for exact integrations in the range 1500 eV to 85 keV. Below 1500 eV the dispersion integral was evaluated numerically. For each element, interpolated cross-section values were found at 250 points. Especially fine spacings were used in the vicinity of absorption edges. A three-term polynomial was calculated to fit each successive set of three interpolated points, which then permitted a direct integration of the dispersion integral for that interval. The f_1-values for the region 100–2000 eV were thus obtained for the 94 elements. These are also presented in Table I. It is interesting and important to note in the associated plots the large departures from the Thomsonian values of Z for f_1 which result from anomalous dispersion.

V. APPLICATION OF THE ATOMIC SCATTERING FACTORS

A review of the general methods for the application of the atomic scattering factors in low-energy x-ray interaction physics was presented recently elsewhere.[35,36] In this section we illustrate by a few basic examples how the atomic scattering factors may be applied as the primary parameters in precise descriptions of low-energy x-ray interactions from both the macroscopic and the atomic point of view. The methods summarized here as examples are related to the important, practical problems of characterizing the reflectivity of x-ray mirrors, multilayers, and crystals. In Section VI these characterizations are shown to be generally in very good agreement with the experimental measurements.

A. Reflection by X-Ray Mirrors

In an exact, general solution of the boundary-value problem for an electromagnetic wave reflecting from a smooth interface between vacuum and a material (as given, for example, by Mahan[37]), the macroscopic material constants used (in Mahan's notation) are ϵ, μ, and σ, the usual dielectric, permeability, and conductivity constants. For the x-ray region, magnetic interactions are negligible and the permeability constant, μ, is equal to unity. The dielectric constant, ϵ, is only slightly less than unity. It may be shown (see, for example, Henke[38]) that an exact solution may be completely given for x-ray reflection in terms of a single, complex constant, K, which we define as the complex dielectric constant by the relation

$$K = 1 - (1 - \epsilon) - i\frac{2\sigma}{\nu} = 1 - \alpha - i\gamma, \qquad (8)$$

where ν is the frequency of the incident radiation. If we let the refractive index, n_r (which is also only slightly less than unity), be equal to $1 - \delta - i\beta$, it follows from the fact that $n_r = K^{1/2}$ that α and γ are related to the small constants δ and β by

$$\alpha = 2\delta - \delta^2 + \beta^2 \approx 2\delta \qquad (9)$$

and

$$\gamma = 2\beta(1 - \delta) \approx 2\beta. \qquad (10)$$

According to the classical electromagnetic theory, the dielectric constant is given in terms of the dipole moment per unit volume within the material, M. We may therefore write

$$K \doteq 1 + \frac{4\pi M}{E_0}, \qquad (11)$$

where E_0 is the incident electric field. M may be derived as the sum of the contributions from all of the atomic dipole moments within the unit volume. Because, for the low-energy x-ray region, we can assume that the atoms within a condensed system can be considered to act independently as scattering dipoles (as has been discussed earlier) the total atomic dipole moment per unit electric field amplitude will be simply proportional to the *average* atomic scattering factor for the medium. Thus from the quantum theory of dispersion[1,2,33] it is shown that

$$\frac{\alpha}{2} = \left(\frac{r_0}{2\pi}\right)\lambda^2\phi \sum_p x_p f_{1p} \approx \delta \qquad (12)$$

and

$$\frac{\gamma}{2} = \left(\frac{r_0}{2\pi}\right)\lambda^2\phi \sum_p x_p f_{2p} \approx \beta, \qquad (13)$$

where ϕ is the number of molecular groups per unit volume each with x_p atoms of atomic scattering factor, f_p, of real and imaginary components, f_{1p} and f_{2p}.

In the rewriting of the exact general solution for the intensity reflected at the interface between vacuum and an absorbing, dielectric medium,[38] the parameters

α and γ have therefore been adopted and the following convenient characteristic quantity, ρ, made use of:

$$\rho^2 = (1/2)\{\sin^2\theta - \alpha + [(\sin^2\theta - \alpha)^2 + \gamma^2]^{1/2}\}. \quad (14)$$

Here θ is the grazing angle of incidence. (For small θ, α, and γ, the parameter ρ measures the angle which the refracted beam makes with the surface.) Because, for many problems of interest in the low-energy x-ray region (for example ultrasoft x-ray reflection and large-angle reflection generally) it is not possible to make the small-angle approximations as is usual in the conventional Fresnel x-ray reflection equations.[1,2] We summarize here the exact solutions for $I_\sigma(\theta)$ and for $I_\pi(\theta)/I_\sigma(\theta)$, where $I_\sigma(\theta)$ and $I_\pi(\theta)$ are the ratios of the reflected intensity to the incident intensity for the two polarized components with the incident electric vector perpendicular and parallel to the plane of reflection, respectively.

$$I_\sigma(\theta) = \frac{4\rho^2(\sin\theta - \rho)^2 + \gamma^2}{4\rho^2(\sin\theta + \rho)^2 + \gamma^2}. \quad (15)$$

The polarization ratio of the two intensity components becomes

$$\frac{I_\pi(\theta)}{I_\sigma(\theta)} = \frac{4\rho^2(\rho - \cos\theta\cot\theta)^2 + \gamma^2}{4\rho^2(\rho + \cos\theta\cot\theta) + \gamma^2}, \quad (16)$$

and the total reflected intensity relative to that of the incident unpolarized beam becomes

$$I(\theta) = (1/2)I_\sigma[1 + (I_\pi/I_\sigma)]. \quad (17)$$

Finally, it may be shown[38] that the attenuation factor in the Poynting vector which describes the energy flow into the medium is $\exp(-2\pi\gamma z/\lambda\rho)$, where z is the depth measured normal to the surface. This yields a $1/e$ depth, $d_{1/e}$, given by

$$d_{1/e} = \lambda\rho/2\pi\gamma. \quad (18)$$

Using these results and the atomic scattering factor data of Table I, we calculated the reflectivity as a function of photon energy and of angle of incidence for x-ray mirrors (with assumed perfectly smooth surfaces) of beryllium, carbon, aluminum oxide, aluminum, fused quartz, nickel, copper, and gold. Our results are presented in Table II for the region 100–2000 eV at 20 angles of incidence in the range 10–785 milliradians (at approximately equal logarithmically spaced intervals). In the associated reflectivity plots it is important to note the "rounding off" of the "total reflection" cutoff characteristic as a result of absorption and the strong effect of anomalous dispersion particularly near the absorption-edge energies.

In the vicinity of the total reflection cutoff ($\sin^2\theta - \alpha = 0$), and where $\rho = (\gamma/2)^{1/2}$, the effective penetration depth, $d_{1/e}$, becomes equal to $\lambda/[2\pi(2\gamma)^{1/2}]$. For example, this effective layer depth for the carbon, fused quartz, copper, and gold mirrors is equal respectively to 122, 129, 71, and 28 Å for $E = 108.5$ eV and is equal to 175, 105, 37, and 32 Å for $E = 677$ eV.

B. Reflection by Sputtered or Evaporated Multilayers

In order to extend Bragg crystal spectrometry into the low-energy x-ray region it is necessary to obtain large d-spacing multilayer analyzers in the range 10–100 Å. Except for the acid phthalate analyzers ($d \approx 13.3$ Å), there are very few suitable crystal systems with such relatively large d-spacings. Consequently synthetic "crystal" analyzers were constructed by successively evaporating or sputtering heavy- and light-element layers upon a substrate,[39,40] or by successively depositing molecular monolayers by the Langmuir–Blodgett process[41,42] (for example with a lead salt of a straight-chain fatty acid). We have found that the reflectivity characteristics of these analyzers may be accurately predicted from either the macroscopic or the atomic point of view, by using the atomic scattering factors as the primary parameters of the system. In this section, we summarize first a description developed recently by Lee[43] and by Rosenbluth and Forsyth,[44] by means of an electromagnetic boundary-value solution for the reflected wave from a periodic, layered system (with a characteristic matrix method[45]).

We define the sputtered or evaporated double-layer structure of heavy and light materials to be of combined thickness (and periodicity length) equal to d. If the heavy layer is of thickness Γd, the light layer is of thickness $(1 - \Gamma)d$. These layers have optical constants δ and β, calculated by Eqs. (12) and (13) from the atomic scattering factors of the materials. It is convenient to define also the average values of these constants for the multilayer system as

$$\bar{\delta} = \Gamma\delta_1 + (1 - \Gamma)\delta_2$$

and

$$\bar{\beta} = \Gamma\beta_1 + (1 - \Gamma)\beta_2,$$

where subscripts 1 and 2 refer to the heavy and light layers, respectively.

The rigorous solution for the intensity of reflection of an electromagnetic wave in the x-ray region may be completely described with the help of these constants, as has been discussed in the preceding section. For a beam of low-energy x-rays at a grazing incidence angle, θ, the ratio of the reflected to the incident intensity $I(\theta)$ derived for a system of N layers is given by

$$I(\theta) = \left| \frac{-2ire^{i\psi_2} \sin \psi_1 \sin (N \cos^{-1} x)}{e^{i\psi}(1 - r^2 e^{-2i\psi_1}) \sin (N \cos^{-1} x) - \Delta^{1/2} \sin [(N-1) \cos^{-1} x]} \right|^2, \tag{19}$$

where

$$\Delta = 1 - 2r^2 + r^4$$

and

$$x = \frac{\cos \psi - r^2 \cos (\psi_1 - \psi_2)}{\Delta^{1/2}}.$$

The phase shifts within layer 1 and layer 2 are

$$\psi_1 = \frac{2\pi\Gamma d}{\lambda} \sin \theta \left[1 - \frac{\delta_1 + i\beta_1}{\sin^2 \theta} \right]$$

and

$$\psi_2 = \frac{2\pi(1 - \Gamma)d}{\lambda} \sin \theta \left[1 - \frac{\delta_2 + i\beta_2}{\sin^2 \theta} \right].$$

An "internal reflection coefficient," r, is defined by

$$r = \frac{[(\delta_1 - \delta_2) + i(\beta_1 - \beta_2)]P(2\theta)}{2 \sin^2 \theta},$$

where $P(2\theta)$ is again the polarization factor that is equal to unity or to $\cos 2\theta$ depending upon whether the incident electric field vector is perpendicular or parallel to the plane of reflection. Since, except for very small values of θ (which are of no practical interest for x-ray Bragg spectrometry) the value of r is typically small compared with unity Eq. (19) can be appreciably simplified, to a good approximation, by retaining only terms in these expressions that are first order in r.

For the small δ- and β-values of the low-energy x-ray region, Lee[43] has shown, after some redefinition and algebraic manipulation, that the rigorous intensity equation (19) may be written in the form

$$I(\theta) = \left| \frac{D + iB}{\xi \pm [\xi^2 - (D + iB)^2]^{1/2} i \cot (N \cos^{-1} x)} \right|^2. \tag{20}$$

For large N, the quantity $i \cot (N \cos^{-1} x)$ approaches unity and Eq. (20) becomes identical to the well-known expression given by Darwin and generalized for the case of absorption by Prins for the perfect, semi-infinite crystal of periodic atomic planes.[1,2,35,36]

From the atomic point of view, in this dynamical theory the quantity $D + iB$ can be defined in terms of a *structure factor*, $F_1 + iF_2$, for a *unit cell* of the periodic *layered* system by the relations

$$F_1 = \sum_p x_p \left[f_{1p} \cos \left(\frac{4\pi z_p \sin \theta}{\lambda} \right) + f_{2p} \sin \left(\frac{4\pi z_p \sin \theta}{\lambda} \right) \right] \tag{21}$$

and

$$F_2 = \sum_p x_p \left[f_{2p} \cos \left(\frac{4\pi z_p \sin \theta}{\lambda} \right) - f_{1p} \sin \left(\frac{4\pi z_p \sin \theta}{\lambda} \right) \right], \tag{22}$$

where x_p is the number of the p-type atoms located within the cell at positions z_p and the summations are taken over all the atoms in the unit cell. For diffraction angles in the vicinity of a diffraction peak angle, θ_0, the argument $4\pi z_p \sin \theta_0/\lambda$ may be equated to $2\pi m z_p/d$ by using the Bragg condition $m\lambda = 2d \sin \theta_0$. For the periodic layered systems of interest here, it is convenient to define the unit cell so that z_p is measured from a central plane of symmetry and hence the second terms in Eqs. (21) and (22) drop out. For this case, and for angles of scattering at the Bragg peak position, $2\theta_0$, the structure factor components may then be given simply by

$$F_1 = \sum_p x_p f_{1p} \cos \frac{2\pi m z_p}{d} \tag{23}$$

and

$$F_2 = \sum_p x_p f_{2p} \cos \frac{2\pi m z_p}{d}. \tag{24}$$

$D + iB$ is then defined by

$$D + iB = \frac{kd}{\sin \theta} P(2\theta) \left(\frac{r_0 \lambda^2}{2\pi} \right) \phi(F_1 + iF_2), \tag{25}$$

in which k is $2\pi/\lambda$ and ϕ is the number of unit cells per unit volume of the multilayered system.

The quantity ξ is defined by the relation

$$\xi = \frac{kd}{\sin \theta} [(\sin \theta - \sin \theta_0) \sin \theta - (\bar{\delta} + i\bar{\beta})]. \tag{26}$$

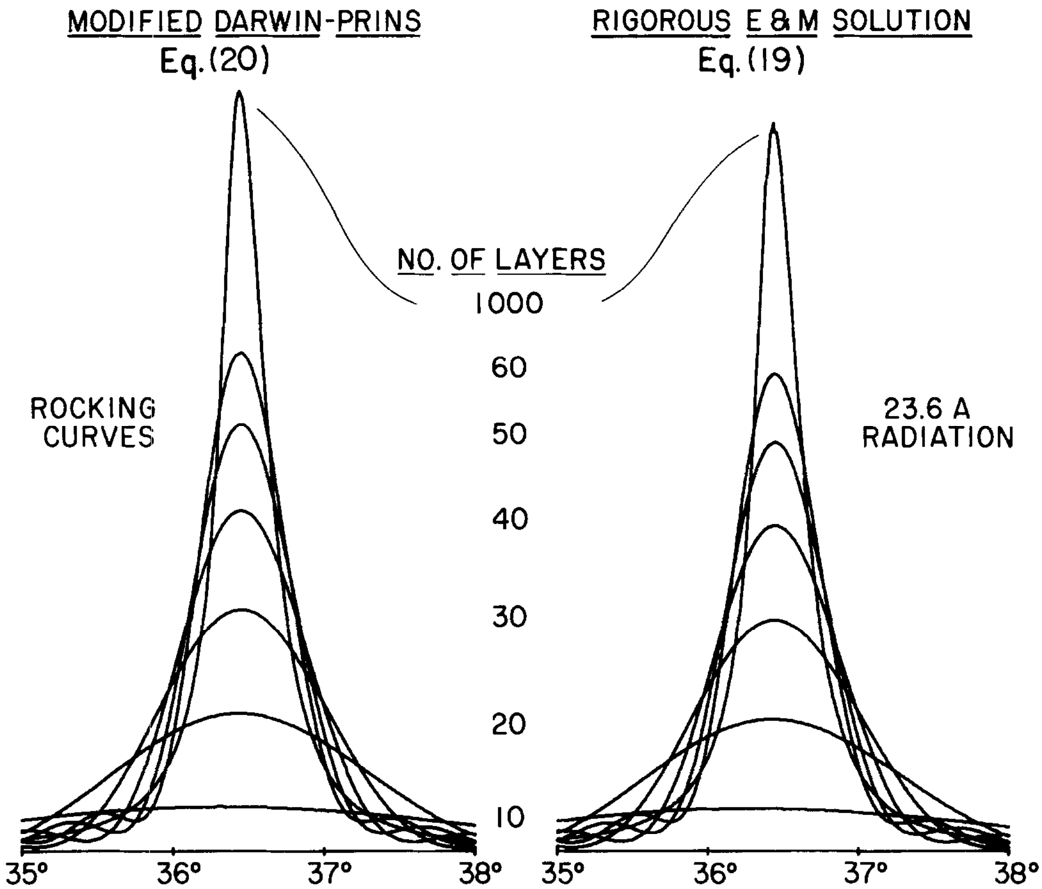
In order to apply Eq. (20) to the prediction of the reflection characteristics of multilayer analyzers constructed of successive heavy and light layers of uniform sputtered or evaporated materials of thickness Γd and $(1 - \Gamma)d$ and atomic scattering factors, f and f', respectively, we replace the summations in Eqs. (23) and (24) by integrals, using atomic number densities n and n' to obtain $\phi(F_1 + iF_2)$, the structure factor per unit volume for these multilayer systems, as

$$\phi F_1 = \frac{1}{m\pi} (n f_1 - n' f_1') \sin m\Gamma\pi \tag{27}$$

and

$$\phi F_2 = \frac{1}{m\pi} (n f_2 - n' f_2') \sin m\Gamma\pi. \tag{28}$$

In Fig. 4 we indicate how closely the macroscopic, rigorous result, Eq. (19), is approximated by the atomic and phenomenological description, and N-dependent



6 A--TUNGSTEN / 14 A--CARBON MULTILAYER

N = 30

E(eV)	R_p(mr) (20)	R_p(mr) (19)	P(%) (20)	P(%) (19)	ω(mr) (20)	ω(mr) (19)	L/R_p (20)	L/R_p (19)	λ(A)
392.4	0.83	0.80	1.85	1.78	39.19	39.18	1.07	1.03	31.6
395.3	0.82	0.78	1.85	1.78	38.41	38.41	1.05	1.01	31.4
452.2	0.75	0.72	2.31	2.22	28.41	28.40	0.97	0.93	27.4
511.3	0.79	0.75	3.00	2.87	22.95	22.95	1.02	0.97	24.3
524.9	0.80	0.76	3.18	3.04	22.03	22.02	1.03	0.99	23.6
556.3	0.82	0.79	3.58	3.42	20.19	20.19	1.07	1.02	22.3
572.8	0.83	0.79	3.76	3.59	19.35	19.35	1.07	1.03	21.7
637.4	0.90	0.86	4.75	4.53	16.74	16.74	1.17	1.12	19.5
676.8	0.94	0.90	5.35	5.11	15.52	15.51	1.23	1.17	18.3
705.0	0.96	0.91	5.74	5.47	14.76	14.75	1.25	1.19	17.6
776.2	0.99	0.94	6.66	6.36	13.15	13.14	1.29	1.23	16.0
851.5	0.99	0.95	7.49	7.15	11.82	11.81	1.31	1.25	14.6
929.7	0.98	0.94	8.21	7.84	10.71	10.71	1.30	1.24	13.3
1011.7	0.96	0.92	8.80	8.41	9.76	9.76	1.27	1.21	12.3
1041.0	0.95	0.91	8.97	8.58	9.47	9.46	1.25	1.20	11.9
1188.0	0.87	0.83	9.52	9.12	8.22	8.21	1.16	1.11	10.4
1253.6	0.83	0.79	9.61	9.21	7.76	7.75	1.10	1.05	9.89
1486.7	0.64	0.61	8.88	8.54	6.46	6.45	0.85	0.81	8.34
1740.0	0.24	0.24	4.11	3.98	5.38	5.38	0.33	0.32	7.13
2042.4	0.70	0.66	13.18	12.40	4.61	4.62	0.90	0.85	6.07

Fig. 4. Reflectivity curves $I(\theta)$ calculated by Eq. (19) from a rigorous electromagnetic boundary-value solution for a periodic layered system and by Eq. (20), a modified Darwin–Prins approximation to Eq. (19). These plots are for a tungsten/carbon multilayer of $\Gamma = 0.3$. Also compared here for 30 double layers of W and C at appropriate photon energies are the results calculated by Eqs. (19) and (20) for the integrated reflectivity R_p; the peak reflectivity $P(\%)$; the FWHM ω; and the ratio L/R_p, the area under a Lorentzian with the same $P(\%)$ and ω compared with R_p (a measure of the Lorentzian quality of the rocking curve $I(\theta)$).

Darwin–Prins result, Eq. (20). Here the predicted reflectivity characteristics are presented for a multilayer of assumed sharply defined tungsten and carbon double layers of d-spacing equal to 20 Å and of Γ-value 0.3. Plotted here for λ = 23.6 Å (O–$K\alpha$) are the reflectivity curves, $I(\theta)$, for multilayers of N equal to 10, 20, 30, 40, 50, 60, and 1000. The N = 1000 curves are essentially identical to that given by the Darwin–Prins model for a thick, perfect crystal. In the associated table we present the values calculated with Eqs. (19) and (20) of the integrated reflectivity R_p; the peak reflectivity P(%); the full-width-at-half-maximum ω (milliradians), and the ratio L/R_p, where L is the integrated reflectivity for a Lorentzian curve with the same P- and ω-values. (L/R_p is a measure of the Lorentzian quality of the rocking curve $I(\theta)$.)

The integrated reflectivity R_p has been defined for a numerical integration range of $\pm5\omega$ from θ_0. These limits are similar to typical limits in the experimental measurement of the integrated reflectivity. (The equivalent Lorentzian falls to 1% value at $(\theta - \theta_0) = \pm5\omega$.)

In Table III we present characterizations of the sharply defined tungsten/carbon multilayers of Γ = 0.4 and N = 100 for the low-energy x-ray region with d-spacings of 20, 25, 35, 40, and 50 Å. These have been calculated from Eqs. (19), (27), and (28). Presented here for comparison are the corresponding values for the integrated reflectivity R_m, calculated from the *mosaic crystal model*, and given by[1,2,35]

$$R_m = \frac{(r_0\phi\lambda^2)^2}{16\pi\beta}(F_1^2 + F_2^2)\frac{1 + \cos^2 2\theta}{\sin 2\theta}. \quad (29)$$

Also presented in Table III are the parameters ΔE and $E/\Delta E$. The equivalent energy width of the rocking curve ΔE, obtained by differentiating the Bragg equation, is given by

$$\Delta E = E\frac{\omega}{\tan\theta_0} \quad (30)$$

and, correspondingly, the resolving power of the analyzer $E/\Delta E$ is given by

$$\frac{E}{\Delta E} = \frac{\tan\theta_0}{\omega}, \quad (31)$$

where ω is the full-width-at-half-maximum in radians.

C. Reflection by Molecular Multilayers and Crystals

Molecular multilayers can be constructed by dipping a smooth substrate in and out of the surface of a liquid on which an insoluble monolayer has been deposited and condensed under a steady surface pressure. The outstanding example of this process is that developed by Langmuir and Blodgett,[46] who worked principally with barium stearate multilayers. In our laboratory,[36,47] their process was specialized for the construction of x-ray Bragg analyzers. In order to obtain high reflectivity (electron scattering contrast), we chose the lead salts of straight-chain fatty acids such as lead laurate, myristate, stearate, behenate, lignocerate, and melissate of d-spacings equal to 35, 40, 50, 60, 65 and 80 Å, respectively.

An effective unit cell for these molecular multilayers described in Ref. 36 is illustrated in Table IV. For n CH_2 groups in the chain, the molecular formula may be written as $[CH_3(CH_2)_nCOO]_2Pb$ with measured unit-cell length d that may be given by $2.50(n + 4)$ Å. The corresponding structure factor components, as calculated with Eqs. (23) and (24), become for first-order reflection simply

$$F_1 = f_1(\mathrm{Pb}) + 4f_1(\mathrm{O})\cos(2\pi|z(\mathrm{O})/d|) \quad (32)$$

and

$$F_2 = f_2(\mathrm{Pb}) + 4f_2(\mathrm{O})\cos(2\pi|z(\mathrm{O})/d|), \quad (33)$$

in which the position of the oxygen atoms $z(\mathrm{O})$ is taken here to be 1.33 Å. The area occupied by the unit cell of these molecular multilayers (in the reflecting planes) is taken here to be 20.4 Å^2. It is interesting to note that for odd-order reflections, the scattering amplitudes from the carbon atoms cancel to zero. For even orders, however, they contribute a significant negative amount which reduces the magnitude of the structure factors. With this molecular model the corresponding structure factors for first-order Bragg reflection and for the low-energy x-ray region of 100–2000 eV were calculated. Results are presented in Table V.

The crystallographic data for the acid phthalate crystals with cations NH_4^+, Na^+, K^+, Rb^+, and Tl^+ reported by Okaya and Pepinsky[48,49] and by Smith[50,51] are presented in Table IV. (The z_p/d ratios are measured from the symmetry plane.) With Eqs. (23) and (24) the corresponding structure factors for first-order diffraction in the low-energy x-ray region of 550–2000 eV were calculated for these acid phthalate crystals and are presented in Table V.

As in Table III for the sputtered or evaporated multilayer analyzers, we present in Table VI the reflection characteristics of the molecular and the acid phthalate crystal analyzers. These were found from the N-dependent Darwin–Prins reflectivity $I(\theta)$, given in Eq. (20); the integrated reflectivity R_m, from the mosaic crystal model given in Eq. (29); and the structure factors given in Table V. The ten Bragg analyzers characterized in Table VI for the low-energy x-ray region are the five molecular multilayers of $2d$-values in the region 70–130 Å, lead laurate, myristate, stearate, behenate, and lignocerate with N = 200; and the five acid phthalates of $2d$-value of about 26.6 Å with the cations of ammonium, sodium, potassium, rubidium, and thallium (with $N = \infty$). Their parameters, R_m, R_p, $P(\%)$, ω, ΔE, and $E/\Delta E$ (as defined in Sect. V-B), are also presented here as plots and as functions of photon energy.

VI. COMPARISON WITH REFLECTIVITY MEASUREMENTS

As noted above, the prediction of the reflectivity of low-energy x-rays from mirrors and periodically layered systems is sensitively dependent upon both atomic scattering components, f_1 and f_2, because both coherent scattering and photoabsorption interactions are strongly involved. Reflectivity measurements from a system of accurately known structure should, therefore, provide a good test of the atomic scattering factors and the methods for their application as presented here.

Plotted in Figs. 5 and 6 are integrated reflectivity measurements for the acid phthalate crystals and for the molecular multilayers, lead myristate and lead behenate, systems for which the structures are well defined and accurately known. Superimposed upon these data are the curves predicted by Table VI. It is seen that outside the threshold energy regions the agreement between predicted and measured reflectivities is very satisfactory. (The continuum reflectivity measurements of Blake et al.[52] near the oxygen-K absorption edge (530 eV) show molecular orbital structures which cannot be found, however, by calculations based upon the atomic scattering factors.)

Presented elsewhere[35,36] are comparisons of the predicted reflectivity curves as given in Tables II and III for mirrors and for sputtered or evaporated multilayer systems with available experimental data. The predicted reflectivities based upon models which assume perfectly smooth, sharply defined interfaces were typically higher than those measured for practical systems for which the interface structures are not usually well characterized. Mirror surfaces are not perfectly smooth and may often exhibit a gradient in their surface density. Interface structures within the sputtered or evaporated multilayers are probably relatively rough or diffused. Smirnov et al.[53] recently presented a roughness or gradient model for x-ray reflecting surfaces that does effectively predict the reduced reflectivity of real mirror systems.

The basic methods outlined here for the description of the low-energy x-ray interactions were applied to obtain comparisons with the experimental data given in a forthcoming American Institute of Physics publication of the Proceedings of the American Physical Society's Topical Conference (June 1981) on Low Energy X-Ray Diagnostics.[54] The Proceedings includes up-to-date reviews and extensive references on the applications of low-energy x-ray interaction physics (for example to current areas of research utilizing the synchrotron radiation sources and the high-temperature plasma sources involved in controlled thermonuclear fusion energy research and in x-ray astronomy). Included are tables of the atomic scattering factors as interpolated at regular energy intervals derived directly from and complementary to the present work.

The authors would also like to refer the readers to a new compilation entitled "The Optical Constants of Metals. I. The Transition Metals." These tables present optical constants in the photon energy region of 0.1 eV to a few hundred eV,[55] many of which were based upon reflectivity measurements.

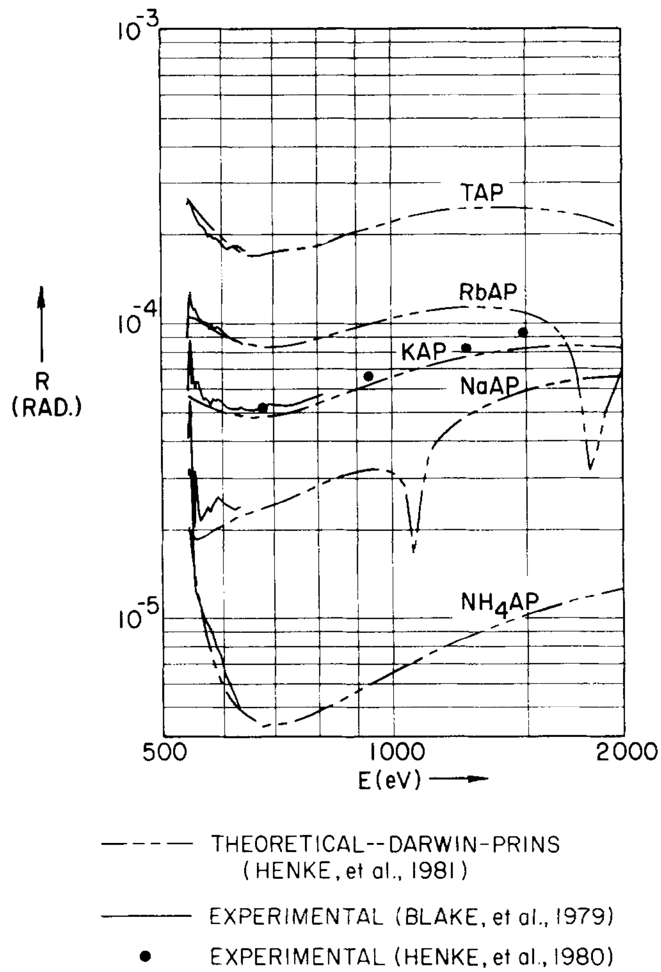


Fig. 5. Comparison of the integrated reflectivity curves predicted by the Darwin–Prins relation, Eq. (20), with those measured experimentally for the acid phthalate crystals of ammonium, sodium, potassium, rubidium, and thallium. At the oxygen K threshold (530 eV), the measurements of Blake et al. (Ref. 52) made with a continuum radiation source reveal threshold structures that cannot be predicted by calculations based upon atomic scattering factors.

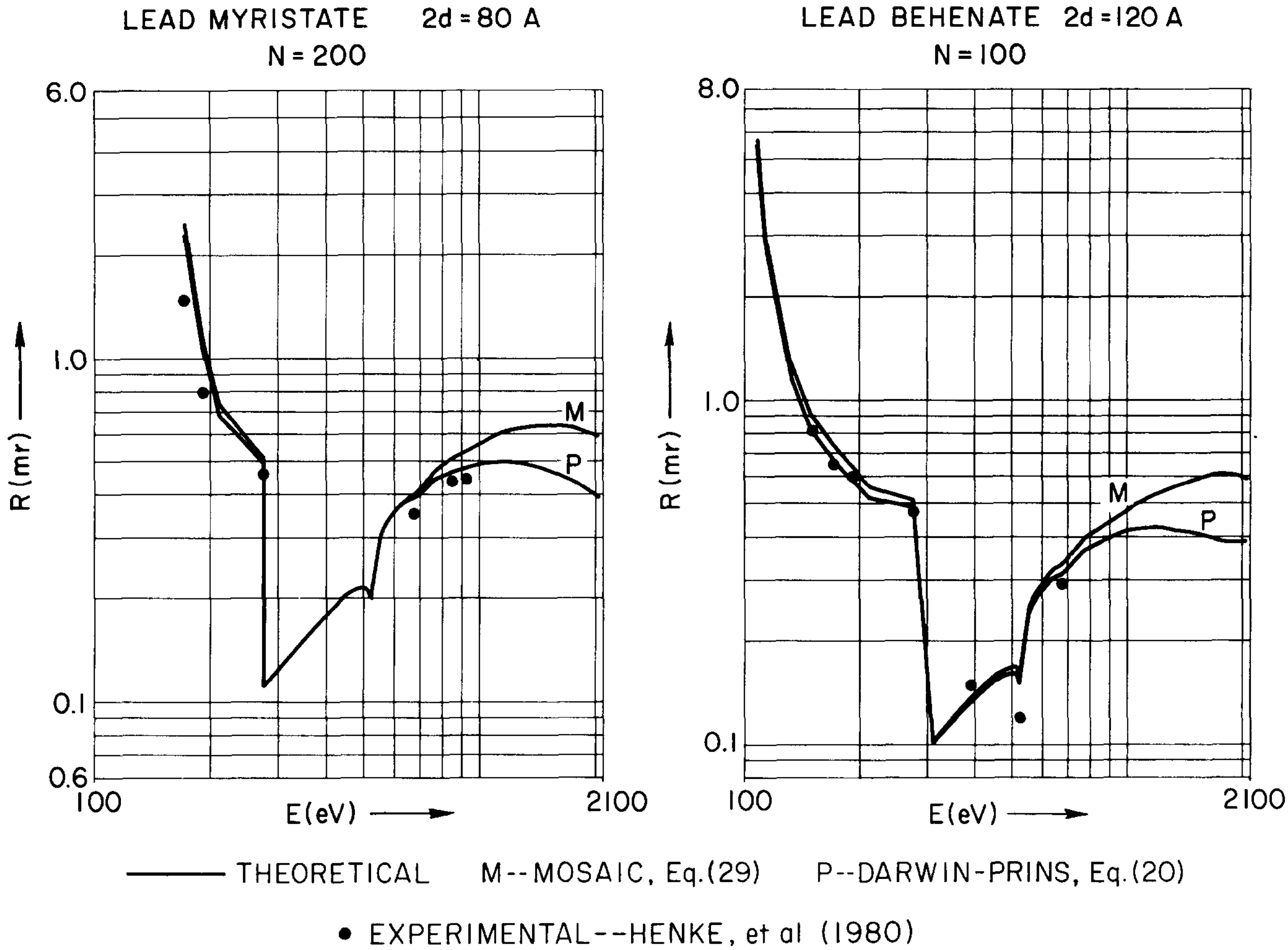


Fig. 6. Comparison of the integrated reflectivity curves predicted by the modified Darwin–Prins relation, Eq. (20), and by the mosaic crystal model relation, Eq. (29), with experimental measurements for the molecular multilayer systems of lead behenate and lead myristate.

VII. APPENDIX: DERIVATION OF DISPERSION RELATIONS FOR THE ATOMIC SCATTERING FACTOR COMPONENTS f_1 AND f_2

Classically, the solution for the amplitude scattered by a single, bound electron with a natural frequency of oscillation ω_s and damping constant η_s for an incident radiation of frequency ω_0 yields a scattering factor (see, for example, Ref. 2, p. 137) given simply by

$$f = \frac{\omega_0^2}{(\omega_0^2 - \omega_s^2) - i\eta_s\omega_0}. \tag{A1}$$

Semiclassically, a bound atomic electron (type-q of the n,l-subshell) is not assigned a single equilibrium position but rather is considered to be statistically distributed in position about the nucleus according to a probability density, $\psi\psi^*$. It is assigned a corresponding continuum of characteristic frequencies ω, each with an associated oscillator strength $(dg_q/d\omega)d\omega$. Under the interaction of an incident electromagnetic wave of frequency ω_0, the scattering factor is then described by the integral

$$f_q = \int_{\omega_q}^{\infty} \frac{\omega_0^2(dg_q/d\omega)d\omega}{(\omega_0^2 - \omega^2) - i\eta_q\omega_0}, \tag{A2}$$

in which ω_q is the threshold frequency.

It is convenient to express this integral in terms of the energy variables and the incident photon energy E ($E = \hbar\omega_0$). We obtain

$$f_q = \int_{E_q}^{\infty} \frac{E^2(dg_q/d\epsilon)d\epsilon}{(E^2 - \epsilon^2) - i\eta_q E}, \tag{A3}$$

with E_q as the *threshold energy* for the atomic electron of type-q of the subshell, n,l.

Formally, with either the Schrödinger wave mechanics or with such modern techniques as those of

Feynman (see the excellent review of Fano and Cooper, "Spectral Distribution of Atomic Oscillator Strengths"[33]), the quantum mechanics yields the same equations for the atomic scattering factors and for the optical constants as does the semiclassical approach for this low-energy x-ray region for which relativistic corrections are not required.[18,19] The quantum mechanics yields the important relationship for the oscillator density in terms of the transition probability μ_q for promoting an electron from the n,l-subshell to the ionization continuum or, for photon energies near threshold, to discrete bound states (with a subsequent ejection of an Auger electron—called indirect photoionization). Rather than append a summation term in Eq. (A3) to account for the small contribution of the discrete bound-state transitions, we include their effect within this integral by using an average value of the oscillator density in the threshold region as has been noted earlier.[24] The quantum mechanical equivalent for the semiclassical concept of *oscillator density* is then given by

$$(dg_q/d\epsilon) = C\mu_q(\epsilon). \tag{A4}$$

Here, $C = (\pi r_0 hc)^{-1} = 0.9111$ (eV Å^2)$^{-1}$ in which r_0, h, and c are the classical electron radius, Planck's constant, and the velocity of light, respectively. We may rewrite (A3) as a sum of two integrals,

$$f_q = \int_{E_q}^{\infty} \frac{(E^2-\epsilon^2)(dg_q/d\epsilon)d\epsilon}{(E^2-\epsilon^2) - i\eta_q E} + \int_{E_q}^{\infty} \frac{\epsilon^2(dg_q/d\epsilon)d\epsilon}{(E^2-\epsilon^2) - i\eta_q E}.$$

Because η_q/E is very small compared with unity for the x-ray region,[56] the first integral becomes simply equal to g_q, the oscillator strength for the n,l-subshell electron, which is the high-energy limit for this scattering factor contribution. The effect of the binding of the electron to the nucleus (the anomalous dispersion effect) is taken care of principally through the second integral term.

The scattering factor, f_q, may now be expressed as

$$f_q = f_{1q} + if_{2q},$$

where

$$f_{1q} = g_q + C\int_{E_q}^{\infty} \frac{\epsilon^2(E^2-\epsilon^2)\mu_q(\epsilon)d\epsilon}{(E^2-\epsilon^2)^2 + (\eta_q E)^2} \tag{A5}$$

and

$$f_{2q} = C\int_{E_q}^{\infty} \frac{\eta_q E\epsilon^2\mu_q(\epsilon)d\epsilon}{(E^2-\epsilon^2)^2 + (\eta_q E)^2}. \tag{A6}$$

Because the value of (η_q/E) is very small compared with unity, it is easily shown that the integral (A5) is essentially independent of η_q when the incident photon energy E is not close to the critical energy E_q.[56] It may be simplified to

$$f_{1q} = g_q + C\int_{E_q}^{\infty} \frac{\epsilon^2\mu_q(\epsilon)d\epsilon}{(E^2-\epsilon^2)}. \tag{A7}$$

Similarly, f_{2q} is essentially independent of η_q. The integral in Eq. (A6) is significant only when the integration variable ϵ approaches E. Therefore, we may replace the quantity $(E^2 - \epsilon^2)$ by $2E(E - \epsilon)$ and to within a very good approximation, we may express Eq. (A6) as

$$f_{2q} \approx (1/4)C\eta_q E\mu_q(E)\int_{E_q}^{\infty} \frac{d\epsilon}{(E-\epsilon)^2 + (\eta_q/2)^2},$$

which then directly integrates to

$$f_{2q} = (1/2)CE\mu_q(E)\left[\frac{\pi}{2} + \tan^{-1}\left(\frac{2(E-E_q)}{\eta_q}\right)\right]. \tag{A8}$$

Now for incident energy E larger than E_q (and since $\eta_q/E \ll 1$), Eq. (A8) becomes

$$f_{2q} = (1/2)\pi CE\mu_q(E) \qquad \text{if } E > E_q$$

and also (A9)

$$f_{2q} = 0 \qquad \text{if } E < E_q.$$

By summing the amplitudes scattered over all subshells of a given atom, we obtain the corresponding complex *atomic scattering factor* f,

$$f = f_1 + if_2.$$

For the low-energy x-ray region of interest here, the incident radiation wavelengths are large compared with the atomic dimensions. Therefore as discussed earlier, we may usually assume that the q-type electrons within the atom scatter in all directions *in the same phase* as that in which these scatter in the forward direction. Therefore, the real part of the atomic scattering factor f_1 is obtained through the direct summation

$$f_1 = \sum z_q g_q + \sum C\int_{E_q}^{\infty} \frac{\epsilon^2 z_q\mu_q(\epsilon)d\epsilon}{E^2-\epsilon^2}, \tag{A10}$$

in which z_q is the number of electrons in the n,l-subshell. The sum of the oscillator strengths over the bound and continuum states and over all the subshells of the atom may be equated to the atomic number Z according to the Thomas-Reiche-Kuhn sum rule.[33] Also, because μ_q has zero value below threshold energy E_q, the summation in the second term in Eq. (A10) may be taken inside the integral by setting the lower integration limit to zero and letting $\Sigma_p z_q\mu_q = \mu_a$ (the total atomic photoabsorption cross section). Therefore, Eq. (A10) may be written as

$$f_1 = Z + C\int_0^{\infty} \frac{\epsilon^2\mu_a(\epsilon)d\epsilon}{E^2-\epsilon^2}. \tag{A11}$$

Similarly, the component f_2 becomes, from Eq. (A9),

$$f_2 = \sum_p z_q f_{2q} = (1/2)\pi C E \mu_a. \qquad \text{(A12)}$$

These results have been applied above as Eqs. (4) and (5).

In these derivations for the atomic scattering factor components we have assumed that the incident wavelengths are large compared with atomic dimensions (or for very small scattering angles) so that phase shifts associated with scattering from different points within the electron charge distribution could be ignored. As James has pointed out (Ref. 2, pp. 145–146), a very good approximation for the atomic scattering factor that can be applied with the shorter wavelengths and/or the larger angles of scattering and that accounts for the effect of charge distribution is obtained by simply replacing Z by the *form factor* f_0 in Eq. (A11). The effect of charge distribution in the calculation of the energy-dependent, dispersion terms in the atomic scattering factor (the dispersion integral term in the f_1- and f_2-components) is small because these terms have appreciable magnitudes only for photon energies near threshold for a given n,l-orbital for which the corresponding incident wavelengths are very large compared with those of the active orbitals. If, then, we take into account the phase of the scattered contributions within the charge distribution in the remaining energy-independent, short-wavelength limit for the atomic scattering factor $\Sigma\, z_q g_q$ in Eq. (A10), a value that is *not* equal to the Thomsonian Z-factor but rather to the angle-dependent form factor f_0 is obtained:

$$f_0 = \int_0^\infty U(r) \frac{\sin \mu r}{\mu r}\, dr. \qquad \text{(A13)}$$

(See, for example, James, Ref. 2, p. 97). Here $U(r)$ is the radial charge distribution, usually assumed to be spherically symmetric, and the parameter μ is equal to $4\pi \sin\theta/\lambda$. The value of f_0 is essentially equal to Z for $\sin\theta/\lambda \leq 0.05$ Å^{-1}, and, for most elements, it drops to about $0.9Z$ for $\sin\theta/\lambda$ equal to 0.1 Å^{-1} (for example for 10-Å, backscattered x-radiation).

This charge distribution correction, along with the relativistic correction discussed earlier, can be of relative importance when the magnitude of the f_1-component has been appreciably reduced by the effect of anomalous dispersion. Then a simple, but very good, approximation for the atomic scattering factor may be obtained by subtracting two small correction terms from the scattering factor $f_1 + if_2$, as has been tabulated in this work. This modified atomic scattering factor may then be written as

$$f = f_1 - \Delta f_r - \Delta f_0 + if_2\,, \qquad \text{(A14)}$$

where, as noted earlier, $\Delta f_r = (5/3)|E_{tot}|/mc^2$, with E_{tot} the total energy of the atom, and Δf_r thus depends upon Z only (Δf_r was tabulated by Cromer and Liberman in Ref. 18 for $Z = 3$ to $Z = 98$); and Δf_0 is equal to $(Z - f_0)$, for which the form factor f_0 was tabulated recently for $Z = 1$ to $Z = 100$ by Hubbell and Øverbø[57] and by Hubbell et al.[58] [Note: θ(Hubbell) = 2θ(Henke).] The corrected f-factor, calculated with Eq. (A14), can be compared with the exact atomic scattering factors calculated as described recently by Kissel, Pratt, and Roy.[59] These S-matrix calculations are considerably more complicated and expensive. They have been applied for a detailed tabulation of the exact scattering factor for the elements carbon and neon by Parker and Pratt[60] for E = 100 eV to 30 keV, and at 5° intervals in 2θ. The agreement between the atomic scattering factors for these elements as calculated exactly and by the modified f-factor expression of Eq. (A14) has been found to be very satisfactory for all angles of scattering for the low-energy x-rays in the region 100 to 2000 eV.

In the reflectivity calculations for x-ray mirrors, multilayers, and crystals that have been presented in this work for this low-energy region, the effects of the relativistic and the charge distribution corrections were generally not significant and the unmodified scattering factors $f_1 + if_2$ as derived from Eqs. (A11) and (A12) were used exclusively.

VIII. ACKNOWLEDGMENTS

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X. EXPLANATION OF TABLES

TABLE I. Photoabsorption Cross Section μ (E = 30–10 000 eV) and Atomic Scattering Factor $f_1 + if_2$ (E = 100–2000 eV). Z = 1–94

μ	Photoabsorption cross section in cm^2/gram. High-energy region (1500–10 000 eV) from Biggs and Lighthill [60];* intermediate-energy region (~300–1500 eV) from Henke and Ebisu [76]; low-energy region (30–~300 eV) as compiled and fit in this work. Note: High- and low-energy photoabsorption data are normalized, when necessary, to match the data of the intermediate-energy region. Policy explained in Section III
f_1 and f_2	Atomic scattering factor components calculated from the photoabsorption cross sections by Eqs. (4) and (5)
E	Photon energy in electron volts (eV)
λ	Wavelength in angstroms (Å)
Atomic Weights	(As currently recommended by the International Union of Pure and Applied Chemistry.) Used in determination of listed conversion factors [μ(barns/atom)/μ(cm^2/gram)] and [$E\mu(E)/f_2$] keV-cm^2/gram
Lines	Fifty characteristic, laboratory wavelengths; values from Bearden [7a]. (For origin of lines see, for example, Compton and Allison, Ref. 1, p. 630.) $K\alpha$ and $L\alpha$ in Table I refer to $K\alpha_1$ and $L\alpha_1$
Absorption Edges	For principal core level binding energies in the region 100–10 000 eV; values primarily from Bearden and Burr [7b]. If not listed in Ref. [7b], values are from Storm and Israel [49] or Cauchois and Senemaud [136] and are indicated by (**) or (*), respectively. Origin of typical, broad photoabsorption structures (30–~300 eV) noted on corresponding f_2 plots.
References	To "References for Photoabsorption Data (for E < 300 eV)" presented at the end of the Tables. References to photoabsorption data used to generate f_2 by Eq. (5) are given along with photoabsorption energy range as applied for fitting below ~300 eV. Best-fit f_2 curves are plotted as heavy, dark lines (——). When available, other experimental data are also plotted and referenced for comparison. Data reported as relative values, or as μ (cm^{-1}), have been normalized to match at intermediate-energy region and indicated here by the letter N following the reference number (for example (32-N)). If absolute photoabsorption data have been so normalized for the best-fit curve, the

* Numerals within brackets refer to references listed in Section XII.

normalization factor is given following source reference number (for example (129) × 0.95). References to all reported photoabsorption data studied for these low-energy-region fittings of μ and f_2 are presented at bottom of table for each element. If no low-energy-region photoabsorption data were available for a given element, its best-fit f_2 curve was obtained by interpolation or extrapolation through Z [1] and indicated here as a dashed line (- - -)

TABLE II. Specular Reflectivity for Be, Al_2O_3, Al, Fused Quartz, Ni, Cu, and Au Mirrors. E = 100–1740 eV; Grazing Incidence Angle = 10–785 milliradians

P(%)	100 × $I(\theta)$, the reflection intensity ratio calculated by Eqs. (12), (13), (15), (16), and (17) for *unpolarized* incident radiation
θ	Grazing incidence angle in milliradians
E, λ	See Table I

TABLE III. Bragg Reflection Characteristics of Sputtered or Evaporated Multilayers for 100 Double Layers of W and C with 2*d*-Values of 40, 50, 70, 80, and 100 Å.

E, λ	See Table I
N	Number of tungsten/carbon double layers
d	Thickness of double layer in angstroms
Γ	Heavy layer (tungsten) thickness = Γd Light layer (carbon) thickness = $(1 - \Gamma)d$
R_m	Integrated reflection efficiency calculated by mosaic-crystal-model reflection, Eq. (29) (in milliradians)
R_p	Integrated reflection efficiency calculated by integration of modified Darwin–Prins relation, Eq. (20) (in milliradians). Numerical integration limits of $\pm 5\omega$.
P(%)	Percentage reflectivity at peak, 100 × $I(\theta)$ given by Eq. (20)
ω	Full-width-at-half-maximum (FWHM) of rocking curve $I(\theta)$ given in Eq. (30) (in milliradians)

L/R_p	Area L under a Lorentzian of same peak efficiency and FWHM, ω, of $I(\theta)$ with $\pm 5\omega$ integration limits as compared with the integrated reflectivity R_p
ΔE	Energy width corresponding to ω angular width and given by Eq. (30). In eV
$E/\Delta E$	Resolving power of analyzer given by Eq. (31)

TABLE IV. Unit-Cell Data for the Molecular Multilayers of the Lead Salts of Straight-Chain Fatty Acids and for the Acid Phthalate Crystals of NH_4, Na, K, Rb, and Tl Cations

Presented here is the linear molecular geometry for a Langmuir-Blodgett system. $[CH_3(CH_2)_nCOO_2]_2Pb$. The area normal to the periodicity length *d* is assumed here to be 20.4 Å^2. The crystallographic data for the acid phthalate crystals were derived from the works of Okaya and of Smith.[48-51]

$a \times b \times d$	Volume of the unit cell, *d* the layer thickness. Dimensions in angstroms
z_p/d	Fractional positions from the symmetry plane containing the cations for the oxygen (O), carbon (C), and hydrogen (H) atoms

TABLE V. Structure Factor $F_1 + iF_2$ of Layered Analyzers for Lead Laurate, Myristate, Stearate, Behenate, and Lignocerate Molecular Multilayers and for the Acid Phthalate Crystals of Table IV

E, λ	See Table I
F_1, F_2	Calculated by Eqs. (32) and (33) for the molecular multilayers (lead salts of straight-chain fatty acids) and by Eqs. (23) and (24) for the acid phthalate crystals

TABLE VI. Bragg Reflection Characteristics for Molecular Multilayers and for Acid Phthalate Analyzers. For First-Order Reflection from 200 *d*-Spacings of Lead Laurate, Myristate, Stearate, Behenate, and Lignocerate and for Thick Analyzers of the Acid Phthalates of Table IV

See Table III for explanation of symbols

The 2*d*-values listed here for the acid phthalate analyzers are those measured and recommended by Blake et al.[52] and are absolute (corrected for refraction).

XI. Low-Energy X-Ray Interaction Coefficient Tables

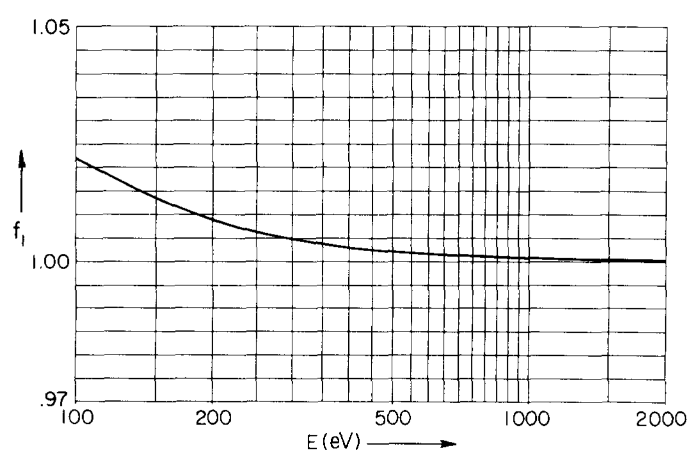
See page 19 for Explanation of Tables

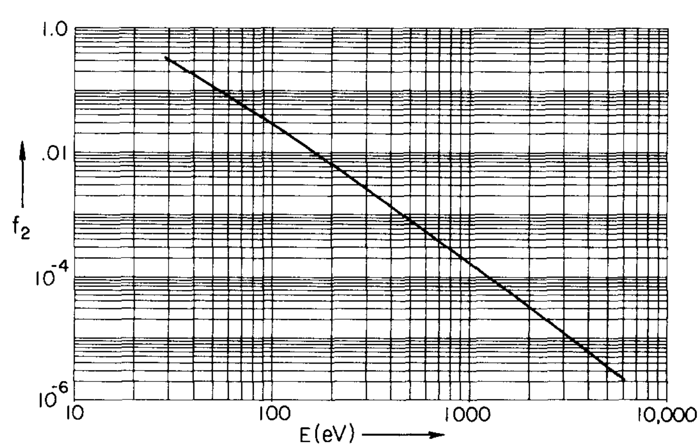
TABLE I. PHOTOABSORPTION CROSS SECTION, μ
ATOMIC SCATTERING FACTOR, $f_1 + if_2$

Atomic Weight = 1.008 Z = 1

μ(barns/atom) = μ(cm^2/gm) x 1.674 HYDROGEN (H)
$E\mu(E)$ = 41725 f_2 keVcm^2/gm

LINE	E(eV)	μ(cm^2/gm)	f_1	f_2	λ(A)
Na $L_{2,3}M$	30.5	4.04 05		2.95-01	407.1
Mg $L_{2,3}M$	49.3	9.68 04		1.14-01	251.5
Al $L_{2,3}M$	72.4	3.10 04		5.39-02	171.4
Si $L_{2,3}M$	91.5	1.52 04		3.32-02	135.5
Be K	108.5	8.95 03	1.02	2.33-02	114.
Sr $M\zeta$	114.0	7.68 03	1.02	2.10-02	108.7
Y $M\zeta$	132.8	4.78 03	1.02	1.52-02	93.4
S $L\ell$	148.7	3.35 03	1.01	1.19-02	83.4
Zr $M\zeta$	151.1	3.19 03	1.01	1.15-02	82.1
Nb $M\zeta$	171.7	2.13 03	1.01	8.76-03	72.2
B Kα	183.3	1.73 03	1.01	7.59-03	67.6
Mo $M\zeta$	192.6	1.47 03	1.01	6.80-03	64.4
W N_5N_7	212.2	1.08 03	1.01	5.50-03	58.4
C Kα	277.0	4.62 02	1.01	3.06-03	44.7
Ag $M\zeta$	311.7	3.16 02	1.00	2.36-03	39.8
N Kα	392.4	1.49 02	1.00	1.40-03	31.6
Ti $L\ell$	395.3	1.45 02	1.00	1.38-03	31.4
Ti Lα	452.2	9.35 01	1.00	1.01-03	27.4
V Lα	511.3	6.25 01	1.00	7.66-04	24.3
O Kα	524.9	5.73 01	1.00	7.21-04	23.6
Mn $L\ell$	556.3	4.74 01	1.00	6.32-04	22.3
Cr Lα	572.8	4.31 01	1.00	5.91-04	21.6
Mn Lα	637.4	3.03 01	1.00	4.63-04	19.5
F Kα	676.8	2.48 01	1.00	4.03-04	18.3
Fe Lα	705.0	2.17 01	1.00	3.66-04	17.6
Co Lα	776.2	1.57 01	1.00	2.93-04	16.0
Ni Lα	851.5	1.16 01	1.00	2.36-04	14.56
Cu Lα	929.7	8.64 00	1.00	1.92-04	13.33
Zn Lα	1011.7	6.52 00	1.00	1.58-04	12.25
Na Kα	1041.0	5.93 00	1.00	1.48-04	11.91
Ge Lα	1188.0	3.82 00	1.00	1.09-04	10.44
Mg Kα	1253.6	3.20 00	1.00	9.60-05	9.89
Al Kα	1486.7	1.80 00	1.00	6.42-05	8.34
Si Kα	1740.0	1.06 00	1.00	4.43-05	7.13
Zr Lα	2042.4	6.19-01	1.00	3.03-05	6.07
Nb Lα	2165.9	5.08-01		2.63-05	5.73
Mo Lα	2293.2	4.18-01		2.30-05	5.41
Cl Kα	2622.4	2.65-01		1.67-05	4.73
Ag Lα	2984.3	1.70-01		1.22-05	4.16
Ca Kα	3691.7	8.20-02		7.26-06	3.36
Ba Lα	4466.3	4.27-02		4.57-06	2.78
Ti Kα	4510.8	4.13-02		4.46-06	2.75
V Kα	4952.2	3.00-02		3.56-06	2.50
Cr Kα	5414.7	2.22-02		2.88-06	2.29
Mn Kα	5898.8	1.66-02		2.34-06	2.10
Co Kα	6930.3	9.58-03		1.59-06	1.79
Ni Kα	7478.2	7.40-03		1.33-06	1.66
Cu Kα	8047.8	5.76-03		1.11-06	1.54
Zn Kα	8638.9	4.53-03		9.37-07	1.44
Ge Kα	9886.4	2.86-03		6.77-07	1.25





For all E ——— (18)

References: 18, 47, 111

XI. Low-Energy X-Ray Interaction Coefficient Tables

See page 19 for Explanation of Tables

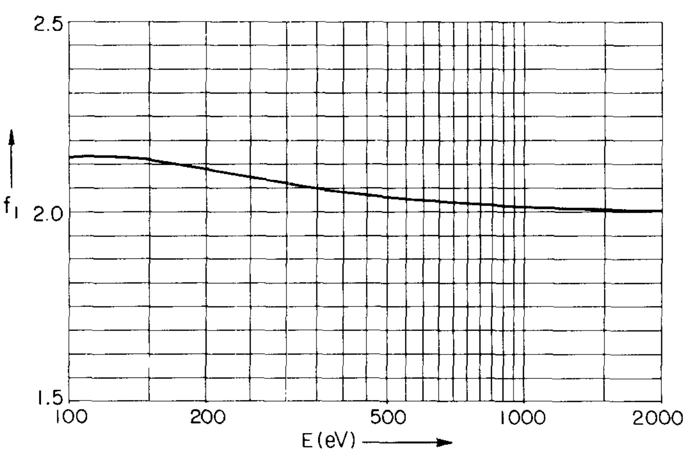
TABLE I. PHOTOABSORPTION CROSS SECTION, μ
ATOMIC SCATTERING FACTOR, $f_1 + if_2$

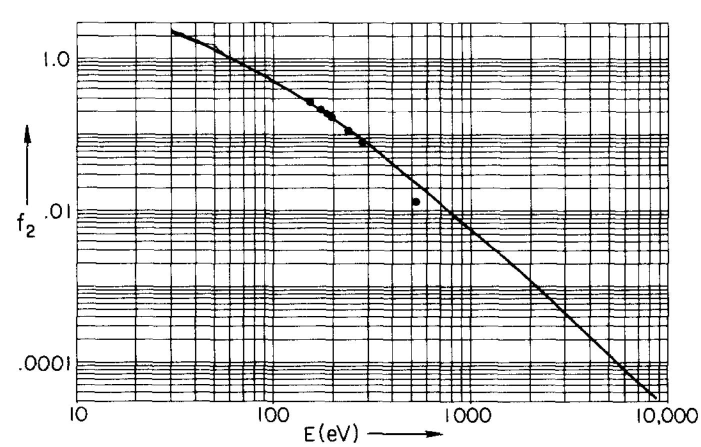
Atomic Weight = 4.003 Z = 2

μ(barns/atom) = μ(cm^2/gm) x 6.646 HELIUM (He)
Eμ(E) = 10507 f_2 keVcm^2/gm

LINE	E(eV)	μ(cm^2/gm)	f_1	f_2	λ(A)
Na $L_{2,3}M$	30.5	7.61 05		2.20 00	407.1
Mg $L_{2,3}M$	49.3	2.76 05		1.29 00	251.5
Al $L_{2,3}M$	72.4	1.14 05		7.83-01	171.4
Si $L_{2,3}M$	91.5	6.47 04		5.63-01	135.5
Be K	108.5	4.22 04	2.15	4.36-01	114.
Sr Mζ	114.0	3.73 04	2.15	4.04-01	108.7
Y Mζ	132.8	2.53 04	2.14	3.19-01	93.4
S Lℓ	148.7	1.88 04	2.14	2.66-01	83.4
Zr Mζ	151.1	1.80 04	2.14	2.59-01	82.1
Nb Mζ	171.7	1.28 04	2.13	2.09-01	72.2
B Kα	183.3	1.07 04	2.12	1.87-01	67.6
Mo Mζ	192.6	9.37 03	2.11	1.72-01	64.4
W N_5N_7	212.2	7.16 03	2.11	1.45-01	58.4
C Kα	277.0	3.35 03	2.08	8.83-02	44.7
Ag Mζ	311.7	2.32 03	2.07	6.88-02	39.8
N Kα	392.4	1.14 03	2.05	4.26-02	31.6
Ti Lℓ	395.3	1.11 03	2.05	4.19-02	31.4
Ti Lα	452.2	7.28 02	2.04	3.13-02	27.4
V Lα	511.3	4.94 02	2.04	2.40-02	24.3
O Kα	524.9	4.55 02	2.04	2.27-02	23.6
Mn Lℓ	556.3	3.80 02	2.03	2.01-02	22.3
Cr Lα	572.8	3.45 02	2.03	1.88-02	21.6
Mn Lα	637.4	2.46 02	2.03	1.49-02	19.5
F Kα	676.8	2.01 02	2.02	1.29-02	18.3
Fe Lα	705.0	1.78 02	2.02	1.19-02	17.6

LINE	E(eV)	μ(cm^2/gm)	f_1	f_2	λ(A)
Co Lα	776.2	1.31 02	2.02	9.68-03	16.0
Ni Lα	851.5	9.73 01	2.02	7.88-03	14.56
Cu Lα	929.7	7.39 01	2.01	6.54-03	13.33
Zn Lα	1011.7	5.68 01	2.01	5.47-03	12.25
Na Kα	1041.0	5.18 01	2.01	5.13-03	11.91
Ge Lα	1188.0	3.40 01	2.01	3.84-03	10.44
Mg Kα	1253.6	2.86 01	2.01	3.41-03	9.89
Al Kα	1486.7	1.68 01	2.01	2.38-03	8.34
Si Kα	1740.0	1.00 01	2.00	1.66-03	7.13
Zr Lα	2042.4	5.84 00	2.00	1.13-03	6.07
Nb Lα	2165.9	4.78 00		9.85-04	5.73
Mo Lα	2293.2	3.93 00		8.58-04	5.41
Cl Kα	2622.4	2.48 00		6.18-04	4.73
Ag Lα	2984.3	1.58 00		4.48-04	4.16
Ca Kα	3691.7	7.48-01		2.63-04	3.36
Ba Lα	4466.3	3.87-01		1.65-04	2.78
Ti Kα	4510.8	3.74-01		1.61-04	2.75
V Kα	4952.2	2.72-01		1.28-04	2.50
Cr Kα	5414.7	2.01-01		1.03-04	2.29
Mn Kα	5898.8	1.50-01		8.41-05	2.10
Co Kα	6930.3	8.69-02		5.73-05	1.79
Ni Kα	7478.2	6.72-02		4.78-05	1.66
Cu Kα	8047.8	5.25-02		4.02-05	1.54
Zn Kα	8638.9	4.14-02		3.40-05	1.44
Ge Kα	9886.4	2.63-02		2.47-05	1.25





For E < 150 eV (129)
(18)
(47)

References: 8, 18, 47, 95, 129

XI. Low-Energy X-Ray Interaction Coefficient Tables

See page 19 for Explanation of Tables

TABLE I. PHOTOABSORPTION CROSS SECTION, μ
ATOMIC SCATTERING FACTOR, $f_1 + if_2$

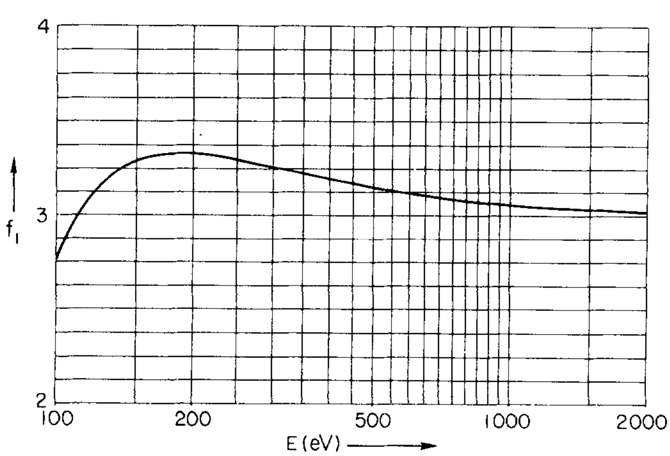
Atomic Weight = 6.941 Z = 3

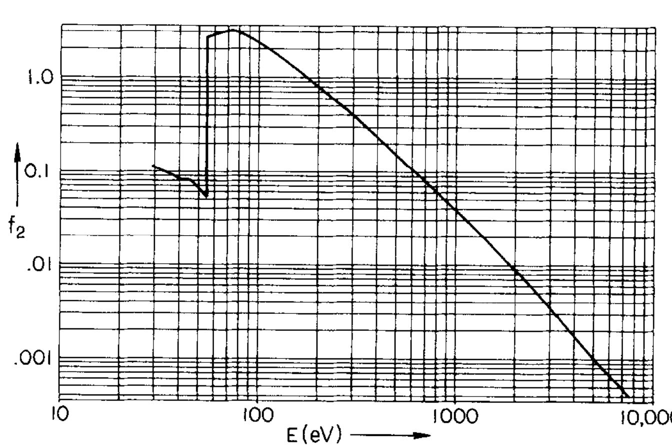
μ(barns/atom) = μ(cm^2/gm) x 11.52 LITHIUM (Li)
$E\mu(E)$ = 6059. f_2 keVcm^2/gm

LINE	E(eV)	μ(cm^2/gm)	f_1	f_2	λ(A)	LINE	E(eV)	μ(cm^2/gm)	f_1	f_2	λ(A)
Na $L_{2,3}M$	30.5	2.16 04		1.09-01	407.1	Co $L\alpha$	776.2	4.88 02	3.08	6.24-02	16.0
Mg $L_{2,3}M$	49.3	8.18 03		6.65-02	251.5	Ni $L\alpha$	851.5	3.66 02	3.07	5.15-02	14.56
Al $L_{2,3}M$	72.4	2.59 05		3.09 00	171.4	Cu $L\alpha$	929.7	2.80 02	3.06	4.29-02	13.33
Si $L_{2,3}M$	91.5	1.72 05		2.60 00	135.5	Zn $L\alpha$	1011.7	2.15 02	3.06	3.59-02	12.25
Be K	108.5	1.12 05	2.95	2.01 00	114.	Na $K\alpha$	1041.0	1.97 02	3.05	3.38-02	11.91
Sr $M\zeta$	114.0	1.02 05	3.04	1.92 00	108.7	Ge $L\alpha$	1188.0	1.31 02	3.04	2.56-02	10.44
Y $M\zeta$	132.8	7.07 04	3.22	1.55 00	93.4	Mg $K\alpha$	1253.6	1.11 02	3.04	2.29-02	9.89
S $L\ell$	148.7	5.30 04	3.29	1.30 00	83.4	Al $K\alpha$	1486.7	6.47 01	3.03	1.59-02	8.34
Zr $M\zeta$	151.1	5.12 04	3.29	1.28 00	82.1	Si $K\alpha$	1740.0	3.92 01	3.02	1.13-02	7.13
Nb $M\zeta$	171.7	3.71 04	3.32	1.05 00	72.2	Zr $L\alpha$	2042.4	2.34 01	3.02	7.87-03	6.07
B $K\alpha$	183.3	3.16 04	3.33	9.55-01	67.6	Nb $L\alpha$	2165.9	1.93 01		6.89-03	5.73
Mo $M\zeta$	192.6	2.75 04	3.33	8.75-01	64.4	Mo $L\alpha$	2293.2	1.60 01		6.05-03	5.41
W N_5N_7	212.2	2.14 04	3.32	7.51-01	58.4	Cl $K\alpha$	2622.4	1.03 01		4.44-03	4.73
C $K\alpha$	277.0	1.03 04	3.28	4.71-01	44.7	Ag $L\alpha$	2984.3	6.66 00		3.28-03	4.16
Ag $M\zeta$	311.7	7.36 03	3.25	3.78-01	39.8	Ca $K\alpha$	3691.7	3.26 00		1.99-03	3.36
N $K\alpha$	392.4	3.81 03	3.20	2.47-01	31.6	Ba $L\alpha$	4466.3	1.73 00		1.27-03	2.78
Ti $L\ell$	395.3	3.73 03	3.20	2.43-01	31.4	Ti $K\alpha$	4510.8	1.67 00		1.24-03	2.75
Ti $L\alpha$	452.2	2.51 03	3.17	1.87-01	27.4	V $K\alpha$	4952.2	1.22 00		1.00-03	2.50
V $L\alpha$	511.3	1.73 03	3.15	1.46-01	24.3	Cr $K\alpha$	5414.7	9.09-01		8.13-04	2.29
O $K\alpha$	524.9	1.60 03	3.14	1.39-01	23.6	Mn $K\alpha$	5898.8	6.85-01		6.66-04	2.10
Mn $L\ell$	556.3	1.35 03	3.13	1.24-01	22.3	Co $K\alpha$	6930.3	4.01-01		4.59-04	1.79
Cr $L\alpha$	572.8	1.23 03	3.13	1.17-01	21.6	Ni $K\alpha$	7478.2	3.12-01		3.85-04	1.66
Mn $L\alpha$	637.4	8.93 02	3.11	9.39-02	19.5	Cu $K\alpha$	8047.8	2.45-01		3.25-04	1.54
F $K\alpha$	676.8	7.35 02	3.10	8.21-02	18.3	Zn $K\alpha$	8638.9	1.93-01		2.76-04	1.44
Fe $L\alpha$	705.0	6.55 02	3.10	7.62-02	17.6	Ge $K\alpha$	9886.4	1.24-01		2.02-04	1.25

ABSORPTION EDGE

K 54.75 eV 226.5 A





For E < 100 eV ———— (129)

References: 26, 46, 113, 129

XI. Low-Energy X-Ray Interaction Coefficient Tables

See page 19 for Explanation of Tables

TABLE I. PHOTOABSORPTION CROSS SECTION, μ
ATOMIC SCATTERING FACTOR, $f_1 + if_2$

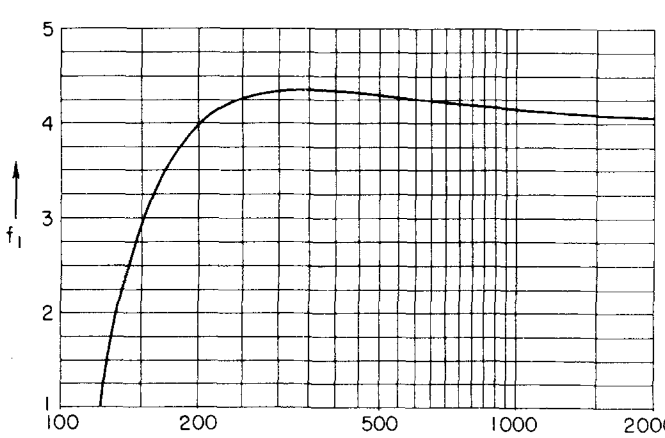
Atomic Weight = 9.012 Z = 4

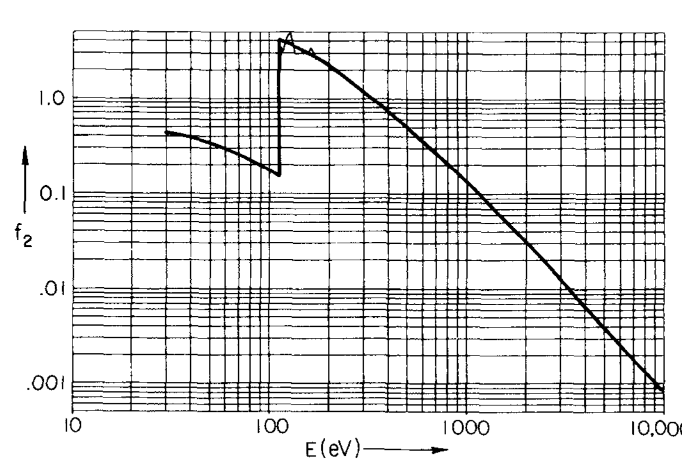
μ(barns/atom) = μ(cm^2/gm) x 14.96 BERYLLIUM (Be)
Eμ(E) = 4667. f_2 keVcm^2/gm

LINE	E(eV)	μ(cm^2/gm)	f_1	f_2	λ(A)
Na $L_{2,3}M$	30.5	6.61 04		4.31-01	407.1
Mg $L_{2,3}M$	49.3	3.19 04		3.37-01	251.5
Al $L_{2,3}M$	72.4	1.55 04		2.41-01	171.4
Si $L_{2,3}M$	91.5	9.47 03		1.86-01	135.5
Be K	108.5	6.50 03	-1.20	1.51-01	114.
Sr Mζ	114.0	1.69 05	-0.72	4.13 00	108.7
Y Mζ	132.8	1.23 05	2.10	3.50 00	93.4
S Lℓ	148.7	9.63 04	2.89	3.07 00	83.4
Zr Mζ	151.1	9.35 04	2.97	3.03 00	82.1
Nb Mζ	171.7	6.99 04	3.57	2.57 00	72.2
B Kα	183.3	6.06 04	3.77	2.38 00	67.6
Mo Mζ	192.6	5.32 04	3.91	2.19 00	64.4
W N_5N_7	212.2	4.27 04	4.09	1.94 00	58.4
C Kα	277.0	2.20 04	4.32	1.31 00	44.7
Ag Mζ	311.7	1.62 04	4.35	1.08 00	39.8
N Kα	392.4	8.88 03	4.35	7.46-01	31.6
Ti Lℓ	395.3	8.69 03	4.35	7.36-01	31.4
Ti Lα	452.2	5.97 03	4.32	5.78-01	27.4
V Lα	511.3	4.22 03	4.30	4.63-01	24.3
O Kα	524.9	3.92 03	4.29	4.41-01	23.6
Mn Lℓ	556.3	3.34 03	4.27	3.98-01	22.3
Cr Lα	572.8	3.06 03	4.27	3.76-01	21.6
Mn Lα	637.4	2.26 03	4.24	3.08-01	19.5
F Kα	676.8	1.88 03	4.23	2.72-01	18.3
Fe Lα	705.0	1.68 03	4.22	2.54-01	17.6
Co Lα	776.2	1.27 03	4.19	2.11-01	16.0
Ni Lα	851.5	9.63 02	4.17	1.76-01	14.56
Cu Lα	929.7	7.45 02	4.15	1.48-01	13.33
Zn Lα	1011.7	5.78 02	4.14	1.25-01	12.25
Na Kα	1041.0	5.30 02	4.13	1.18-01	11.91
Ge Lα	1188.0	3.54 02	4.11	9.02-02	10.44
Mg Kα	1253.6	3.01 02	4.10	8.07-02	9.89
Al Kα	1486.7	1.79 02	4.08	5.69-02	8.34
Si Kα	1740.0	1.10 02	4.06	4.10-02	7.13
Zr Lα	2042.4	6.66 01	4.05	2.91-02	6.07
Nb Lα	2165.9	5.53 01		2.57-02	5.73
Mo Lα	2293.2	4.61 01		2.26-02	5.41
Cl Kα	2622.4	2.99 01		1.68-02	4.73
Ag Lα	2984.3	1.97 01		1.26-02	4.16
Ca Kα	3691.7	9.78 00		7.74-03	3.36
Ba Lα	4466.3	5.24 00		5.01-03	2.78
Ti Kα	4510.8	5.07 00		4.90-03	2.75
V Kα	4952.2	3.74 00		3.97-03	2.50
Cr Kα	5414.7	2.79 00		3.24-03	2.29
Mn Kα	5898.8	2.11 00		2.67-03	2.10
Co Kα	6930.3	1.25 00		1.86-03	1.79
Ni Kα	7478.2	9.75-01		1.56-03	1.66
Cu Kα	8047.8	7.67-01		1.32-03	1.54
Zn Kα	8638.9	6.09-01		1.13-03	1.44
Ge Kα	9886.4	3.92-01		8.30-04	1.25

ABSORPTION EDGE

K 111 eV 111 A





For E < 110 eV —— (129)
—— (46)

References: 9, 14, 21, 46, 129

XI. Low-Energy X-Ray Interaction Coefficient Tables

See page 19 for Explanation of Tables

TABLE I. PHOTOABSORPTION CROSS SECTION, μ
ATOMIC SCATTERING FACTOR, $f_1 + if_2$

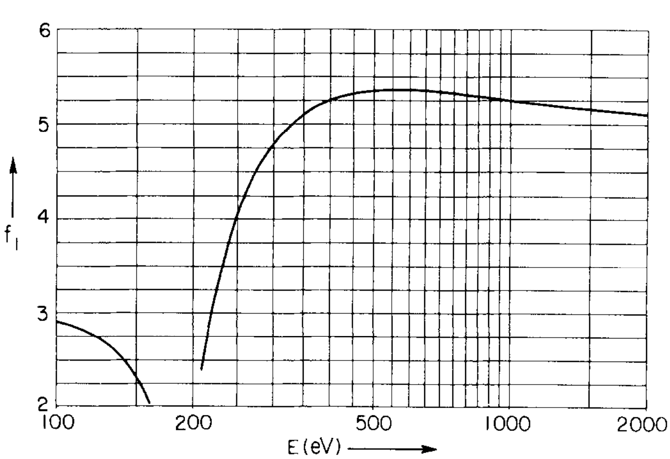
Atomic Weight = 10.81 Z = 5

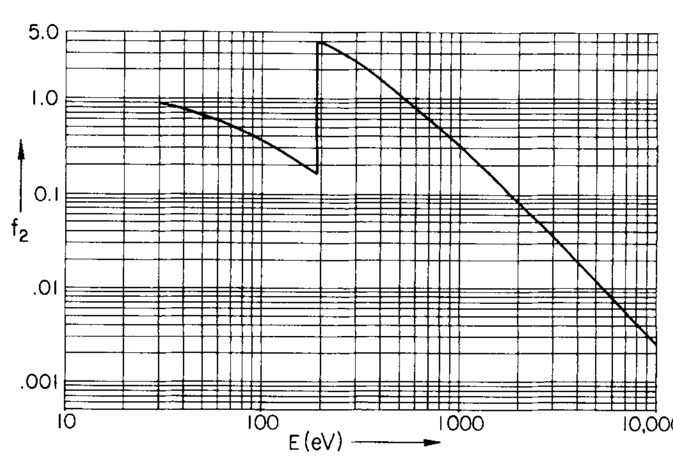
μ(barns/atom) = μ(cm^2/gm) x 17.95 BORON (B)
Eμ(E) = 3890. f_2 keVcm^2/gm

LINE	E(eV)	μ(cm^2/gm)	f_1	f_2	λ(A)
Na $L_{2,3}M$	30.5	1.10 05		8.65-01	407.1
Mg $L_{2,3}M$	49.3	5.24 04		6.63-01	251.5
Al $L_{2,3}M$	72.4	2.61 04		4.86-01	171.4
Si $L_{2,3}M$	91.5	1.63 04		3.83-01	135.5
Be K	108.5	1.12 04	2.85	3.13-01	114.
Sr Mζ	114.0	1.02 04	2.81	2.99-01	108.7
Y Mζ	132.8	7.23 03	2.62	2.47-01	93.4
S Lℓ	148.7	5.58 03	2.35	2.13-01	83.4
Zr Mζ	151.1	5.42 03	2.30	2.10-01	82.1
Nb Mζ	171.7	3.87 03	1.53	1.71-01	72.2
B Kα	183.3	3.35 03	0.19	1.58-01	67.6
Mo Mζ	192.6	8.36 04	0.39	4.14 00	64.4
W N_5N_7	212.2	6.85 04	2.63	3.74 00	58.4
C Kα	277.0	3.70 04	4.54	2.64 00	44.7
Ag Mζ	311.7	2.77 04	4.89	2.22 00	39.8
N Kα	392.4	1.58 04	5.25	1.59 00	31.6
Ti Lℓ	395.3	1.55 04	5.25	1.58 00	31.4
Ti Lα	452.2	1.10 04	5.33	1.28 00	27.4
V Lα	511.3	7.95 03	5.36	1.04 00	24.3
O Kα	524.9	7.42 03	5.36	1.00 00	23.6
Mn Lℓ	556.3	6.33 03	5.36	9.05-01	22.3
Cr Lα	572.8	5.87 03	5.36	8.64-01	21.6
Mn Lα	637.4	4.39 03	5.35	7.20-01	19.5
F Kα	676.8	3.68 03	5.34	6.40-01	18.3
Fe Lα	705.0	3.31 03	5.33	6.01-01	17.6
Co Lα	776.2	2.53 03	5.31	5.05-01	16.0
Ni Lα	851.5	1.95 03	5.29	4.26-01	14.56
Cu Lα	929.7	1.51 03	5.26	3.61-01	13.33
Zn Lα	1011.7	1.19 03	5.24	3.09-01	12.25
Na Kα	1041.0	1.09 03	5.24	2.92-01	11.91
Ge Lα	1188.0	7.42 02	5.20	2.27-01	10.44
Mg Kα	1253.6	6.33 02	5.19	2.04-01	9.89
Al Kα	1486.7	3.83 02	5.15	1.46-01	8.34
Si Kα	1740.0	2.39 02	5.13	1.07-01	7.13
Zr Lα	2042.4	1.47 02	5.10	7.74-02	6.07
Nb Lα	2165.9	1.23 02		6.87-02	5.73
Mo Lα	2293.2	1.04 02		6.11-02	5.41
Cl Kα	2622.4	6.86 01		4.63-02	4.73
Ag Lα	2984.3	4.60 01		3.53-02	4.16
Ca Kα	3691.7	2.37 01		2.25-02	3.36
Ba Lα	4466.3	1.30 01		1.49-02	2.78
Ti Kα	4510.8	1.26 01		1.46-02	2.75
V Kα	4952.2	9.37 00		1.19-02	2.50
Cr Kα	5414.7	7.05 00		9.82-03	2.29
Mn Kα	5898.8	5.37 00		8.13-03	2.10
Co Kα	6930.3	3.20 00		5.70-03	1.79
Ni Kα	7478.2	2.50 00		4.81-03	1.66
Cu Kα	8047.8	1.97 00		4.08-03	1.54
Zn Kα	8638.9	1.56 00		3.48-03	1.44
Ge Kα	9886.4	1.01 00		2.56-03	1.25

ABSORPTION EDGE

K** 188 eV 66.0 A





For E < 100 eV ———— (129) x 0.87

References: 129

XI. Low-Energy X-Ray Interaction Coefficient Tables

See page 19 for Explanation of Tables

TABLE I. PHOTOABSORPTION CROSS SECTION, μ
ATOMIC SCATTERING FACTOR, $f_1 + if_2$

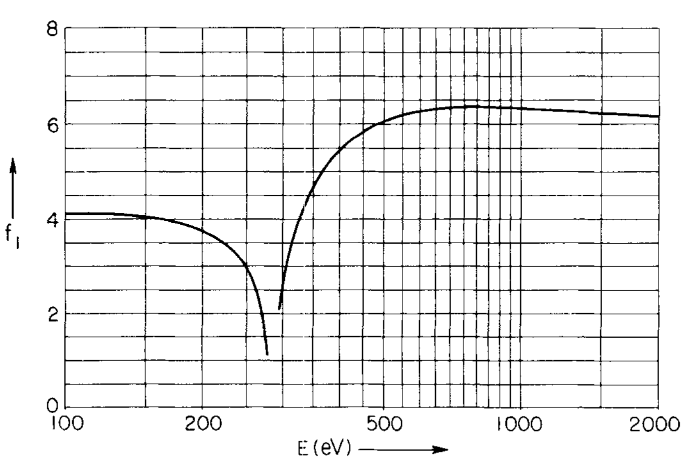
Atomic Weight = 12.01 Z = 6

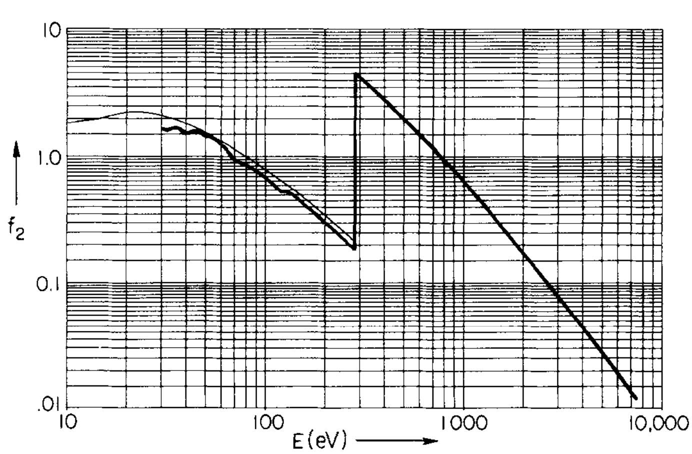
μ(barns/atom) = μ(cm^2/gm) x 19.94 CARBON (C)
$E\mu(E)$ = 3502. f_2 keVcm^2/gm

LINE	E(eV)	μ(cm^2/gm)	f_1	f_2	λ(A)	LINE	E(eV)	μ(cm^2/gm)	f_1	f_2	λ(A)
Na $L_{2,3}M$	30.5	1.87 05		1.62 00	407.1	Co Lα	776.2	4.45 03	6.37	9.86-01	16.0
Mg $L_{2,3}M$	49.3	1.06 05		1.49 00	251.5	Ni Lα	851.5	3.46 03	6.37	8.40-01	14.56
Al $L_{2,3}M$	72.4	4.47 04		9.25-01	171.4	Cu Lα	929.7	2.71 03	6.36	7.20-01	13.33
Si $L_{2,3}M$	91.5	2.82 04		7.38-01	135.5	Zn Lα	1011.7	2.15 03	6.34	6.20-01	12.25
Be K	108.5	1.92 04	4.08	5.96-01	114.	Na Kα	1041.0	1.98 03	6.33	5.90-01	11.91
Sr Mζ	114.0	1.74 04	4.06	5.68-01	108.7	Ge Lα	1188.0	1.37 03	6.30	4.63-01	10.44
Y Mζ	132.8	1.31 04	4.04	4.97-01	93.4	Mg Kα	1253.6	1.17 03	6.29	4.20-01	9.89
S Lℓ	148.7	1.02 04	3.99	4.33-01	83.4	Al Kα	1486.7	7.18 02	6.24	3.05-01	8.34
Zr Mζ	151.1	9.84 03	3.98	4.24-01	82.1	Si Kα	1740.0	4.55 02	6.20	2.26-01	7.13
Nb Mζ	171.7	7.37 03	3.89	3.61-01	72.2	Zr Lα	2042.4	2.84 02	6.17	1.66-01	6.07
B Kα	183.3	6.35 03	3.81	3.32-01	67.6	Nb Lα	2165.9	2.39 02		1.48-01	5.73
Mo Mζ	192.6	5.67 03	3.74	3.12-01	64.4	Mo Lα	2293.2	2.02 02		1.32-01	5.41
W N_5N_7	212.2	4.50 03	3.55	2.73-01	58.4	Cl Kα	2622.4	1.35 02		1.01-01	4.73
C Kα	277.0	2.35 03	0.99	1.86-01	44.7	Ag Lα	2984.3	9.19 01		7.83-02	4.16
Ag Mζ	311.7	4.50 04	3.52	4.01 00	39.8	Ca Kα	3691.7	4.82 01		5.08-02	3.36
N Kα	392.4	2.55 04	5.46	2.86 00	31.6	Ba Lα	4466.3	2.68 01		3.42-02	2.78
Ti Lℓ	395.3	2.50 04	5.49	2.82 00	31.4	Ti Kα	4510.8	2.60 01		3.35-02	2.75
Ti Lα	452.2	1.80 04	5.90	2.32 00	27.4	V Kα	4952.2	1.95 01		2.75-02	2.50
V Lα	511.3	1.32 04	6.12	1.93 00	24.3	Cr Kα	5414.7	1.47 01		2.28-02	2.29
O Kα	524.9	1.24 04	6.16	1.86 00	23.6	Mn Kα	5898.8	1.12 01		1.89-02	2.10
Mn Lℓ	556.3	1.07 04	6.23	1.70 00	22.3	Co Kα	6930.3	6.75 00		1.34-02	1.79
Cr Lα	572.8	9.90 03	6.25	1.62 00	21.6	Ni Kα	7478.2	5.29 00		1.13-02	1.66
Mn Lα	637.4	7.50 03	6.32	1.36 00	19.5	Cu Kα	8047.8	4.18 00		9.60-03	1.54
F Kα	676.8	6.37 03	6.34	1.23 00	18.3	Zn Kα	8638.9	3.32 00		8.20-03	1.44
Fe Lα	705.0	5.79 03	6.35	1.16 00	17.6	Ge Kα	9886.4	2.14 00		6.05-03	1.25

ABSORPTION EDGE

K 283.84 eV 43.68 A





For E < 200 eV ———— (82)
———— (129)

References: 82, 92, 111, 115, 129

XI. Low-Energy X-Ray Interaction Coefficient Tables

See page 19 for Explanation of Tables

TABLE I. PHOTOABSORPTION CROSS SECTION, μ
ATOMIC SCATTERING FACTOR, $f_1 + if_2$

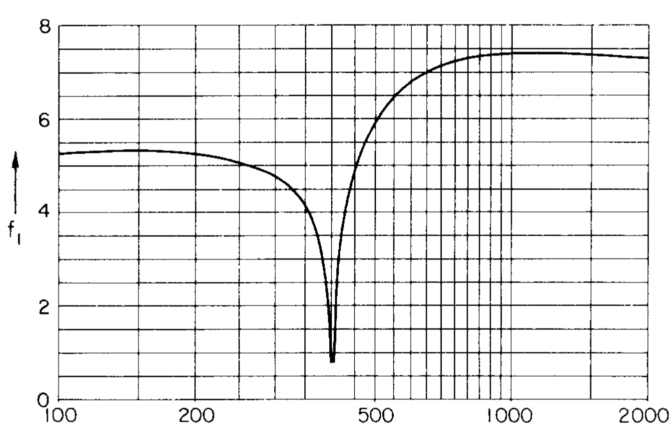
Atomic Weight = 14.01 Z = 7

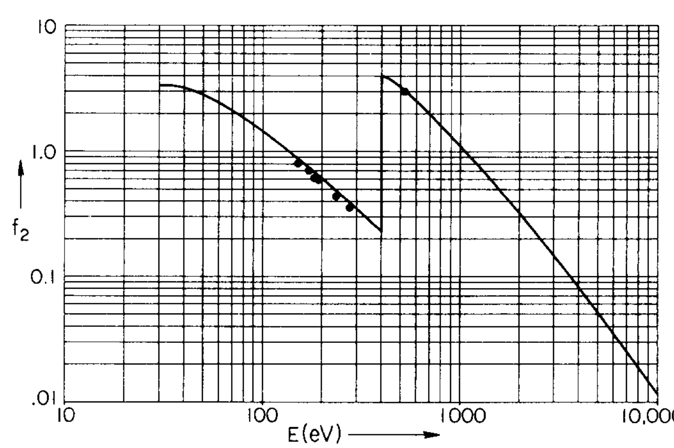
μ(barns/atom) = μ(cm²/gm) x 23.26 NITROGEN (N)
$E\mu(E)$ = 3003. f_2 keVcm²/gm

LINE	E(eV)	μ(cm²/gm)	f_1	f_2	λ(A)	LINE	E(eV)	μ(cm²/gm)	f_1	f_2	λ(A)
Na $L_{2,3}M$	30.5	3.31 05		3.35 00	407.1	Co $L\alpha$	776.2	6.50 03	7.24	1.68 00	16.0
Mg $L_{2,3}M$	49.3	1.74 05		2.85 00	251.5	Ni $L\alpha$	851.5	5.07 03	7.31	1.44 00	14.56
Al $L_{2,3}M$	72.4	8.52 04		2.05 00	171.4	Cu $L\alpha$	929.7	4.02 03	7.35	1.25 00	13.33
Si $L_{2,3}M$	91.5	5.26 04		1.60 00	135.5	Zn $L\alpha$	1011.7	3.21 03	7.37	1.08 00	12.25
Be K	108.5	3.64 04	5.27	1.32 00	114.	Na $K\alpha$	1041.0	2.97 03	7.37	1.03 00	11.91
Sr $M\zeta$	114.0	3.27 04	5.28	1.24 00	108.7	Ge $L\alpha$	1188.0	2.07 03	7.37	8.19-01	10.44
Y $M\zeta$	132.8	2.34 04	5.32	1.03 00	93.4	Mg $K\alpha$	1253.6	1.79 03	7.36	7.47-01	9.89
S $L\ell$	148.7	1.81 04	5.32	8.96-01	83.4	Al $K\alpha$	1486.7	1.11 03	7.33	5.48-01	8.34
Zr $M\zeta$	151.1	1.75 04	5.32	8.78-01	82.1	Si $K\alpha$	1740.0	7.08 02	7.29	4.10-01	7.13
Nb $M\zeta$	171.7	1.30 04	5.29	7.46-01	72.2	Zr $L\alpha$	2042.4	4.46 02	7.24	3.03-01	6.07
B $K\alpha$	183.3	1.12 04	5.27	6.84-01	67.6	Nb $L\alpha$	2165.9	3.76 02		2.71-01	5.73
Mo $M\zeta$	192.6	1.00 04	5.25	6.41-01	64.4	Mo $L\alpha$	2293.2	3.18 02		2.43-01	5.41
W N_5N_7	212.2	7.97 03	5.20	5.63-01	58.4	Cl $K\alpha$	2622.4	2.14 02		1.87-01	4.73
C $K\alpha$	277.0	4.22 03	4.91	3.90-01	44.7	Ag $L\alpha$	2984.3	1.46 02		1.45-01	4.16
Ag $M\zeta$	311.7	3.18 03	4.64	3.30-01	39.8	Ca $K\alpha$	3691.7	7.69 01		9.46-02	3.36
N $K\alpha$	392.4	1.81 03	2.13	2.37-01	31.6	Ba $L\alpha$	4466.3	4.30 01		6.40-02	2.78
Ti $L\ell$	395.3	1.78 03	1.58	2.34-01	31.4	Ti $K\alpha$	4510.8	4.17 01		6.27-02	2.75
Ti $L\alpha$	452.2	2.48 04	4.93	3.74 00	27.4	V $K\alpha$	4952.2	3.13 01		5.16-02	2.50
V $L\alpha$	511.3	1.84 04	6.09	3.14 00	24.3	Cr $K\alpha$	5414.7	2.37 01		4.28-02	2.29
O $K\alpha$	524.9	1.73 04	6.23	3.03 00	23.6	Mn $K\alpha$	5898.8	1.82 01		3.57-02	2.10
Mn $L\ell$	556.3	1.51 04	6.49	2.79 00	22.3	Co $K\alpha$	6930.3	1.10 01		2.54-02	1.79
Cr $L\alpha$	572.8	1.40 04	6.61	2.67 00	21.6	Ni $K\alpha$	7478.2	8.65 00		2.15-02	1.66
Mn $L\alpha$	637.4	1.07 04	6.93	2.28 00	19.5	Cu $K\alpha$	8047.8	6.85 00		1.84-02	1.54
F $K\alpha$	676.8	9.16 03	7.06	2.06 00	18.3	Zn $K\alpha$	8638.9	5.47 00		1.57-02	1.44
Fe $L\alpha$	705.0	8.34 03	7.12	1.96 00	17.6	Ge $K\alpha$	9886.4	3.55 00		1.17-02	1.25

ABSORPTION EDGE

K 400 eV 30.99 A





For E < 450 eV ——— (129)
• (47)

References: 18, 47, 111, 115, 129

XI. Low-Energy X-Ray Interaction Coefficient Tables

See page 19 for Explanation of Tables

TABLE I. PHOTOABSORPTION CROSS SECTION, μ
ATOMIC SCATTERING FACTOR, $f_1 + if_2$

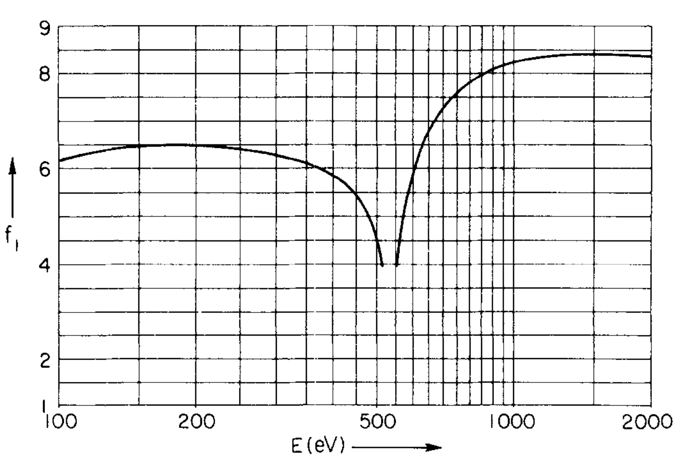
Atomic Weight = 16.00 Z = 8

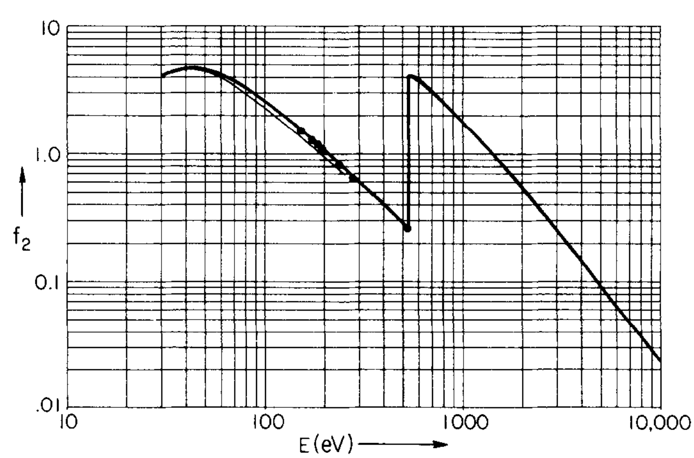
μ(barns/atom) = μ(cm^2/gm) x 26.56 OXYGEN (O)
Eμ(E) = 2629. f_2 keVcm^2/gm

LINE	E(eV)	μ(cm^2/gm)	f_1	f_2	λ(A)	LINE	E(eV)	μ(cm^2/gm)	f_1	f_2	λ(A)
Na $L_{2,3}M$	30.5	3.59 05		4.15 00	407.1	Co Lα	776.2	8.88 03	7.72	2.62 00	16.0
Mg $L_{2,3}M$	49.3	2.32 05		4.35 00	251.5	Ni Lα	851.5	6.96 03	7.98	2.25 00	14.56
Al $L_{2,3}M$	72.4	1.25 05		3.45 00	171.4	Cu Lα	929.7	5.60 03	8.14	1.98 00	13.33
Si $L_{2,3}M$	91.5	7.90 04		2.75 00	135.5	Zn Lα	1011.7	4.48 03	8.24	1.72 00	12.25
Be K	108.5	5.40 04	6.24	2.23 00	114.	Na Kα	1041.0	4.15 03	8.27	1.65 00	11.91
Sr Mζ	114.0	4.89 04	6.30	2.12 00	108.7	Ge Lα	1188.0	2.92 03	8.35	1.32 00	10.44
Y Mζ	132.8	3.47 04	6.41	1.75 00	93.4	Mg Kα	1253.6	2.53 03	8.37	1.21 00	9.89
S Lℓ	148.7	2.68 04	6.45	1.52 00	83.4	Al Kα	1486.7	1.60 03	8.38	9.03-01	8.34
Zr Mζ	151.1	2.60 04	6.46	1.49 00	82.1	Si Kα	1740.0	1.03 03	8.36	6.85-01	7.13
Nb Mζ	171.7	1.92 04	6.48	1.25 00	72.2	Zr Lα	2042.4	6.61 02	8.32	5.13-01	6.07
B Kα	183.3	1.65 04	6.48	1.15 00	67.6	Nb Lα	2165.9	5.60 02		4.61-01	5.73
Mo Mζ	192.6	1.46 04	6.47	1.07 00	64.4	Mo Lα	2293.2	4.76 02		4.16-01	5.41
W N_5N_7	212.2	1.16 04	6.45	9.38-01	58.4	Cl Kα	2622.4	3.25 02		3.24-01	4.73
C Kα	277.0	6.04 03	6.32	6.37-01	44.7	Ag Lα	2984.3	2.24 02		2.54-01	4.16
Ag Mζ	311.7	4.49 03	6.22	5.33-01	39.8	Ca Kα	3691.7	1.20 02		1.69-01	3.36
N Kα	392.4	2.53 03	5.87	3.77-01	31.6	Ba Lα	4466.3	6.77 01		1.15-01	2.78
Ti Lℓ	395.3	2.48 03	5.85	3.73-01	31.4	Ti Kα	4510.8	6.57 01		1.13-01	2.75
Ti Lα	452.2	1.76 03	5.38	3.02-01	27.4	V Kα	4952.2	4.94 01		9.31-02	2.50
V Lα	511.3	1.28 03	4.04	2.50-01	24.3	Cr Kα	5414.7	3.76 01		7.75-02	2.29
O Kα	524.9	1.20 03	2.92	2.40-01	23.6	Mn Kα	5898.8	2.89 01		6.49-02	2.10
Mn Lℓ	556.3	2.01 04	4.42	4.26 00	22.3	Co Kα	6930.3	1.76 01		4.63-02	1.79
Cr Lα	572.8	1.87 04	5.18	4.08 00	21.6	Ni Kα	7478.2	1.39 01		3.94-02	1.66
Mn Lα	637.4	1.45 04	6.68	3.52 00	19.5	Cu Kα	8047.8	1.10 01		3.37-02	1.54
F Kα	676.8	1.24 04	7.11	3.19 00	18.3	Zn Kα	8638.9	8.81 00		2.90-02	1.44
Fe Lα	705.0	1.13 04	7.33	3.03 00	17.6	Ge Kα	9886.4	5.75 00		2.16-02	1.25

ABSORPTION EDGE

K 531.7 eV 23.32 A





For E < 100 eV —— (129)
—— (115)
● (47)

References: 18, 47, 101, 111, 115, 129

XI. Low-Energy X-Ray Interaction Coefficient Tables

See page 19 for Explanation of Tables

TABLE I. PHOTOABSORPTION CROSS SECTION, μ
ATOMIC SCATTERING FACTOR, $f_1 + if_2$

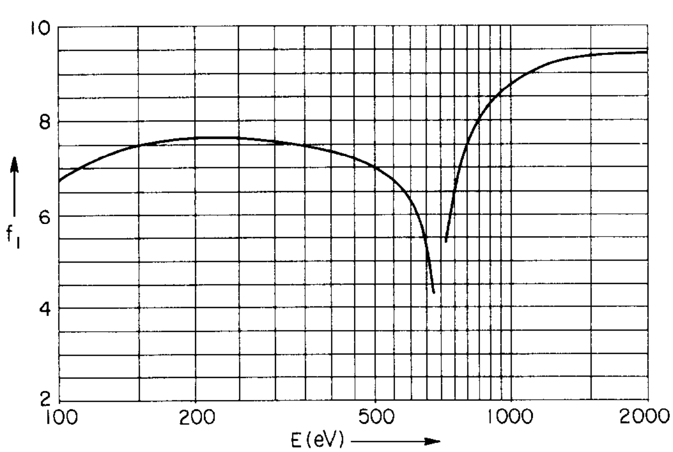
Atomic Weight = 19.00 Z = 9

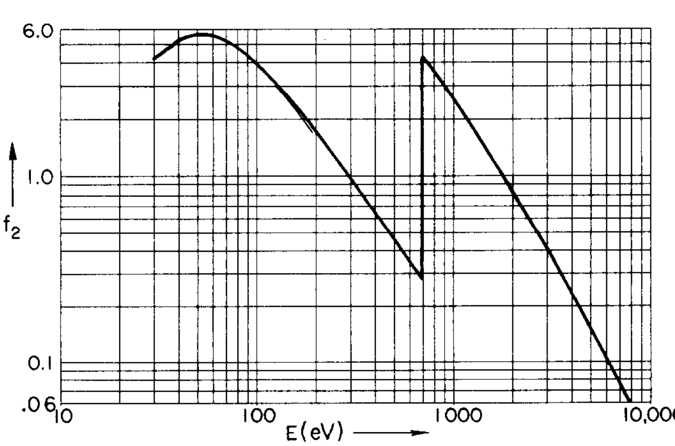
μ(barns/atom) = μ(cm^2/gm) x 31.54 FLUORINE (F)
$E\mu(E)$ = 2214. f_2 keVcm^2/gm

LINE	E(eV)	μ(cm^2/gm)	f_1	f_2	λ(A)
Na $L_{2,3}M$	30.5	3.07 05		4.22	407.1
Mg $L_{2,3}M$	49.3	2.48 05		5.53	251.5
Al $L_{2,3}M$	72.4	1.56 05		5.09	171.4
Si $L_{2,3}M$	91.5	1.04 05		4.29	135.5
Be K	108.5	7.37 04	6.95	3.61	114.
Sr Mζ	114.0	6.64 04	7.06	3.42	108.7
Y Mζ	132.8	4.82 04	7.34	2.89	93.4
S Lℓ	148.7	3.75 04	7.47	2.52	83.4
Zr Mζ	151.1	3.62 04	7.49	2.47	82.1
Nb Mζ	171.7	2.71 04	7.58	2.10	72.2
B Kα	183.3	2.33 04	7.60	1.93	67.6
Mo Mζ	192.6	2.08 04	7.62	1.81	64.4
W N_5N_7	212.2	1.66 04	7.63	1.59	58.4
C Kα	277.0	8.75 03	7.58	1.09	44.7
Ag Mζ	311.7	6.55 03	7.52	0.92	39.8
N Kα	392.4	3.70 03	7.34	0.65	31.6
Ti Lℓ	395.3	3.63 03	7.33	0.65	31.4
Ti Lα	452.2	2.59 03	7.16	0.53	27.4
V Lα	511.3	1.90 03	6.92	0.44	24.3
O Kα	524.9	1.77 03	6.85	0.42	23.6
Mn Lℓ	556.3	1.53 03	6.65	0.38	22.3
Cr Lα	572.8	1.42 03	6.53	0.37	21.6
Mn Lα	637.4	1.08 03	5.70	0.31	19.5
F Kα	676.8	9.22 02	3.88	0.28	18.3
Fe Lα	705.0	1.29 04	4.90	4.10	17.6
Co Lα	776.2	1.06 04	7.16	3.73	16.0
Ni Lα	851.5	8.39 03	8.03	3.23	14.56
Cu Lα	929.7	6.78 03	8.50	2.85	13.33
Zn Lα	1011.7	5.51 03	8.81	2.52	12.25
Na Kα	1041.0	5.12 03	8.89	2.41	11.91
Ge Lα	1188.0	3.66 03	9.16	1.96	10.44
Mg Kα	1253.6	3.18 03	9.23	1.80	9.89
Al Kα	1486.7	2.03 03	9.35	1.36	8.34
Si Kα	1740.0	1.33 03	9.39	1.04	7.13
Zr Lα	2042.4	8.54 02	9.38	0.79	6.07
Nb Lα	2165.9	7.25 02		0.71	5.73
Mo Lα	2293.2	6.18 02		0.64	5.41
Cl Kα	2622.4	4.24 02		0.50	4.73
Ag Lα	2984.3	2.94 02		0.40	4.16
Ca Kα	3691.7	1.59 02		0.27	3.36
Ba Lα	4466.3	9.07 01		0.18	2.78
Ti Kα	4510.8	8.81 01		0.18	2.75
V Kα	4952.2	6.67 01		0.15	2.50
Cr Kα	5414.7	5.10 01		0.12	2.29
Mn Kα	5898.8	3.94 01		0.10	2.10
Co Kα	6930.3	2.41 01		0.08	1.79
Ni Kα	7478.2	1.91 01		0.06	1.66
Cu Kα	8047.8	1.52 01		0.06	1.54
Zn Kα	8638.9	1.22 01		0.05	1.44
Ge Kα	9886.4	8.02 00		0.04	1.25

ABSORPTION EDGE

K** 687 eV 18.0 A





For E < 100 eV ——— (129)
——— (115)

References: 115, 129

XI. Low-Energy X-Ray Interaction Coefficient Tables

See page 19 for Explanation of Tables

TABLE I. PHOTOABSORPTION CROSS SECTION, μ
ATOMIC SCATTERING FACTOR, $f_1 + if_2$

Atomic Weight = 20.18

Z = 10

μ(barns/atom) = μ(cm^2/gm) x 33.50

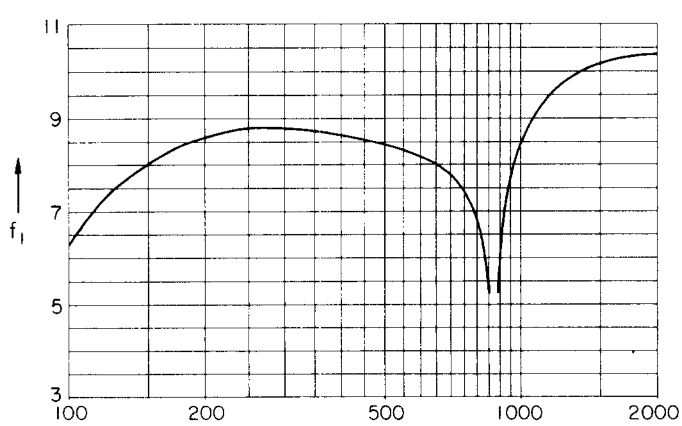
NEON (Ne)

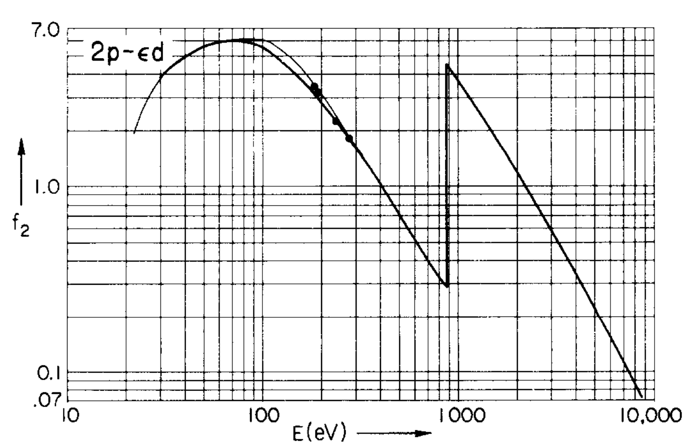
Eμ(E) = 2084. f_2 keVcm^2/gm

LINE	E(eV)	μ(cm^2/gm)	f_1	f_2	λ(A)	LINE	E(eV)	μ(cm^2/gm)	f_1	f_2	λ(A)
Na $L_{2,3}M$	30.5	2.70 05		3.94	407.1	Co Lα	776.2	9.18 02	7.09	0.34	16.0
Mg $L_{2,3}M$	49.3	2.34 05		5.53	251.5	Ni Lα	851.5	7.15 02	5.02	0.29	14.56
Al $L_{2,3}M$	72.4	1.69 05		5.88	171.4	Cu Lα	929.7	9.19 03	7.38	4.10	13.33
Si $L_{2,3}M$	91.5	1.29 05		5.67	135.5	Zn Lα	1011.7	7.46 03	8.64	3.62	12.25
Be K	108.5	1.00 05	6.75	5.20	114.0	Na Kα	1041.0	6.93 03	8.90	3.46	11.91
Sr Mζ	114.0	9.17 04	7.02	5.02	108.7	Ge Lα	1188.0	4.93 03	9.66	2.81	10.44
Y Mζ	132.8	6.88 04	7.68	4.38	93.4	Mg Kα	1253.6	4.29 03	9.85	2.58	9.89
S Lℓ	148.7	5.49 04	8.03	3.92	83.4	Al Kα	1486.7	2.75 03	10.21	1.96	8.34
Zr Mζ	151.1	5.33 04	8.07	3.86	82.1	Si Kα	1740.0	1.81 03	10.35	1.51	7.13
Nb Mζ	171.7	4.08 04	8.36	3.36	72.2	Zr Lα	2042.4	1.17 03	10.40	1.15	6.07
B Kα	183.3	3.54 04	8.47	3.11	67.6	Nb Lα	2165.9	9.97 02		1.04	5.73
Mo Mζ	192.6	3.18 04	8.54	2.94	64.4	Mo Lα	2293.2	8.52 02		0.94	5.41
W N_5N_7	212.2	2.57 04	8.66	2.62	58.4	Cl Kα	2622.4	5.87 02		0.74	4.73
C Kα	277.0	1.36 04	8.79	1.80	44.7	Ag Lα	2984.3	4.08 02		0.58	4.16
Ag Mζ	311.7	1.01 04	8.77	1.50	39.8	Ca Kα	3691.7	2.23 02		0.39	3.36
N Kα	392.4	5.62 03	8.66	1.06	31.6	Ba Lα	4466.3	1.28 02		0.27	2.78
Ti Lℓ	395.3	5.50 03	8.65	1.04	31.4	Ti Kα	4510.8	1.25 02		0.27	2.75
Ti Lα	452.2	3.85 03	8.54	0.83	27.4	V Kα	4952.2	9.46 01		0.22	2.50
V Lα	511.3	2.77 03	8.40	0.68	24.3	Cr Kα	5414.7	7.26 01		0.19	2.29
O Kα	524.9	2.58 03	8.37	0.65	23.6	Mn Kα	5898.8	5.63 01		0.16	2.10
Mn Lℓ	556.3	2.21 03	8.28	0.59	22.3	Co Kα	6930.3	3.47 01		0.12	1.79
Cr Lα	572.8	2.04 03	8.23	0.56	21.6	Ni Kα	7478.2	2.75 01		0.10	1.66
Mn Lα	637.4	1.54 03	8.00	0.47	19.5	Cu Kα	8047.8	2.20 01		0.09	1.54
F Kα	676.8	1.30 03	7.83	0.42	18.3	Zn Kα	8638.9	1.77 01		0.07	1.44
Fe Lα	705.0	1.18 03	7.67	0.40	17.6	Ge Kα	9886.4	1.17 01		0.06	1.25

ABSORPTION EDGE

K 866.9 eV 14.3 A





For E < 100 eV ——— (130)
——— (95)
• (47)

References: 47, 83, 95, 129, 130

XI. Low-Energy X-Ray Interaction Coefficient Tables

See page 19 for Explanation of Tables

TABLE I. PHOTOABSORPTION CROSS SECTION, μ
ATOMIC SCATTERING FACTOR, $f_1 + if_2$

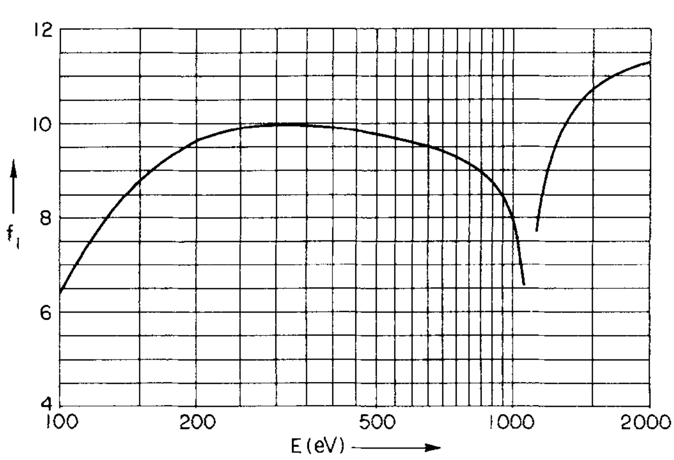
Atomic Weight = 22.99 Z = 1

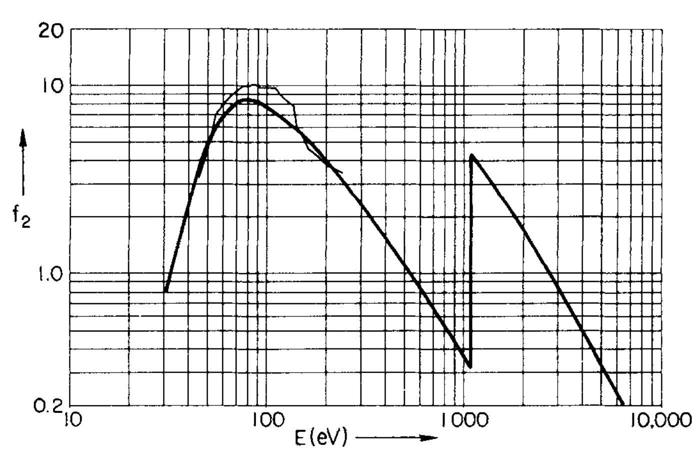
μ(barns/atom) = μ(cm^2/gm) x 38.17 SODIUM (Na)
$E\mu(E)$ = 1829. f_2 keVcm^2/gm

LINE	E(eV)	μ(cm^2/gm)	f_1	f_2	λ(A)	LINE	E(eV)	μ(cm^2/gm)	f_1	f_2	λ(A)
Na $L_{2,3}M$	30.5	1.78 03		0.03	407.1	Co $L\alpha$	776.2	1.27 03	9.19	0.54	16.0
Mg $L_{2,3}M$	49.3	1.80 05		4.84	251.5	Ni $L\alpha$	851.5	9.84 02	8.93	0.46	14.56
Al $L_{2,3}M$	72.4	2.12 05		8.39	171.4	Cu $L\alpha$	929.7	7.75 02	8.52	0.39	13.33
Si $L_{2,3}M$	91.5	1.62 05		8.11	135.5	Zn $L\alpha$	1011.7	6.09 02	7.65	0.34	12.25
Be K	108.5	1.22 05	6.94	7.21	114.	Na $K\alpha$	1041.0	5.61 02	6.91	0.32	11.91
Sr $M\zeta$	114.0	1.11 05	7.28	6.93	108.7	Ge $L\alpha$	1188.0	5.97 03	9.12	3.88	10.44
Y $M\zeta$	132.8	8.42 04	8.22	6.11	93.4	Mg $K\alpha$	1253.6	5.20 03	9.74	3.56	9.89
S $L\ell$	148.7	6.73 04	8.73	5.47	83.4	Al $K\alpha$	1486.7	3.36 03	10.72	2.73	8.34
Zr $M\zeta$	151.1	6.52 04	8.79	5.39	82.1	Si $K\alpha$	1740.0	2.24 03	11.13	2.13	7.13
Nb $M\zeta$	171.7	5.03 04	9.24	4.72	72.2	Zr $L\alpha$	2042.4	1.46 03	11.33	1.63	6.07
B $K\alpha$	183.3	4.39 04	9.42	4.40	67.6	Nb $L\alpha$	2165.9	1.25 03		1.48	5.73
Mo $M\zeta$	192.6	3.95 04	9.56	4.15	64.4	Mo $L\alpha$	2293.2	1.07 03		1.34	5.41
W N_5N_7	212.2	3.16 04	9.74	3.67	58.4	Cl $K\alpha$	2622.4	7.35 02		1.05	4.73
C $K\alpha$	277.0	1.70 04	9.95	2.58	44.7	Ag $L\alpha$	2984.3	5.11 02		0.83	4.16
Ag $M\zeta$	311.7	1.29 04	9.97	2.19	39.8	Ca $K\alpha$	3691.7	2.78 02		0.56	3.36
N $K\alpha$	392.4	7.33 03	9.92	1.57	31.6	Ba $L\alpha$	4466.3	1.60 02		0.39	2.78
Ti $L\ell$	395.3	7.20 03	9.92	1.55	31.4	Ti $K\alpha$	4510.8	1.55 02		0.38	2.75
Ti $L\alpha$	452.2	5.14 03	9.84	1.27	27.4	V $K\alpha$	4952.2	1.18 02		0.32	2.50
V $L\alpha$	511.3	3.77 03	9.75	1.05	24.3	Cr $K\alpha$	5414.7	9.08 01		0.27	2.29
O $K\alpha$	524.9	3.52 03	9.73	1.01	23.6	Mn $K\alpha$	5898.8	7.04 01		0.23	2.10
Mn $L\ell$	556.3	3.04 03	9.68	0.92	22.3	Co $K\alpha$	6930.3	4.36 01		0.17	1.79
Cr $L\alpha$	572.8	2.82 03	9.65	0.88	21.6	Ni $K\alpha$	7478.2	3.47 01		0.14	1.66
Mn $L\alpha$	637.4	2.17 03	9.53	0.75	19.5	Cu $K\alpha$	8047.8	2.78 01		0.12	1.54
F $K\alpha$	676.8	1.82 03	9.45	0.67	18.3	Zn $K\alpha$	8638.9	2.24 01		0.11	1.44
Fe $L\alpha$	705.0	1.65 03	9.38	0.63	17.6	Ge $K\alpha$	9886.4	1.49 01		0.08	1.25

ABSORPTION EDGE

K 1071.7 eV 11.569 A $L_{2,3}$ 30.6 eV 405 A





For E < 600 eV ——— (129)
——— (110)

References: 26, 36, 44, 46, 61, 79, 106, 110, 124, 129

XI. Low-Energy X-Ray Interaction Coefficient Tables

See page 19 for Explanation of Tables

TABLE I. PHOTOABSORPTION CROSS SECTION, μ
ATOMIC SCATTERING FACTOR, $f_1 + if_2$

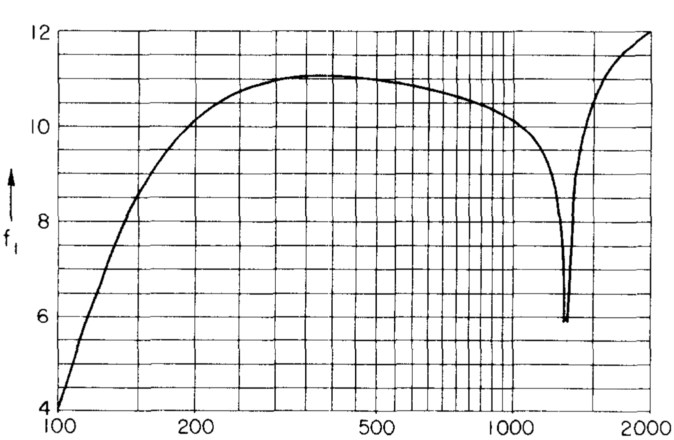
Atomic Weight = 24.31 Z = 12

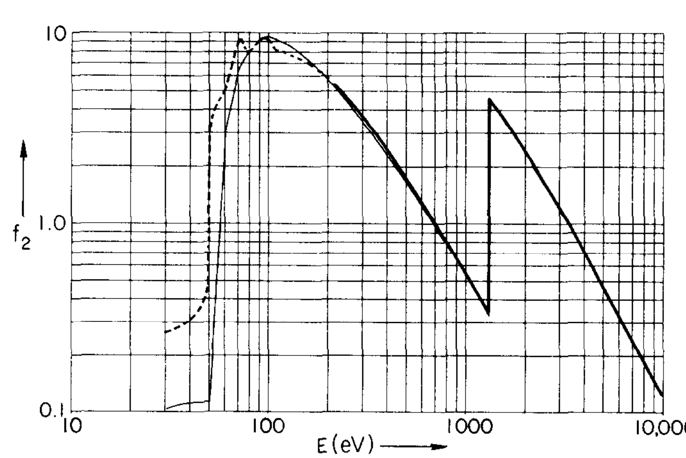
μ(barns/atom) = μ(cm²/gm) x 40.35 MAGNESIUM (Mg)
Eμ(E) = 1730. f_2 keVcm²/gm

LINE	E(eV)	μ(cm²/gm)	f_1	f_2	λ(A)	LINE	E(eV)	μ(cm²/gm)	f_1	f_2	λ(A)
Na $L_{2,3}M$	30.5	1.51 04		0.27	407.1	Co Lα	776.2	1.82 03	10.62	0.82	16.0
Mg $L_{2,3}M$	49.3	2.15 04		0.61	251.5	Ni Lα	851.5	1.41 03	10.49	0.69	14.56
Al $L_{2,3}M$	72.4	1.43 05		5.97	171.4	Cu Lα	929.7	1.11 03	10.32	0.60	13.33
Si $L_{2,3}M$	91.5	1.55 05		8.20	135.5	Zn Lα	1011.7	8.81 02	10.10	0.51	12.25
Be K	108.5	1.27 05	5.03	7.95	114.0	Na Kα	1041.0	8.15 02	10.01	0.49	11.91
Sr Mζ	114.0	1.25 05	5.66	8.26	108.7	Ge Lα	1188.0	5.67 02	9.22	0.39	10.44
Y Mζ	132.8	9.54 04	7.48	7.32	93.4	Mg Kα	1253.6	4.89 02	8.32	0.35	9.89
S Lℓ	148.7	8.32 04	8.49	7.15	83.4	Al Kα	1486.7	4.28 03	10.58	3.68	8.34
Zr Mζ	151.1	8.14 04	8.61	7.11	82.1	Si Kα	1740.0	2.91 03	11.63	2.92	7.13
Nb Mζ	171.7	6.72 04	9.47	6.67	72.2	Zr Lα	2042.4	1.92 03	12.11	2.27	6.07
B Kα	183.3	5.95 04	9.79	6.30	67.6	Nb Lα	2165.9	1.64 03		2.06	5.73
Mo Mζ	192.6	5.39 04	10.03	6.00	64.4	Mo Lα	2293.2	1.41 03		1.87	5.41
W N_5N_7	212.2	4.32 04	10.39	5.29	58.4	Cl Kα	2622.4	9.80 02		1.49	4.73
C Kα	277.0	2.39 04	10.94	3.83	44.7	Ag Lα	2984.3	6.86 02		1.18	4.16
Ag Mζ	311.7	1.88 04	11.06	3.38	39.8	Ca Kα	3691.7	3.77 02		0.80	3.36
N Kα	392.4	1.10 04	11.11	2.48	31.6	Ba Lα	4466.3	2.19 02		0.56	2.78
Ti Lℓ	395.3	1.07 04	11.11	2.45	31.4	Ti Kα	4510.8	2.12 02		0.55	2.75
Ti Lα	452.2	7.64 03	11.07	2.00	27.4	V Kα	4952.2	1.62 02		0.46	2.50
V Lα	511.3	5.54 03	11.01	1.64	24.3	Cr Kα	5414.7	1.25 02		0.39	2.29
O Kα	524.9	5.17 03	10.99	1.57	23.6	Mn Kα	5898.8	9.74 01		0.33	2.10
Mn Lℓ	556.3	4.46 03	10.95	1.43	22.3	Co Kα	6930.3	6.07 01		0.24	1.79
Cr Lα	572.8	4.12 03	10.93	1.36	21.6	Ni Kα	7478.2	4.85 01		0.21	1.66
Mn Lα	637.4	3.11 03	10.84	1.14	19.5	Cu Kα	8047.8	3.90 01		0.18	1.54
F Kα	676.8	2.62 03	10.78	1.02	18.3	Zn Kα	8638.9	3.16 01		0.16	1.44
Fe Lα	705.0	2.36 03	10.74	0.96	17.6	Ge Kα	9886.4	2.11 01		0.12	1.25

ABSORPTION EDGE

K	1303.4 eV	9.5122 A	L_1	62.84 eV	197.3 A
			L_2	49.73 eV	249.3 A
			L_3	49.45 eV	250.7 A





For E < 150 ------- (1)
——— (129)

References: 16, 46, 82, 106, 126, 129

XI. Low-Energy X-Ray Interaction Coefficient Tables

See page 19 for Explanation of Tables

TABLE I. PHOTOABSORPTION CROSS SECTION, μ
ATOMIC SCATTERING FACTOR, $f_1 + if_2$

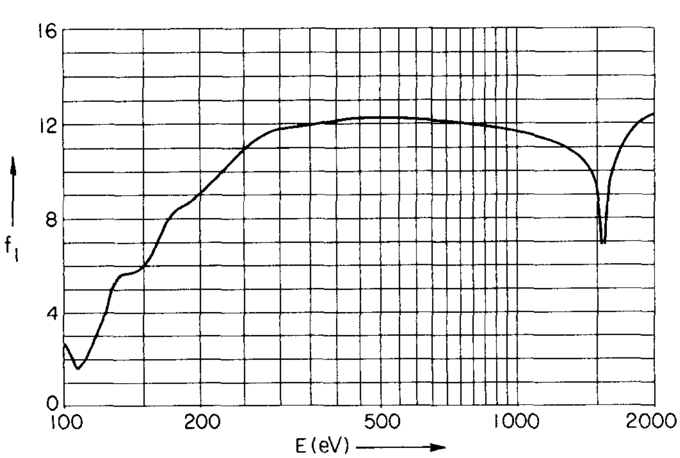
Atomic Weight = 26.98 Z = 13

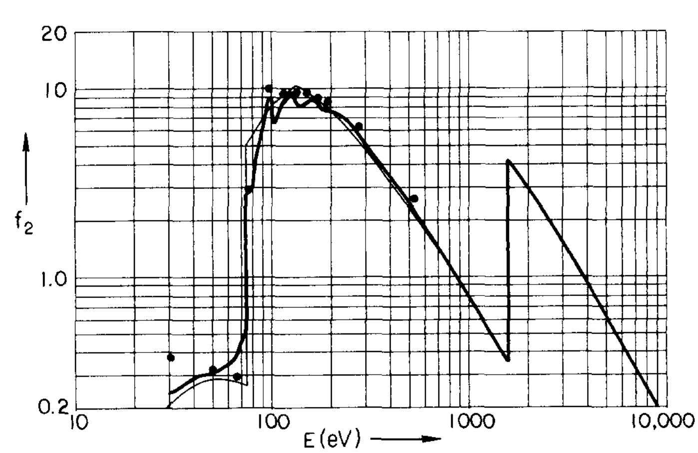
μ(barns/atom) = μ(cm^2/gm) x 44.80 ALUMINUM (Al)
Eμ(E) = 1559. f_2 keVcm^2/gm

LINE	E(eV)	μ(cm^2/gm)	f_1	f_2	λ(A)
Na L$_{2,3}$M	30.5	1.22 04		0.24	407.1
Mg L$_{2,3}$M	49.3	9.64 03		0.30	251.5
Al L$_{2,3}$M	72.4	1.13 04		0.53	171.4
Si L$_{2,3}$M	91.5	1.17 05		6.85	135.5
Be K	108.5	1.07 05	1.51	7.43	114.
Sr Mζ	114.0	1.14 05	2.35	8.32	108.7
Y Mζ	132.8	9.58 04	5.67	8.16	93.4
S Lℓ	148.7	8.51 04	5.86	8.12	83.4
Zr Mζ	151.1	8.49 04	6.02	8.23	82.1
Nb Mζ	171.7	7.43 04	8.13	8.19	72.2
B Kα	183.3	6.40 04	8.45	7.52	67.6
Mo Mζ	192.6	6.02 04	8.76	7.43	64.4
W N$_5$N$_7$	212.2	5.26 04	9.55	7.16	58.4
C Kα	277.0	3.10 04	11.53	5.51	44.7
Ag Mζ	311.7	2.30 04	11.83	4.60	39.8
N Kα	392.4	1.38 04	12.09	3.46	31.6
Ti Lℓ	395.3	1.36 04	12.10	3.44	31.4
Ti Lα	452.2	9.75 03	12.23	2.83	27.4
V Lα	511.3	7.18 03	12.25	2.36	24.3
O Kα	524.9	6.72 03	12.25	2.26	23.6
Mn Lℓ	556.3	5.80 03	12.23	2.07	22.3
Cr Lα	572.8	5.37 03	12.23	1.97	21.6
Mn Lα	637.4	4.04 03	12.17	1.65	19.5
F Kα	676.8	3.41 03	12.12	1.48	18.3
Fe Lα	705.0	3.08 03	12.08	1.39	17.6
Co Lα	776.2	2.38 03	11.99	1.18	16.0
Ni Lα	851.5	1.85 03	11.88	1.01	14.56
Cu Lα	929.7	1.45 03	11.76	0.87	13.33
Zn Lα	1011.7	1.15 03	11.63	0.75	12.25
Na Kα	1041.0	1.07 03	11.58	0.71	11.91
Ge Lα	1188.0	7.42 02	11.27	0.57	10.44
Mg Kα	1253.6	6.39 02	11.09	0.51	9.89
Al Kα	1486.7	4.03 02	9.69	0.38	8.34
Si Kα	1740.0	3.22 03	11.34	3.59	7.13
Zr Lα	2042.4	2.16 03	12.58	2.83	6.07
Nb Lα	2165.9	1.86 03		2.58	5.73
Mo Lα	2293.2	1.60 03		2.36	5.41
Cl Kα	2622.4	1.12 03		1.89	4.73
Ag Lα	2984.3	7.92 02		1.52	4.16
Ca Kα	3691.7	4.40 02		1.04	3.36
Ba Lα	4466.3	2.57 02		0.74	2.78
Ti Kα	4510.8	2.50 02		0.72	2.75
V Kα	4952.2	1.91 02		0.61	2.50
Cr Kα	5414.7	1.48 02		0.51	2.29
Mn Kα	5898.8	1.16 02		0.44	2.10
Co Kα	6930.3	7.25 01		0.32	1.79
Ni Kα	7478.2	5.81 01		0.28	1.66
Cu Kα	8047.8	4.68 01		0.24	1.54
Zn Kα	8638.9	3.80 01		0.21	1.44
Ge Kα	9886.4	2.55 01		0.16	1.25

ABSORPTION EDGE

K	1559.9 eV	7.9481 A	L$_1$	87.01 eV	142.5 A
			L$_{2,3}$	72.78 eV	170.4 A





For E < 400 eV (82)
(129)
• (23)

References: 14, 15, 16, 21, 23, 46, 50, 79, 80, 82,

XI. Low-Energy X-Ray Interaction Coefficient Tables

See page 19 for Explanation of Tables

TABLE I. PHOTOABSORPTION CROSS SECTION, μ
ATOMIC SCATTERING FACTOR, $f_1 + if_2$

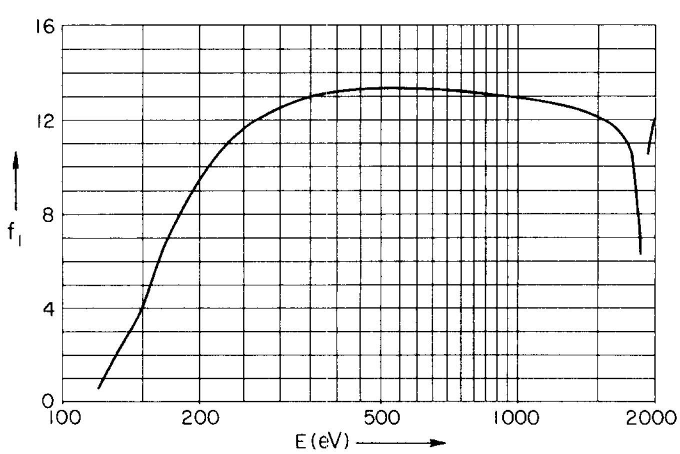
Atomic Weight = 28.09 Z = 14

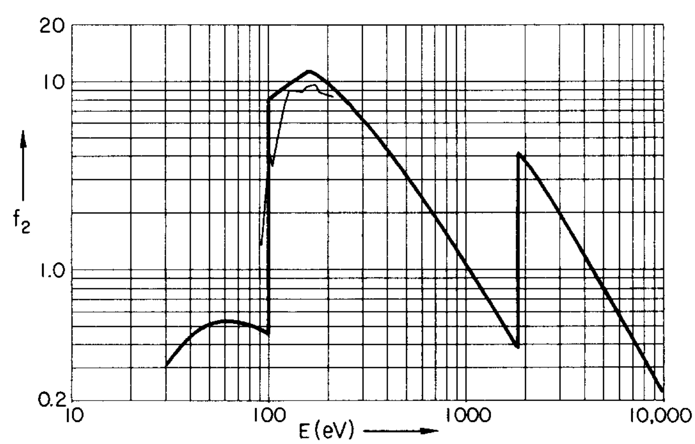
μ(barns/atom) = μ(cm^2/gm) x 46.63 SILICON (Si)
$E\mu(E)$ = 1497. f_2 keVcm^2/gm

LINE	E(eV)	μ(cm^2/gm)	f_1	f_2	λ(A)	LINE	E(eV)	μ(cm^2/gm)	f_1	f_2	λ(A)
Na $L_{2,3}M$	30.5	1.50 04		0.31	407.1	Co Lα	776.2	3.19 03	13.17	1.65	16.0
Mg $L_{2,3}M$	49.3	1.51 04		0.50	251.5	Ni Lα	851.5	2.48 03	13.08	1.41	14.56
Al $L_{2,3}M$	72.4	1.05 04		0.51	171.4	Cu Lα	929.7	1.96 03	12.99	1.22	13.33
Si $L_{2,3}M$	91.5	7.64 03		0.47	135.5	Zn Lα	1011.7	1.56 03	12.90	1.05	12.25
Be K	108.5	1.15 05	-1.76	8.30	114.	Na Kα	1041.0	1.44 03	12.86	1.00	11.91
Sr Mζ	114.0	1.13 05	-0.50	8.61	108.7	Ge Lα	1188.0	1.00 03	12.67	0.79	10.44
Y Mζ	132.8	1.09 05	2.06	9.67	93.4	Mg Kα	1253.6	8.64 02	12.57	0.72	9.89
S Lℓ	148.7	1.06 05	3.87	10.53	83.4	Al Kα	1486.7	5.43 02	12.12	0.54	8.34
Zr Mζ	151.1	1.06 05	4.16	10.66	82.1	Si Kα	1740.0	3.50 02	10.89	0.41	7.13
Nb Mζ	171.7	9.32 04	7.10	10.68	72.2	Zr Lα	2042.4	2.63 03	12.33	3.59	6.07
B Kα	183.3	8.40 04	8.16	10.28	67.6	Nb Lα	2165.9	2.28 03		3.29	5.73
Mo Mζ	192.6	7.74 04	8.94	9.95	64.4	Mo Lα	2293.2	1.97 03		3.02	5.41
W N_5N_7	212.2	6.46 04	10.17	9.15	58.4	Cl Kα	2622.4	1.40 03		2.44	4.73
C Kα	277.0	3.68 04	12.20	6.81	44.7	Ag Lα	2984.3	9.92 02		1.98	4.16
Ag Mζ	311.7	2.83 04	12.69	5.88	39.8	Ca Kα	3691.7	5.56 02		1.37	3.36
N Kα	392.4	1.65 04	13.20	4.33	31.6	Ba Lα	4466.3	3.27 02		0.98	2.78
Ti Lℓ	395.3	1.62 04	13.21	4.29	31.4	Ti Kα	4510.8	3.18 02		0.96	2.75
Ti Lα	452.2	1.18 04	13.33	3.55	27.4	V Kα	4952.2	2.44 02		0.81	2.50
V Lα	511.3	9.38 03	13.36	3.20	24.3	Cr Kα	5414.7	1.90 02		0.69	2.29
O Kα	524.9	8.79 03	13.36	3.08	23.6	Mn Kα	5898.8	1.48 02		0.58	2.10
Mn Lℓ	556.3	7.63 03	13.36	2.83	22.3	Co Kα	6930.3	9.33 01		0.43	1.79
Cr Lα	572.8	7.03 03	13.35	2.69	21.6	Ni Kα	7478.2	7.48 01		0.37	1.66
Mn Lα	637.4	5.38 03	13.30	2.29	19.5	Cu Kα	8047.8	6.04 01		0.32	1.54
F Kα	676.8	4.54 03	13.27	2.05	18.3	Zn Kα	8638.9	4.91 01		0.28	1.44
Fe Lα	705.0	4.11 03	13.24	1.94	17.6	Ge Kα	9886.4	3.30 01		0.22	1.25

ABSORPTION EDGE

K 1840.0 eV 6.738 A $L_{2,3}$ 100.6 eV 123 A





For E < 520 eV (129)
(50)

References: 3, 15, 16, 50, 79, 125, 129

XI. Low-Energy X-Ray Interaction Coefficient Tables

See page 19 for Explanation of Tables

TABLE I. PHOTOABSORPTION CROSS SECTION, μ
ATOMIC SCATTERING FACTOR, $f_1 + if_2$

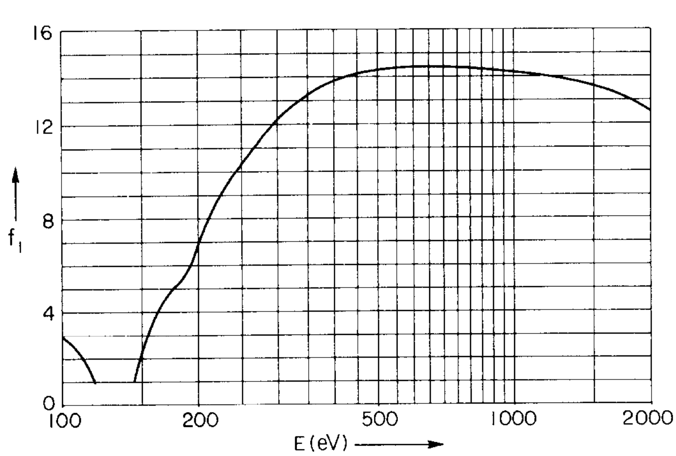
Atomic Weight = 30.97 Z = 15

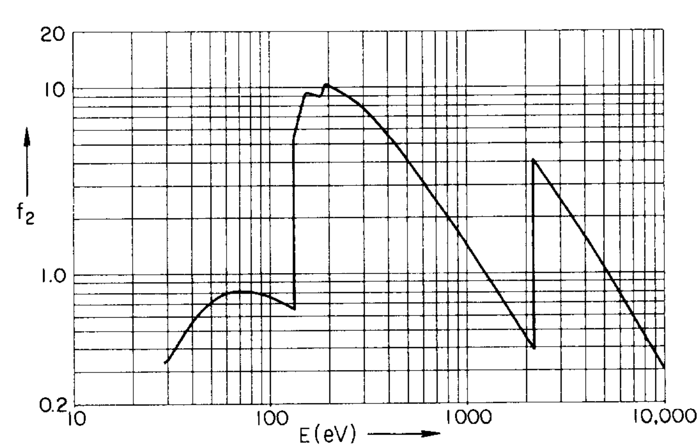
μ(barns/atom) = μ(cm^2/gm) x 51.43 PHOSPHORUS (P)
$E\mu(E)$ = 1358. f_2 keVcm^2/gm

LINE	E(eV)	μ(cm^2/gm)	f_1	f_2	λ(A)	LINE	E(eV)	μ(cm^2/gm)	f_1	f_2	λ(A)
Na $L_{2,3}M$	30.5	1.55 04		0.35	407.1	Co $L\alpha$	776.2	3.90 03	14.32	2.23	16.0
Mg $L_{2,3}M$	49.3	1.91 04		0.69	251.5	Ni $L\alpha$	851.5	3.04 03	14.26	1.91	14.56
Al $L_{2,3}M$	72.4	1.51 04		0.81	171.4	Cu $L\alpha$	929.7	2.41 03	14.19	1.65	13.33
Si $L_{2,3}M$	91.5	1.15 04		0.78	135.5	Zn $L\alpha$	1011.7	1.92 03	14.11	1.43	12.25
Be K	108.5	9.05 03	2.27	0.72	114.	Na $K\alpha$	1041.0	1.78 03	14.08	1.36	11.91
Sr $M\zeta$	114.0	8.46 03	1.64	0.71	108.7	Ge $L\alpha$	1188.0	1.24 03	13.93	1.08	10.44
Y $M\zeta$	132.8	5.50 04	-6.68	5.38	93.4	Mg $K\alpha$	1253.6	1.07 03	13.86	0.99	9.89
S $L\ell$	148.7	8.46 04	2.03	9.26	83.4	Al $K\alpha$	1486.7	6.75 02	13.58	0.74	8.34
Zr $M\zeta$	151.1	8.34 04	2.47	9.28	82.1	Si $K\alpha$	1740.0	4.44 02	13.14	0.57	7.13
Nb $M\zeta$	171.7	7.18 04	4.71	9.07	72.2	Zr $L\alpha$	2042.4	2.86 02	11.81	0.43	6.07
B $K\alpha$	183.3	6.62 04	4.99	8.93	67.6	Nb $L\alpha$	2165.9	2.61 03		4.17	5.73
Mo $M\zeta$	192.6	7.33 04	5.69	10.39	64.4	Mo $L\alpha$	2293.2	2.28 03		3.84	5.41
W N_5N_7	212.2	6.40 04	8.09	9.99	58.4	Cl $K\alpha$	2622.4	1.63 03		3.15	4.73
C $K\alpha$	277.0	4.13 04	11.42	8.42	44.7	Ag $L\alpha$	2984.3	1.17 03		2.56	4.16
Ag $M\zeta$	311.7	3.26 04	12.46	7.48	39.8	Ca $K\alpha$	3691.7	6.61 02		1.80	3.36
N $K\alpha$	392.4	2.06 04	13.73	5.94	31.6	Ba $L\alpha$	4466.3	3.92 02		1.29	2.78
Ti $L\ell$	395.3	2.02 04	13.76	5.89	31.4	Ti $K\alpha$	4510.8	3.81 02		1.27	2.75
Ti $L\alpha$	452.2	1.50 04	14.12	4.98	27.4	V $K\alpha$	4952.2	2.94 02		1.07	2.50
V $L\alpha$	511.3	1.12 04	14.29	4.22	24.3	Cr $K\alpha$	5414.7	2.29 02		0.91	2.29
O $K\alpha$	524.9	1.05 04	14.31	4.07	23.6	Mn $K\alpha$	5898.8	1.79 02		0.78	2.10
Mn $L\ell$	556.3	9.15 03	14.36	3.75	22.3	Co $K\alpha$	6930.3	1.13 02		0.58	1.79
Cr $L\alpha$	572.8	8.47 03	14.37	3.57	21.6	Ni $K\alpha$	7478.2	9.10 01		0.50	1.66
Mn $L\alpha$	637.4	6.53 03	14.39	3.06	19.5	Cu $K\alpha$	8047.8	7.37 01		0.44	1.54
F $K\alpha$	676.8	5.53 03	14.38	2.75	18.3	Zn $K\alpha$	8638.9	6.00 01		0.38	1.44
Fe $L\alpha$	705.0	5.01 03	14.37	2.60	17.6	Ge $K\alpha$	9886.4	4.05 01		0.29	1.25

ABSORPTION EDGE

K 2143.5 eV 5.784 A $L_{2,3}$ 132 eV 94 A





For E < 100 eV ———— (129)

References: 129

XI. Low-Energy X-Ray Interaction Coefficient Tables

See page 19 for Explanation of Tables

TABLE I. PHOTOABSORPTION CROSS SECTION, μ
ATOMIC SCATTERING FACTOR, $f_1 + if_2$

Atomic Weight = 32.06 Z = 16

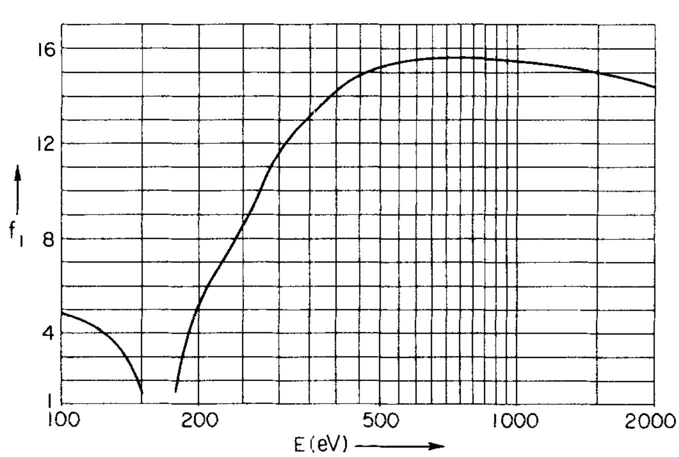
μ(barns/atom) = μ(cm^2/gm) x 53.24 SULFUR (S)
$E\mu(E)$ = 1312. f_2 keVcm^2/gm

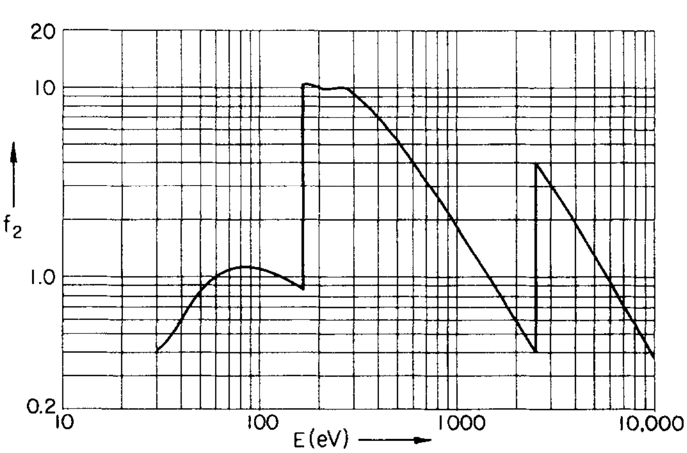
LINE	E(eV)	μ(cm^2/gm)	f_1	f_2	λ(A)
Na $L_{2,3}M$	30.5	1.76 04		0.41	407.1
Mg $L_{2,3}M$	49.3	2.21 04		0.83	251.5
Al $L_{2,3}M$	72.4	2.02 04		1.12	171.4
Si $L_{2,3}M$	91.5	1.62 04		1.13	135.5
Be K	108.5	1.28 04	4.57	1.06	114.
Sr $M\zeta$	114.0	1.20 04	4.39	1.05	108.7
Y $M\zeta$	132.8	9.64 03	3.43	0.98	93.4
S $L\ell$	148.7	8.09 03	1.71	0.92	83.4
Zr $M\zeta$	151.1	7.92 03	1.28	0.91	82.1
Nb $M\zeta$	171.7	7.98 04	-0.65	10.44	72.2
B $K\alpha$	183.3	7.42 04	2.81	10.37	67.6
Mo $M\zeta$	192.6	6.98 04	4.28	10.25	64.4
W N_5N_7	212.2	6.12 04	6.18	9.89	58.4
C $K\alpha$	277.0	4.79 04	10.26	10.12	44.7
Ag $M\zeta$	311.7	3.84 04	12.02	9.12	39.8
N $K\alpha$	392.4	2.49 04	14.06	7.46	31.6
Ti $L\ell$	395.3	2.45 04	14.12	7.40	31.4
Ti $L\alpha$	452.2	1.83 04	14.85	6.32	27.4
V $L\alpha$	511.3	1.38 04	15.22	5.39	24.3
O $K\alpha$	524.9	1.30 04	15.27	5.21	23.6
Mn $L\ell$	556.3	1.14 04	15.37	4.83	22.3
Cr $L\alpha$	572.8	1.06 04	15.41	4.63	21.6
Mn $L\alpha$	637.4	8.20 03	15.51	3.98	19.5
F $K\alpha$	676.8	7.01 03	15.53	3.61	18.3
Fe $L\alpha$	705.0	6.38 03	15.54	3.43	17.6

LINE	E(eV)	μ(cm^2/gm)	f_1	f_2	λ(A)
Co $L\alpha$	776.2	4.95 03	15.53	2.93	16.0
Ni $L\alpha$	851.5	3.89 03	15.50	2.52	14.56
Cu $L\alpha$	929.7	3.08 03	15.45	2.18	13.33
Zn $L\alpha$	1011.7	2.46 03	15.39	1.90	12.25
Na $K\alpha$	1041.0	2.28 03	15.36	1.81	11.91
Ge $L\alpha$	1188.0	1.59 03	15.23	1.44	10.44
Mg $K\alpha$	1253.6	1.38 03	15.18	1.32	9.89
Al $K\alpha$	1486.7	8.70 02	14.96	0.99	8.34
Si $K\alpha$	1740.0	5.75 02	14.69	0.76	7.13
Zr $L\alpha$	2042.4	3.71 02	14.23	0.58	6.07
Nb $L\alpha$	2165.9	3.15 02		0.52	5.73
Mo $L\alpha$	2293.2	2.67 02		0.47	5.41
Cl $K\alpha$	2622.4	1.89 03		3.78	4.73
Ag $L\alpha$	2984.3	1.37 03		3.11	4.16
Ca $K\alpha$	3691.7	7.84 02		2.21	3.36
Ba $L\alpha$	4466.3	4.69 02		1.60	2.78
Ti $K\alpha$	4510.8	4.56 02		1.57	2.75
V $K\alpha$	4952.2	3.53 02		1.33	2.50
Cr $K\alpha$	5414.7	2.75 02		1.14	2.29
Mn $K\alpha$	5898.8	2.17 02		0.97	2.10
Co $K\alpha$	6930.3	1.37 02		0.73	1.79
Ni $K\alpha$	7478.2	1.11 02		0.63	1.66
Cu $K\alpha$	8047.8	8.98 01		0.55	1.54
Zn $K\alpha$	8638.9	7.32 01		0.48	1.44
Ge $K\alpha$	9886.4	4.96 01		0.37	1.25

ABSORPTION EDGE

K 2470.5 eV 5.0185 A L_3 ** 165 eV 75.1 A





For E < 100 eV ——— (129)

References: 129

XI. Low-Energy X-Ray Interaction Coefficient Tables

See page 19 for Explanation of Tables

TABLE I. PHOTOABSORPTION CROSS SECTION, μ
ATOMIC SCATTERING FACTOR, $f_1 + if_2$

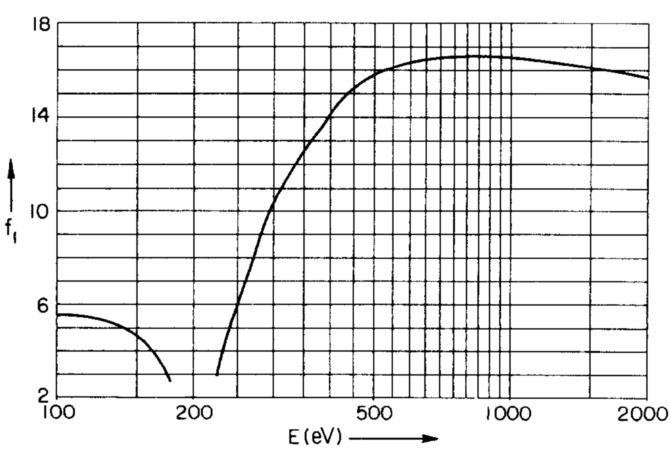
Atomic Weight = 35.45 Z = 17

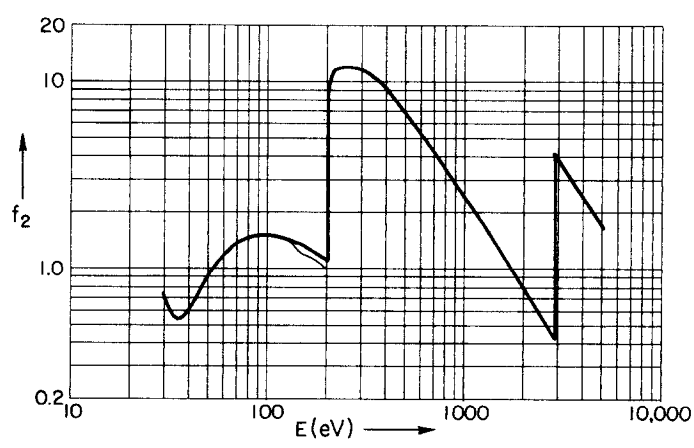
μ(barns/atom) = μ(cm^2/gm) x 58.86 CHLORINE (Cl)
$E\mu(E)$ = 1186. f_2 keVcm^2/gm

LINE	E(eV)	μ(cm^2/gm)	f_1	f_2	λ(A)	LINE	E(eV)	μ(cm^2/gm)	f_1	f_2	λ(A)
Na $L_{2,3}M$	30.5	2.56 04		0.66	407.1	Co Lα	776.2	5.39 03	16.61	3.53	16.0
Mg $L_{2,3}M$	49.3	2.11 04		0.88	251.5	Ni Lα	851.5	4.26 03	16.60	3.06	14.56
Al $L_{2,3}M$	72.4	2.27 04		1.38	171.4	Cu Lα	929.7	3.40 03	16.57	2.67	13.33
Si $L_{2,3}M$	91.5	1.94 04		1.50	135.5	Zn Lα	1011.7	2.73 03	16.53	2.33	12.25
Be K	108.5	1.61 04	5.56	1.47	114.	Na Kα	1041.0	2.54 03	16.51	2.23	11.91
Sr Mζ	114.0	1.52 04	5.51	1.46	108.7	Ge Lα	1188.0	1.80 03	16.40	1.80	10.44
Y Mζ	132.8	1.25 04	5.21	1.40	93.4	Mg Kα	1253.6	1.56 03	16.34	1.65	9.89
S Lℓ	148.7	1.06 04	4.72	1.33	83.4	Al Kα	1486.7	9.93 02	16.15	1.24	8.34
Zr Mζ	151.1	1.03 04	4.62	1.32	82.1	Si Kα	1740.0	6.51 02	15.93	0.95	7.13
Nb Mζ	171.7	8.42 03	3.37	1.22	72.2	Zr Lα	2042.4	4.25 02	15.62	0.73	6.07
B Kα	183.3	7.55 03	2.05	1.17	67.6	Nb Lα	2165.9	3.63 02		0.66	5.73
Mo Mζ	192.6	6.94 03	0.08	1.13	64.4	Mo Lα	2293.2	3.11 02		0.60	5.41
W N_5N_7	212.2	6.41 04	-0.61	11.47	58.4	Cl Kα	2622.4	2.15 02		0.48	4.73
C Kα	277.0	5.08 04	8.63	11.85	44.7	Ag Lα	2984.3	1.51 03		3.80	4.16
Ag Mζ	311.7	4.14 04	11.01	10.88	39.8	Ca Kα	3691.7	8.77 02		2.73	3.36
N Kα	392.4	2.75 04	14.08	9.11	31.6	Ba Lα	4466.3	5.29 02		1.99	2.78
Ti Lℓ	395.3	2.71 04	14.18	9.03	31.4	Ti Kα	4510.8	5.15 02		1.96	2.75
Ti Lα	452.2	2.01 04	15.29	7.65	27.4	V Kα	4952.2	3.99 02		1.67	2.50
V Lα	511.3	1.50 04	15.92	6.48	24.3	Cr Kα	5414.7	3.13 02		1.43	2.29
O Kα	524.9	1.41 04	16.01	6.25	23.6	Mn Kα	5898.8	2.47 02		1.23	2.10
Mn Lℓ	556.3	1.23 04	16.20	5.76	22.3	Co Kα	6930.3	1.57 02		0.92	1.79
Cr Lα	572.8	1.14 04	16.27	5.52	21.6	Ni Kα	7478.2	1.27 02		0.80	1.66
Mn Lα	637.4	8.81 03	16.47	4.73	19.5	Cu Kα	8047.8	1.03 02		0.70	1.54
F Kα	676.8	7.59 03	16.54	4.33	18.3	Zn Kα	8638.9	8.42 01		0.61	1.44
Fe Lα	705.0	6.86 03	16.57	4.08	17.6	Ge Kα	9886.4	5.72 01		0.48	1.25

ABSORPTION EDGE

K 2819.6 eV 4.3971 A L_3^{**} 202 eV 61.4 A





For E < 270 eV (129)
(115)

References: 115, 129

XI. Low-Energy X-Ray Interaction Coefficient Tables

See page 19 for Explanation of Tables

TABLE I. PHOTOABSORPTION CROSS SECTION, μ
ATOMIC SCATTERING FACTOR, $f_1 + if_2$

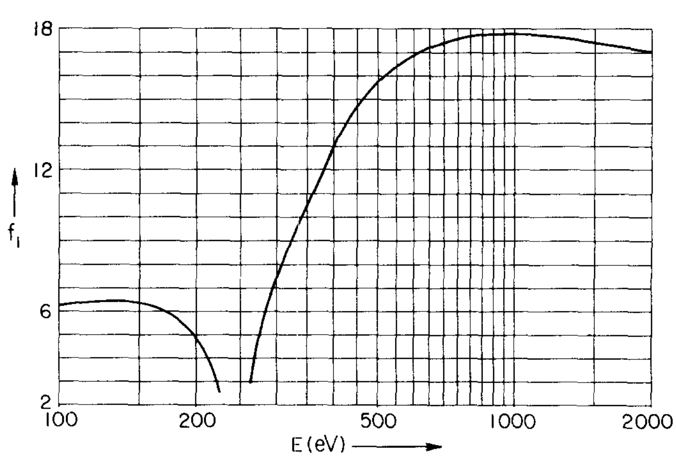
Atomic Weight = 39.95 Z = 18

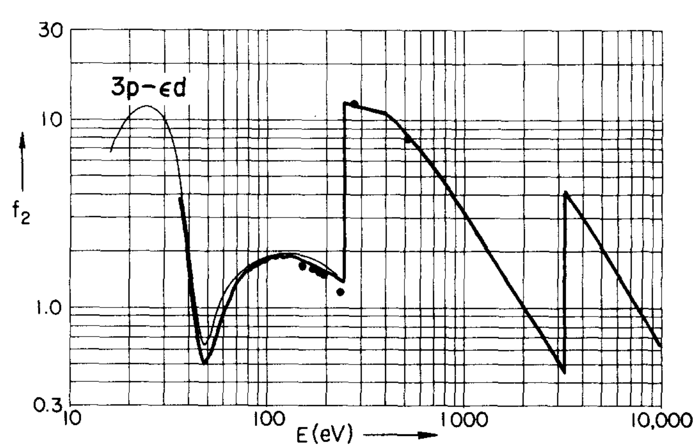
μ(barns/atom) = μ(cm²/gm) x 66.33 ARGON (Ar)
Eμ(E) = 1053. f_2 keVcm²/gm

LINE	E(eV)	μ(cm²/gm)	f_1	f_2	λ(A)	LINE	E(eV)	μ(cm²/gm)	f_1	f_2	λ(A)
Na $L_{2,3}M$	30.5	4.18 05		12.10	407.1	Co Lα	776.2	6.45 03	17.53	4.76	16.0
Mg $L_{2,3}M$	49.3	1.12 04		0.52	251.5	Ni Lα	851.5	5.07 03	17.64	4.10	14.56
Al $L_{2,3}M$	72.4	2.08 04		1.43	171.4	Cu Lα	929.7	4.05 03	17.66	3.57	13.33
Si $L_{2,3}M$	91.5	2.01 04		1.74	135.5	Zn Lα	1011.7	3.25 03	17.65	3.12	12.25
Be K	108.5	1.80 04	6.33	1.85	114.	Na Kα	1041.0	3.02 03	17.64	2.98	11.91
Sr Mζ	114.0	1.75 04	6.31	1.90	108.7	Ge Lα	1188.0	2.12 03	17.56	2.39	10.44
Y Mζ	132.8	1.49 04	6.36	1.88	93.4	Mg Kα	1253.6	1.84 03	17.52	2.19	9.89
S Lℓ	148.7	1.29 04	6.26	1.81	83.4	Al Kα	1486.7	1.16 03	17.32	1.63	8.34
Zr Mζ	151.1	1.26 04	6.24	1.81	82.1	Si Kα	1740.0	7.68 02	17.11	1.27	7.13
Nb Mζ	171.7	1.03 04	5.85	1.68	72.2	Zr Lα	2042.4	5.03 02	16.86	0.98	6.07
B Kα	183.3	9.37 03	5.50	1.63	67.6	Nb Lα	2165.9	4.30 02		0.88	5.73
Mo Mζ	192.6	8.63 03	5.12	1.58	64.4	Mo Lα	2293.2	3.69 02		0.80	5.41
W N_5N_7	212.2	7.39 03	3.87	1.49	58.4	Cl Kα	2622.4	2.56 02		0.64	4.73
C Kα	277.0	4.56 04	5.14	11.99	44.7	Ag Lα	2984.3	1.78 02		0.51	4.16
Ag Mζ	311.7	3.93 04	8.28	11.64	39.8	Ca Kα	3691.7	9.78 02		3.43	3.36
N Kα	392.4	2.95 04	12.56	11.00	31.6	Ba Lα	4466.3	5.95 02		2.52	2.78
Ti Lℓ	395.3	2.91 04	12.73	10.92	31.4	Ti Kα	4510.8	5.80 02		2.48	2.75
Ti Lα	452.2	2.23 04	14.67	9.56	27.4	V Kα	4952.2	4.52 02		2.12	2.50
V Lα	511.3	1.71 04	15.80	8.30	24.3	Cr Kα	5414.7	3.54 02		1.82	2.29
O Kα	524.9	1.62 04	15.99	8.05	23.6	Mn Kα	5898.8	2.80 02		1.57	2.10
Mn Lℓ	556.3	1.42 04	16.40	7.52	22.3	Co Kα	6930.3	1.79 02		1.18	1.79
Cr Lα	572.8	1.33 04	16.57	7.22	21.6	Ni Kα	7478.2	1.45 02		1.03	1.66
Mn Lα	637.4	1.04 04	17.04	6.28	19.5	Cu Kα	8047.8	1.18 02		0.90	1.54
F Kα	676.8	8.92 03	17.22	5.74	18.3	Zn Kα	8638.9	9.66 01		0.79	1.44
Fe Lα	705.0	8.16 03	17.31	5.46	17.6	Ge Kα	9886.4	6.58 01		0.62	1.25

ABSORPTION EDGE

K 3202.9 eV 3.8709 A L_3** 245 eV 50.6 A





For E < 125 eV —— (130)
—— (95)
• (47)

References: 10, 17, 18, 47, 71, 95, 111, 129, 130

XI. Low-Energy X-Ray Interaction Coefficient Tables

See page 19 for Explanation of Tables

TABLE I. PHOTOABSORPTION CROSS SECTION, μ
ATOMIC SCATTERING FACTOR, $f_1 + if_2$

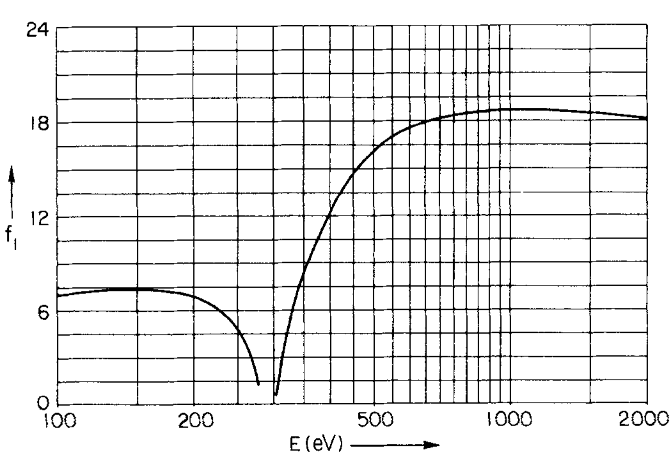
Atomic Weight = 39.09 Z = 19

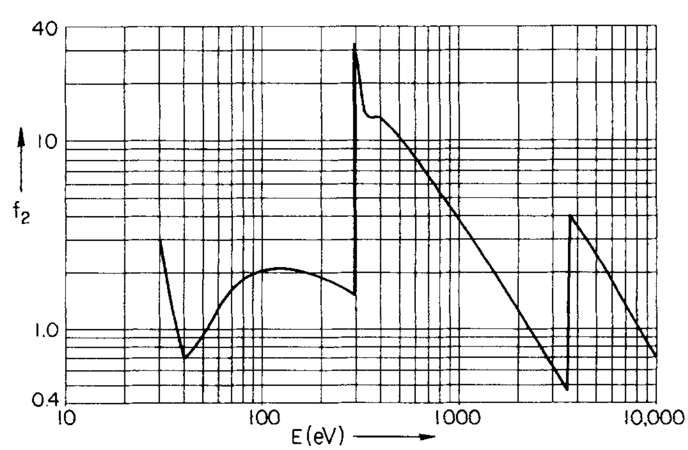
μ(barns/atom) = μ(cm^2/gm) x 64.90 POTASSIUM (K)
Eμ(E) = 1076. f_2 keVcm^2/gm

LINE	E(eV)	μ(cm^2/gm)	f_1	f_2	λ(A)	LINE	E(eV)	μ(cm^2/gm)	f_1	f_2	λ(A)
Na $L_{2,3}M$	30.5	1.02 05		2.89	407.1	Co Lα	776.2	7.68 03	18.56	5.54	16.0
Mg $L_{2,3}M$	49.3	1.97 04		0.90	251.5	Ni Lα	851.5	6.09 03	18.69	4.82	14.56
Al $L_{2,3}M$	72.4	2.51 04		1.69	171.4	Cu Lα	929.7	4.89 03	18.75	4.22	13.33
Si $L_{2,3}M$	91.5	2.38 04		2.02	135.5	Zn Lα	1011.7	4.11 03	18.77	3.86	12.25
Be K	108.5	2.10 04	7.11	2.12	114.	Na Kα	1041.0	3.81 03	18.77	3.69	11.91
Sr Mζ	114.0	2.01 04	7.16	2.13	108.7	Ge Lα	1188.0	2.68 03	18.72	2.96	10.44
Y Mζ	132.8	1.74 04	7.34	2.15	93.4	Mg Kα	1253.6	2.32 03	18.68	2.71	9.89
S Lℓ	148.7	1.52 04	7.38	2.09	83.4	Al Kα	1486.7	1.48 03	18.53	2.04	8.34
Zr Mζ	151.1	1.49 04	7.38	2.09	82.1	Si Kα	1740.0	9.78 02	18.36	1.58	7.13
Nb Mζ	171.7	1.25 04	7.29	1.99	72.2	Zr Lα	2042.4	6.40 02	18.13	1.22	6.07
B Kα	183.3	1.13 04	7.16	1.93	67.6	Nb Lα	2165.9	5.48 02		1.10	5.73
Mo Mζ	192.6	1.05 04	7.02	1.88	64.4	Mo Lα	2293.2	4.70 02		1.00	5.41
W N_5N_7	212.2	9.03 03	6.57	1.78	58.4	Cl Kα	2622.4	3.27 02		0.80	4.73
C Kα	277.0	5.68 03	1.54	1.46	44.7	Ag Lα	2984.3	2.30 02		0.64	4.16
Ag Mζ	311.7	7.38 04	2.34	21.38	39.8	Ca Kα	3691.7	1.18 03		4.04	3.36
N Kα	392.4	3.59 04	11.93	13.09	31.6	Ba Lα	4466.3	7.24 02		3.00	2.78
Ti Lℓ	395.3	3.55 04	12.15	13.04	31.4	Ti Kα	4510.8	7.05 02		2.96	2.75
Ti Lα	452.2	2.69 04	14.78	11.29	27.4	V Kα	4952.2	5.52 02		2.54	2.50
V Lα	511.3	2.05 04	16.37	9.75	24.3	Cr Kα	5414.7	4.35 02		2.19	2.29
O Kα	524.9	1.94 04	16.65	9.45	23.6	Mn Kα	5898.8	3.45 02		1.89	2.10
Mn Lℓ	556.3	1.70 04	17.13	8.77	22.3	Co Kα	6930.3	2.22 02		1.43	1.79
Cr Lα	572.8	1.58 04	17.34	8.43	21.6	Ni Kα	7478.2	1.80 02		1.25	1.66
Mn Lα	637.4	1.24 04	17.95	7.31	19.5	Cu Kα	8047.8	1.47 02		1.10	1.54
F Kα	676.8	1.06 04	18.19	6.68	18.3	Zn Kα	8638.9	1.20 02		0.96	1.44
Fe Lα	705.0	9.71 03	18.33	6.36	17.6	Ge Kα	9886.4	8.22 01		0.75	1.25

ABSORPTION EDGE

K 3607.8 eV 3.4365 A $L_{2,3}$ 294.6 eV 42.1 A





For E < 300 eV ——— (129) x .945

References: 129

XI. Low-Energy X-Ray Interaction Coefficient Tables

See page 19 for Explanation of Tables

TABLE I. PHOTOABSORPTION CROSS SECTION, μ
ATOMIC SCATTERING FACTOR, $f_1 + if_2$

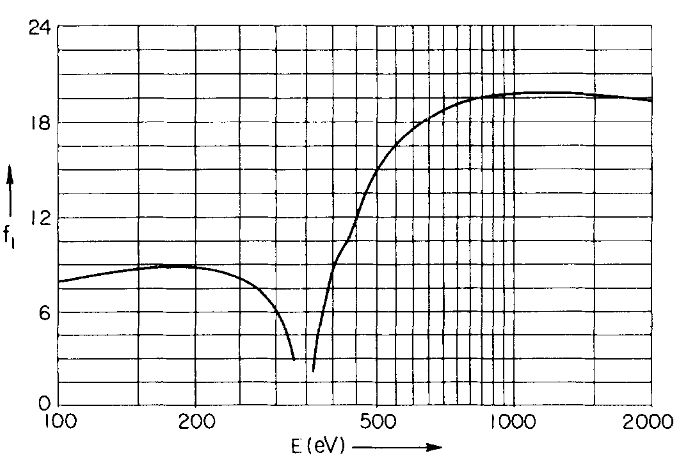
Atomic Weight = 40.08 Z = 20

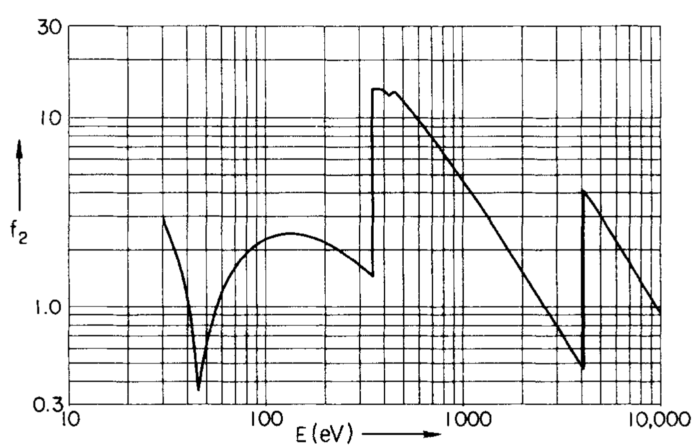
μ(barns/atom) = μ(cm^2/gm) x 66.54 CALCIUM (Ca)
Eμ(E) = 1049. f_2 keVcm^2/gm

LINE	E(eV)	μ(cm^2/gm)	f_1	f_2	λ(A)
Na $L_{2,3}M$	30.5	9.93 04		2.88	407.1
Mg $L_{2,3}M$	49.3	1.47 04		0.69	251.5
Al $L_{2,3}M$	72.4	2.47 04		1.70	171.4
Si $L_{2,3}M$	91.5	2.50 04		2.18	135.5
Be K	108.5	2.22 04	8.07	2.29	114.
Sr Mζ	114.0	2.14 04	8.17	2.32	108.7
Y Mζ	132.8	1.87 04	8.47	2.37	93.4
S Lℓ	148.7	1.70 04	8.64	2.40	83.4
Zr Mζ	151.1	1.67 04	8.66	2.41	82.1
Nb Mζ	171.7	1.41 04	8.77	2.31	72.2
B Kα	183.3	1.30 04	8.78	2.27	67.6
Mo Mζ	192.6	1.21 04	8.76	2.23	64.4
W N_5N_7	212.2	1.06 04	8.65	2.13	58.4
C Kα	277.0	6.84 03	7.25	1.80	44.7
Ag Mζ	311.7	5.64 03	5.17	1.68	39.8
N Kα	392.4	3.56 04	7.82	13.31	31.6
Ti Lℓ	395.3	3.51 04	8.17	13.22	31.4
Ti Lα	452.2	3.03 04	12.20	13.07	27.4
V Lα	511.3	2.33 04	15.36	11.35	24.3
O Kα	524.9	2.20 04	15.81	11.02	23.6
Mn Lℓ	556.3	1.94 04	16.68	10.29	22.3
Cr Lα	572.8	1.82 04	17.05	9.91	21.6
Mn Lα	637.4	1.43 04	18.11	8.69	19.5
F Kα	676.8	1.24 04	18.54	7.98	18.3
Fe Lα	705.0	1.14 04	18.77	7.62	17.6
Co Lα	776.2	9.01 03	19.22	6.66	16.0
Ni Lα	851.5	7.16 03	19.49	5.81	14.56
Cu Lα	929.7	5.77 03	19.66	5.11	13.33
Zn Lα	1011.7	4.69 03	19.75	4.52	12.25
Na Kα	1041.0	4.36 03	19.77	4.32	11.91
Ge Lα	1188.0	3.11 03	19.79	3.52	10.44
Mg Kα	1253.6	2.71 03	19.78	3.24	9.89
Al Kα	1486.7	1.76 03	19.68	2.49	8.34
Si Kα	1740.0	1.15 03	19.53	1.90	7.13
Zr Lα	2042.4	7.41 02	19.35	1.44	6.07
Nb Lα	2165.9	6.31 02		1.30	5.73
Mo Lα	2293.2	5.40 02		1.18	5.41
Cl Kα	2622.4	3.75 02		0.94	4.73
Ag Lα	2984.3	2.64 02		0.75	4.16
Ca Kα	3691.7	1.50 02		0.53	3.36
Ba Lα	4466.3	8.33 02		3.55	2.78
Ti Kα	4510.8	8.12 02		3.49	2.75
V Kα	4952.2	6.37 02		3.01	2.50
Cr Kα	5414.7	5.03 02		2.60	2.29
Mn Kα	5898.8	4.00 02		2.25	2.10
Co Kα	6930.3	2.58 02		1.71	1.79
Ni Kα	7478.2	2.10 02		1.49	1.66
Cu Kα	8047.8	1.71 02		1.31	1.54
Zn Kα	8638.9	1.41 02		1.16	1.44
Ge Kα	9886.4	9.65 01		0.91	1.25

ABSORPTION EDGE

K	4038.1 eV	3.0703 A		L_2	352.9 eV	35.13 A
				L_3	349.31 eV	35.49 A





For E < 100 eV ——— (129) x .898

References: 98, 129

XI. Low-Energy X-Ray Interaction Coefficient Tables

See page 19 for Explanation of Tables

TABLE I. PHOTOABSORPTION CROSS SECTION, μ
ATOMIC SCATTERING FACTOR, $f_1 + if_2$

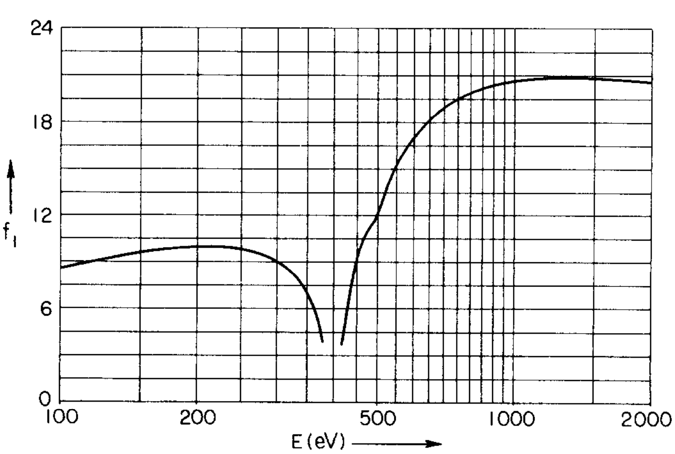
Atomic Weight = 44.96 Z = 2

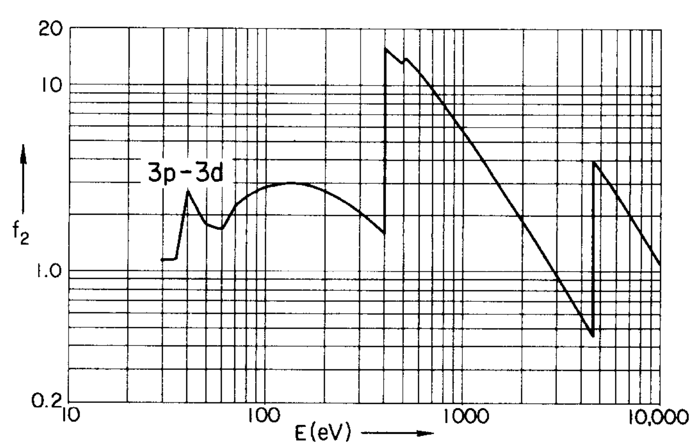
μ(barns/atom) = μ(cm^2/gm) x 74.64 SCANDIUM (Sc)
Eμ(E) = 935.5 f_2 keVcm^2/gm

LINE	E(eV)	μ(cm^2/gm)	f_1	f_2	λ(A)	LINE	E(eV)	μ(cm^2/gm)	f_1	f_2	λ(A)
Na $L_{2,3}M$	30.5	3.53 04		1.15	407.1	Co Lα	776.2	9.72 03	19.68	8.07	16.0
Mg $L_{2,3}M$	49.3	3.41 04		1.80	251.5	Ni Lα	851.5	7.75 03	20.14	7.06	14.56
Al $L_{2,3}M$	72.4	3.02 04		2.33	171.4	Cu Lα	929.7	6.25 03	20.44	6.21	13.33
Si $L_{2,3}M$	91.5	2.82 04		2.76	135.5	Zn Lα	1011.7	5.07 03	20.64	5.48	12.25
Be K	108.5	2.50 04	8.72	2.89	114.	Na Kα	1041.0	4.72 03	20.68	5.25	11.91
Sr Mζ	114.0	2.39 04	8.84	2.91	108.7	Ge Lα	1188.0	3.39 03	20.80	4.30	10.44
Y Mζ	132.8	2.07 04	9.24	2.93	93.4	Mg Kα	1253.6	2.96 03	20.81	3.96	9.89
S Lℓ	148.7	1.86 04	9.50	2.95	83.4	Al Kα	1486.7	1.92 03	20.76	3.04	8.34
Zr Mζ	151.1	1.83 04	9.53	2.95	82.1	Si Kα	1740.0	1.27 03	20.64	2.37	7.13
Nb Mζ	171.7	1.54 04	9.77	2.83	72.2	Zr Lα	2042.4	8.37 02	20.46	1.83	6.07
B Kα	183.3	1.42 04	9.85	2.78	67.6	Nb Lα	2165.9	7.17 02		1.66	5.73
Mo Mζ	192.6	1.32 04	9.90	2.72	64.4	Mo Lα	2293.2	6.16 02		1.51	5.41
W N_5N_7	212.2	1.15 04	9.93	2.60	58.4	Cl Kα	2622.4	4.31 02		1.21	4.73
C Kα	277.0	7.46 03	9.41	2.21	44.7	Ag Lα	2984.3	3.04 02		0.97	4.16
Ag Mζ	311.7	6.03 03	8.62	2.01	39.8	Ca Kα	3691.7	1.70 02		0.67	3.36
N Kα	392.4	3.99 03	0.07	1.67	31.6	Ba Lα	4466.3	9.92 01		0.47	2.78
Ti Lℓ	395.3	3.93 03	-1.65	1.66	31.4	Ti Kα	4510.8	8.47 02		4.08	2.75
Ti Lα	452.2	2.84 04	9.46	13.74	27.4	V Kα	4952.2	6.74 02		3.57	2.50
V Lα	511.3	2.44 04	13.02	13.32	24.3	Cr Kα	5414.7	5.38 02		3.11	2.29
O Kα	524.9	2.36 04	14.06	13.24	23.6	Mn Kα	5898.8	4.31 02		2.72	2.10
Mn Lℓ	556.3	2.08 04	15.61	12.38	22.3	Co Kα	6930.3	2.81 02		2.08	1.79
Cr Lα	572.8	1.95 04	16.22	11.94	21.6	Ni Kα	7478.2	2.29 02		1.83	1.66
Mn Lα	637.4	1.54 04	17.90	10.48	19.5	Cu Kα	8047.8	1.87 02		1.61	1.54
F Kα	676.8	1.33 04	18.59	9.62	18.3	Zn Kα	8638.9	1.54 02		1.42	1.44
Fe Lα	705.0	1.22 04	18.97	9.19	17.6	Ge Kα	9886.4	1.06 02		1.12	1.25

ABSORPTION EDGE

K 4489 eV 2.762 A L_3** 401 eV 30.9 A





For E < 100 eV ——— (129) x 0.94

References: 129

XI. Low-Energy X-Ray Interaction Coefficient Tables

See page 19 for Explanation of Tables

TABLE I. PHOTOABSORPTION CROSS SECTION, μ
ATOMIC SCATTERING FACTOR, $f_1 + if_2$

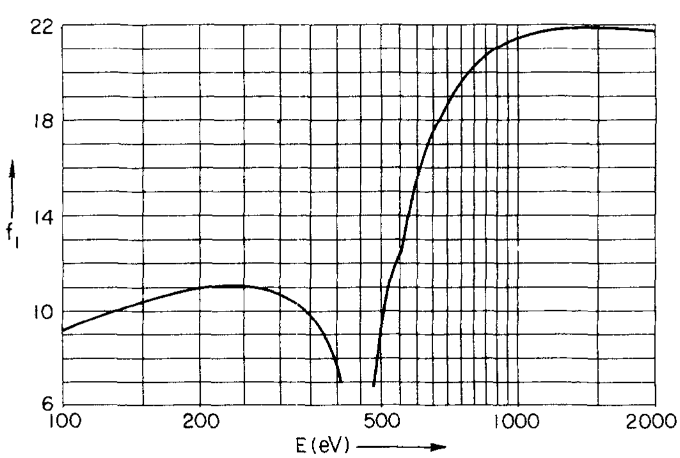
Atomic Weight = 47.90 Z = 22

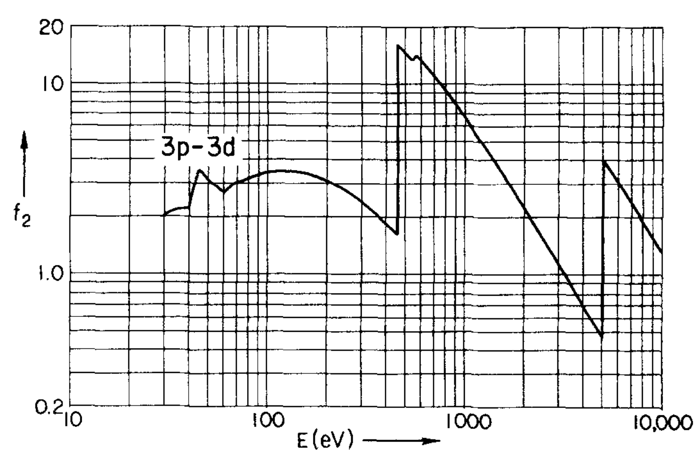
μ(barns/atom) = μ(cm^2/gm) x 79.53 TITANIUM (Ti)
Eμ(E) = 878.0 f_2 keVcm^2/gm

LINE	E(eV)	μ(cm^2/gm)	f_1	f_2	λ(A)
Na $L_{2,3}M$	30.5	6.00 04		2.08	407.1
Mg $L_{2,3}M$	49.3	5.66 04		3.17	251.5
Al $L_{2,3}M$	72.4	3.79 04		3.13	171.4
Si $L_{2,3}M$	91.5	3.23 04		3.37	135.5
Be K	108.5	2.75 04	9.48	3.40	114.
Sr Mζ	114.0	2.63 04	9.62	3.41	108.7
Y Mζ	132.8	2.25 04	10.09	3.40	93.4
S Lℓ	148.7	2.00 04	10.39	3.39	83.4
Zr Mζ	151.1	1.97 04	10.43	3.39	82.1
Nb Mζ	171.7	1.66 04	10.74	3.24	72.2
B Kα	183.3	1.53 04	10.86	3.19	67.6
Mo Mζ	192.6	1.43 04	10.95	3.13	64.4
W N_5N_7	212.2	1.24 04	11.06	2.99	58.4
C Kα	277.0	8.09 03	10.95	2.55	44.7
Ag Mζ	311.7	6.57 03	10.57	2.33	39.8
N Kα	392.4	4.36 03	8.17	1.95	31.6
Ti Lℓ	395.3	4.30 03	8.01	1.94	31.4
Ti Lα	452.2	3.32 03	-5.87	1.71	27.4
V Lα	511.3	2.34 04	10.61	13.64	24.3
O Kα	524.9	2.21 04	11.57	13.23	23.6
Mn Lℓ	556.3	1.95 04	12.73	12.37	22.3
Cr Lα	572.8	2.12 04	14.03	13.82	21.6
Mn Lα	637.4	1.67 04	17.13	12.15	19.5
F Kα	676.8	1.45 04	18.21	11.20	18.3
Fe Lα	705.0	1.34 04	18.85	10.73	17.6
Co Lα	776.2	1.07 04	19.91	9.43	16.0
Ni Lα	851.5	8.56 03	20.64	8.30	14.56
Cu Lα	929.7	6.93 03	21.13	7.34	13.33
Zn Lα	1011.7	5.63 03	21.45	6.48	12.25
Na Kα	1041.0	5.25 03	21.53	6.22	11.91
Ge Lα	1188.0	3.77 03	21.78	5.10	10.44
Mg Kα	1253.6	3.30 03	21.84	4.71	9.89
Al Kα	1486.7	2.14 03	21.87	3.62	8.34
Si Kα	1740.0	1.41 03	21.80	2.80	7.13
Zr Lα	2042.4	9.24 02	21.65	2.15	6.07
Nb Lα	2165.9	7.90 02		1.95	5.73
Mo Lα	2293.2	6.77 02		1.77	5.41
Cl Kα	2622.4	4.72 02		1.41	4.73
Ag Lα	2984.3	3.33 02		1.13	4.16
Ca Kα	3691.7	1.87 02		0.79	3.36
Ba Lα	4466.3	1.11 02		0.57	2.78
Ti Kα	4510.8	1.08 02		0.56	2.75
V Kα	4952.2	8.38 01		0.47	2.50
Cr Kα	5414.7	5.77 02		3.56	2.29
Mn Kα	5898.8	4.65 02		3.12	2.10
Co Kα	6930.3	3.05 02		2.41	1.79
Ni Kα	7478.2	2.49 02		2.12	1.66
Cu Kα	8047.8	2.04 02		1.87	1.54
Zn Kα	8638.9	1.68 02		1.65	1.44
Ge Kα	9886.4	1.16 02		1.30	1.25

ABSORPTION EDGE

K	4964.5 eV	2.497 A
$L_{2,3}$	454.4 eV	27.29 A
L_3*	454.3 eV	27.38 A





For E < 100 eV ——— (129) x 0.92

References: 9, 14, 39, 78, 80, 114, 129

XI. Low-Energy X-Ray Interaction Coefficient Tables

See page 19 for Explanation of Tables

TABLE I. PHOTOABSORPTION CROSS SECTION, μ
ATOMIC SCATTERING FACTOR, $f_1 + if_2$

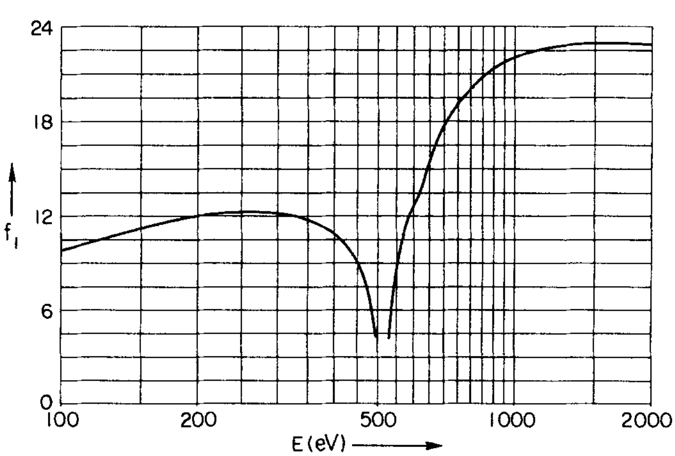
Atomic Weight = 50.94 Z = 23

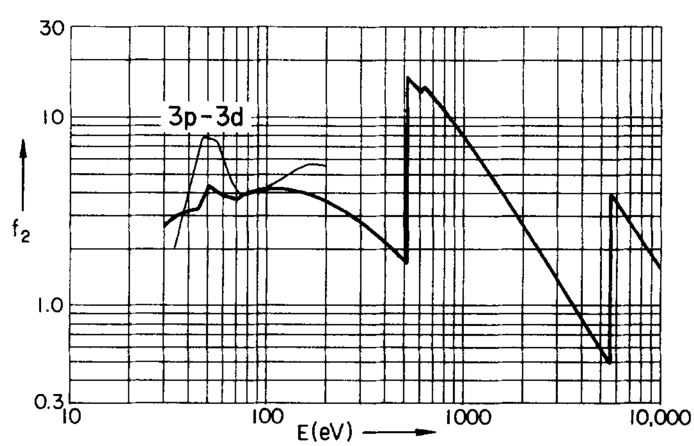
μ(barns/atom) = μ(cm^2/gm) x 84.58 VANADIUM (V)
$E\mu(E)$ = 825.6 f_2 keVcm^2/gm

LINE	E(eV)	μ(cm^2/gm)	f_1	f_2	λ(A)	LINE	E(eV)	μ(cm^2/gm)	f_1	f_2	λ(A)
Na $L_{2,3}M$	30.5	7.29 04		2.69	407.1	Co $L\alpha$	776.2	1.16 04	19.67	10.93	16.0
Mg $L_{2,3}M$	49.3	7.17 04		4.28	251.5	Ni $L\alpha$	851.5	9.37 03	20.80	9.66	14.56
Al $L_{2,3}M$	72.4	4.32 04		3.79	171.4	Cu $L\alpha$	929.7	7.62 03	21.54	8.58	13.33
Si $L_{2,3}M$	91.5	3.76 04		4.16	135.5	Zn $L\alpha$	1011.7	6.21 03	22.06	7.60	12.25
Be K	108.5	3.07 04	10.15	4.03	114.	Na $K\alpha$	1041.0	5.79 03	22.19	7.30	11.91
Sr $M\zeta$	114.0	2.93 04	10.32	4.04	108.7	Ge $L\alpha$	1188.0	4.18 03	22.63	6.01	10.44
Y $M\zeta$	132.8	2.48 04	10.89	3.99	93.4	Mg $K\alpha$	1253.6	3.66 03	22.74	5.55	9.89
S $L\ell$	148.7	2.20 04	11.26	3.96	83.4	Al $K\alpha$	1486.7	2.38 03	22.90	4.28	8.34
Zr $M\zeta$	151.1	2.16 04	11.31	3.96	82.1	Si $K\alpha$	1740.0	1.58 03	22.88	3.33	7.13
Nb $M\zeta$	171.7	1.82 04	11.70	3.78	72.2	Zr $L\alpha$	2042.4	1.04 03	22.77	2.57	6.07
B $K\alpha$	183.3	1.67 04	11.86	3.71	67.6	Nb $L\alpha$	2165.9	8.89 02		2.33	5.73
Mo $M\zeta$	192.6	1.56 04	11.98	3.63	64.4	Mo $L\alpha$	2293.2	7.64 02		2.12	5.41
W N_5N_7	212.2	1.35 04	12.17	3.47	58.4	Cl $K\alpha$	2622.4	5.34 02		1.70	4.73
C $K\alpha$	277.0	8.84 03	12.32	2.97	44.7	Ag $L\alpha$	2984.3	3.77 02		1.36	4.16
Ag $M\zeta$	311.7	7.18 03	12.17	2.71	39.8	Ca $K\alpha$	3691.7	2.12 02		0.95	3.36
N $K\alpha$	392.4	4.79 03	11.04	2.28	31.6	Ba $L\alpha$	4466.3	1.26 02		0.68	2.78
Ti $L\ell$	395.3	4.72 03	10.97	2.26	31.4	Ti $K\alpha$	4510.8	1.23 02		0.67	2.75
Ti $L\alpha$	452.2	3.65 03	8.85	2.00	27.4	V $K\alpha$	4952.2	9.50 01		0.57	2.50
V $L\alpha$	511.3	2.88 03	-6.05	1.78	24.3	Cr $K\alpha$	5414.7	7.42 01		0.49	2.29
O $K\alpha$	524.9	2.43 04	3.17	15.41	23.6	Mn $K\alpha$	5898.8	5.03 02		3.59	2.10
Mn $L\ell$	556.3	2.13 04	9.71	14.36	22.3	Co $K\alpha$	6930.3	3.34 02		2.80	1.79
Cr $L\alpha$	572.8	1.99 04	11.29	13.82	21.6	Ni $K\alpha$	7478.2	2.74 02		2.48	1.66
Mn $L\alpha$	637.4	1.82 04	14.91	14.02	19.5	Cu $K\alpha$	8047.8	2.25 02		2.19	1.54
F $K\alpha$	676.8	1.58 04	17.00	12.91	18.3	Zn $K\alpha$	8638.9	1.86 02		1.95	1.44
Fe $L\alpha$	705.0	1.45 04	17.98	12.35	17.6	Ge $K\alpha$	9886.4	1.29 02		1.54	1.25

ABSORPTION EDGE

K 5463.9 eV 2.2691 A L_3* 511.3 eV 24.25. A





For E < 100 eV ———— (129) x 0.9
———— (39)

References: 39, 78, 114, 129

XI. Low-Energy X-Ray Interaction Coefficient Tables

See page 19 for Explanation of Tables

TABLE I. PHOTOABSORPTION CROSS SECTION, μ
ATOMIC SCATTERING FACTOR, $f_1 + if_2$

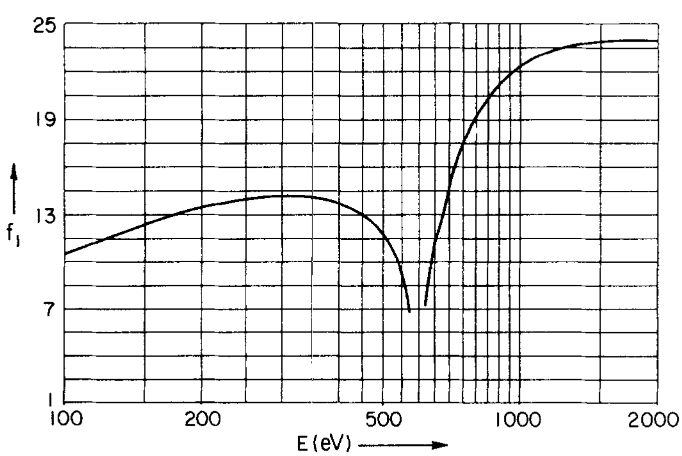
Atomic Weight = 52.00 Z = 24

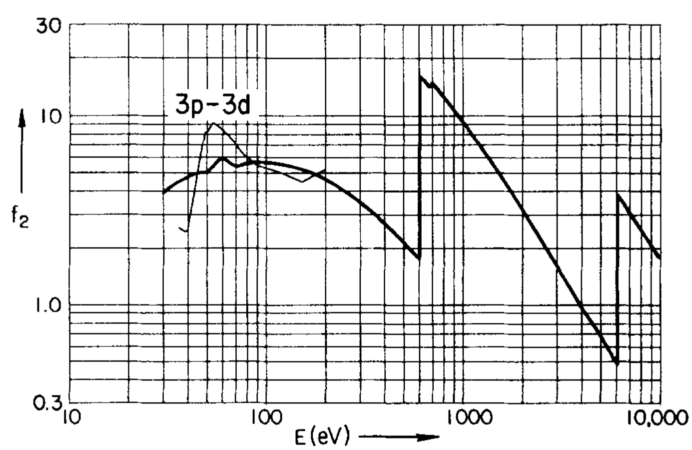
μ(barns/atom) = μ(cm^2/gm) x 86.33 CHROMIUM (Cr)
$E\mu(E)$ = 808.9 f_2 keVcm^2/gm

LINE	E(eV)	μ(cm^2/gm)	f_1	f_2	λ(A)
Na $L_{2,3}M$	30.5	1.05 05		3.95	407.1
Mg $L_{2,3}M$	49.3	8.26 04		5.04	251.5
Al $L_{2,3}M$	72.4	6.12 04		5.47	171.4
Si $L_{2,3}M$	91.5	5.02 04		5.68	135.5
Be K	108.5	4.02 04	10.93	5.39	114.
Sr $M\zeta$	114.0	3.81 04	11.17	5.37	108.7
Y $M\zeta$	132.8	3.17 04	11.90	5.21	93.4
S $L\ell$	148.7	2.77 04	12.40	5.10	83.4
Zr $M\zeta$	151.1	2.73 04	12.47	5.09	82.1
Nb $M\zeta$	171.7	2.26 04	12.99	4.80	72.2
B $K\alpha$	183.3	2.07 04	13.22	4.68	67.6
Mo $M\zeta$	192.6	1.92 04	13.39	4.56	64.4
W N_5N_7	212.2	1.65 04	13.67	4.33	58.4
C $K\alpha$	277.0	1.06 04	14.14	3.63	44.7
Ag $M\zeta$	311.7	8.54 03	14.17	3.29	39.8
N $K\alpha$	392.4	5.63 03	13.77	2.73	31.6
Ti $L\ell$	395.3	5.55 03	13.74	2.71	31.4
Ti $L\alpha$	452.2	4.26 03	12.96	2.38	27.4
V $L\alpha$	511.3	3.32 03	11.39	2.10	24.3
O $K\alpha$	524.9	3.14 03	10.81	2.04	23.6
Mn $L\ell$	556.3	2.78 03	8.78	1.91	22.3
Cr $L\alpha$	572.8	2.61 03	6.80	1.85	21.6
Mn $L\alpha$	637.4	1.87 04	10.33	14.71	19.5
F $K\alpha$	676.8	1.59 04	12.83	13.31	18.3
Fe $L\alpha$	705.0	1.67 04	15.46	14.58	17.6
Co $L\alpha$	776.2	1.34 04	18.54	12.89	16.0
Ni $L\alpha$	851.5	1.08 04	20.40	11.41	14.56
Cu $L\alpha$	929.7	8.84 03	21.60	10.16	13.33
Zn $L\alpha$	1011.7	7.22 03	22.42	9.02	12.25
Na $K\alpha$	1041.0	6.73 03	22.63	8.66	11.91
Ge $L\alpha$	1188.0	4.86 03	23.36	7.13	10.44
Mg $K\alpha$	1253.6	4.25 03	23.56	6.59	9.89
Al $K\alpha$	1486.7	2.77 03	23.91	5.08	8.34
Si $K\alpha$	1740.0	1.83 03	24.00	3.94	7.13
Zr $L\alpha$	2042.4	1.19 03	23.96	3.01	6.07
Nb $L\alpha$	2165.9	1.02 03		2.72	5.73
Mo $L\alpha$	2293.2	8.70 02		2.47	5.41
Cl $K\alpha$	2622.4	6.03 02		1.95	4.73
Ag $L\alpha$	2984.3	4.23 02		1.56	4.16
Ca $K\alpha$	3691.7	2.35 02		1.07	3.36
Ba $L\alpha$	4466.3	1.39 02		0.77	2.78
Ti $K\alpha$	4510.8	1.36 02		0.76	2.75
V $K\alpha$	4952.2	1.05 02		0.64	2.50
Cr $K\alpha$	5414.7	8.27 01		0.55	2.29
Mn $K\alpha$	5898.8	6.57 01		0.48	2.10
Co $K\alpha$	6930.3	3.61 02		3.10	1.79
Ni $K\alpha$	7478.2	2.97 02		2.75	1.66
Cu $K\alpha$	8047.8	2.45 02		2.44	1.54
Zn $K\alpha$	8638.9	2.03 02		2.17	1.44
Ge $K\alpha$	9886.4	1.41 02		1.73	1.25

ABSORPTION EDGE

K	5988.8 eV	2.070 A	L_1	741 eV	16.7 A
			L_2	691 eV	17.9 A
			L_3	598 eV	20.7 A





For E < 100 eV —— (129) x 0.96
—— (39)

References: 4, 39, 78, 129

XI. Low-Energy X-Ray Interaction Coefficient Tables

See page 19 for Explanation of Tables

TABLE I. PHOTOABSORPTION CROSS SECTION, μ
ATOMIC SCATTERING FACTOR, $f_1 + if_2$

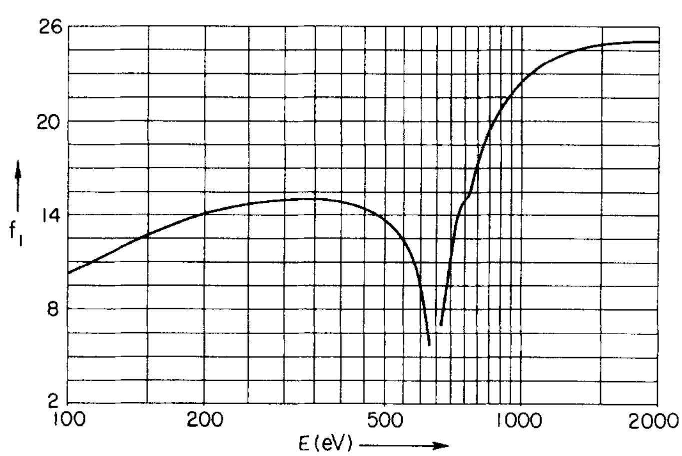
Atomic Weight = 54.94 Z = 25

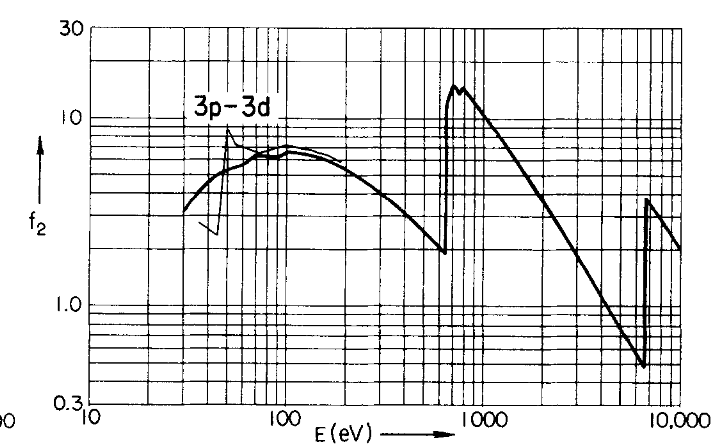
μ(barns/atom) = μ(cm^2/gm) x 91.21 MANGANESE (Mn)
$E\mu(E)$ = 765.5 f_2 keVcm^2/gm

LINE	E(eV)	μ(cm^2/gm)	f_1	f_2	λ(A)	LINE	E(eV)	μ(cm^2/gm)	f_1	f_2	λ(A)
Na $L_{2,3}M$	30.5	8.07 04		3.21	407.1	Co Lα	776.2	1.43 04	15.90	14.48	16.0
Mg $L_{2,3}M$	49.3	8.19 04		5.27	251.5	Ni Lα	851.5	1.16 04	19.58	12.85	14.56
Al $L_{2,3}M$	72.4	6.71 04		6.34	171.4	Cu Lα	929.7	9.47 03	21.39	11.50	13.33
Si $L_{2,3}M$	91.5	5.21 04		6.23	135.5	Zn Lα	1011.7	7.77 03	22.58	10.26	12.25
Be K	108.5	4.18 04	10.74	5.92	114.	Na Kα	1041.0	7.26 03	22.90	9.86	11.91
Sr Mζ	114.0	3.97 04	11.04	5.91	108.7	Ge Lα	1188.0	5.26 03	23.97	8.17	10.44
Y Mζ	132.8	3.35 04	11.99	5.81	93.4	Mg Kα	1253.6	4.62 03	24.26	7.56	9.89
S Lℓ	148.7	2.95 04	12.62	5.73	83.4	Al Kα	1486.7	3.03 03	24.83	5.88	8.34
Zr Mζ	151.1	2.90 04	12.70	5.73	82.1	Si Kα	1740.0	2.03 03	25.02	4.61	7.13
Nb Mζ	171.7	2.42 04	13.38	5.42	72.2	Zr Lα	2042.4	1.33 03	25.04	3.55	6.07
B Kα	183.3	2.22 04	13.66	5.17	67.6	Nb Lα	2165.9	1.14 03		3.22	5.73
Mo Mζ	192.6	2.06 04	13.87	5.18	64.4	Mo Lα	2293.2	9.76 02		2.92	5.41
W N_5N_7	212.2	1.78 04	14.24	4.93	58.4	Cl Kα	2622.4	6.78 02		2.32	4.73
C Kα	277.0	1.15 04	14.91	4.15	44.7	Ag Lα	2984.3	4.77 02		1.86	4.16
Ag Mζ	311.7	9.29 03	15.03	3.78	39.8	Ca Kα	3691.7	2.66 02		1.28	3.36
N Kα	392.4	6.16 03	14.87	3.16	31.6	Ba Lα	4466.3	1.58 02		0.92	2.78
Ti Lℓ	395.3	6.08 03	14.85	3.14	31.4	Ti Kα	4510.8	1.53 02		0.90	2.75
Ti Lα	452.2	4.67 03	14.35	2.76	27.4	V Kα	4952.2	1.19 02		0.77	2.50
V Lα	511.3	3.66 03	13.39	2.44	24.3	Cr Kα	5414.7	9.34 01		0.66	2.29
O Kα	524.9	3.47 03	13.07	2.38	23.6	Mn Kα	5898.8	7.42 01		0.57	2.10
Mn Lℓ	556.3	3.08 03	12.09	2.24	22.3	Co Kα	6930.3	3.94 02		3.56	1.79
Cr Lα	572.8	2.90 03	11.38	2.17	21.6	Ni Kα	7478.2	3.25 02		3.18	1.66
Mn Lα	637.4	2.32 03	0.13	1.93	19.5	Cu Kα	8047.8	2.70 02		2.83	1.54
F Kα	676.8	1.61 04	8.28	14.21	18.3	Zn Kα	8638.9	2.24 02		2.53	1.44
Fe Lα	705.0	1.61 04	12.40	14.82	17.6	Ge Kα	9886.4	1.57 02		2.02	1.25

ABSORPTION EDGE

K 6537.6 eV 1.8964 A L_3** 640 eV 19.4 A $M_{2,3}$* 49.50 eV 250.5 A





For E < 100 eV —— (129) x 0.94
—— (39)

References: 4, 39, 78, 97, 129

XI. Low-Energy X-Ray Interaction Coefficient Tables

See page 19 for Explanation of Tables

TABLE I. PHOTOABSORPTION CROSS SECTION, μ
ATOMIC SCATTERING FACTOR, $f_1 + if_2$

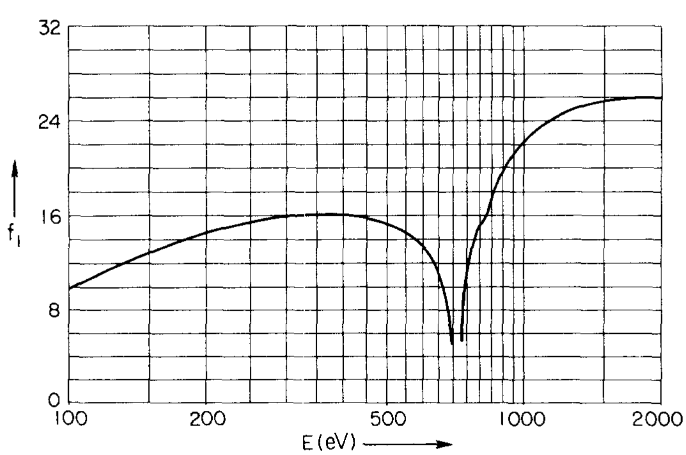
Atomic Weight = 55.85 Z = 26

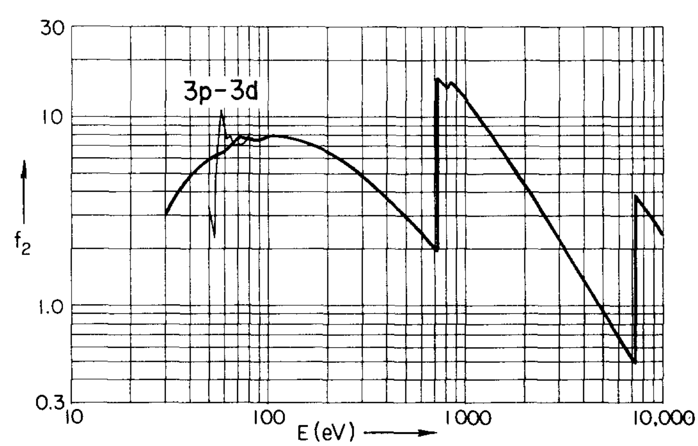
μ(barns/atom) = μ(cm^2/gm) x 92.72 IRON (Fe)
Eμ(E) = 753.1 f_2 keVcm^2/gm

LINE	E(eV)	μ(cm^2/gm)	f_1	f_2	λ(A)	LINE	E(eV)	μ(cm^2/gm)	f_1	f_2	λ(A)
Na $L_{2,3}M$	30.5	7.71 04		3.12	407.1	Co Lα	776.2	1.45 04	14.05	14.98	16.0
Mg $L_{2,3}M$	49.3	8.98 04		5.88	251.5	Ni Lα	851.5	1.32 04	17.70	14.93	14.56
Al $L_{2,3}M$	72.4	7.96 04		7.66	171.4	Cu Lα	929.7	1.07 04	20.75	13.19	13.33
Si $L_{2,3}M$	91.5	6.18 04		7.50	135.5	Zn Lα	1011.7	8.78 03	22.48	11.79	12.25
Be K	108.5	5.43 04	10.51	7.82	114.	Na Kα	1041.0	8.20 03	22.93	11.34	11.91
Sr Mζ	114.0	5.13 04	10.89	7.77	108.7	Ge Lα	1188.0	5.97 03	24.43	9.42	10.44
Y Mζ	132.8	4.30 04	12.04	7.58	93.4	Mg Kα	1253.6	5.25 03	24.84	8.73	9.89
S Lℓ	148.7	3.71 04	12.81	7.33	83.4	Al Kα	1486.7	3.44 03	25.68	6.79	8.34
Zr Mζ	151.1	3.64 04	12.91	7.30	82.1	Si Kα	1740.0	2.31 03	26.00	5.33	7.13
Nb Mζ	171.7	3.04 04	13.75	6.93	72.2	Zr Lα	2042.4	1.52 03	26.09	4.12	6.07
B Kα	183.3	2.76 04	14.11	6.71	67.6	Nb Lα	2165.9	1.30 03		3.74	5.73
Mo Mζ	192.6	2.56 04	14.38	6.55	64.4	Mo Lα	2293.2	1.12 03		3.40	5.41
W N_5N_7	212.2	2.19 04	14.85	6.18	58.4	Cl Kα	2622.4	7.80 02		2.72	4.73
C Kα	277.0	1.39 04	15.76	5.10	44.7	Ag Lα	2984.3	5.50 02		2.18	4.16
Ag Mζ	311.7	1.12 04	15.98	4.63	39.8	Ca Kα	3691.7	3.08 02		1.51	3.36
N Kα	392.4	7.19 03	16.03	3.75	31.6	Ba Lα	4466.3	1.83 02		1.08	2.78
Ti Lℓ	395.3	7.09 03	16.02	3.72	31.4	Ti Kα	4510.8	1.78 02		1.07	2.75
Ti Lα	452.2	5.41 03	15.73	3.25	27.4	V Kα	4952.2	1.38 02		0.91	2.50
V Lα	511.3	4.42 03	15.13	2.86	24.3	Cr Kα	5414.7	1.08 02		0.77	2.29
O Kα	524.9	4.00 03	14.94	2.79	23.6	Mn Kα	5898.8	8.52 01		0.67	2.10
Mn Lℓ	556.3	3.55 03	14.39	2.62	22.3	Co Kα	6930.3	5.48 01		0.50	1.79
Cr Lα	572.8	3.33 03	14.04	2.53	21.6	Ni Kα	7478.2	3.61 02		3.59	1.66
Mn Lα	637.4	2.68 03	11.75	2.27	19.5	Cu Kα	8047.8	3.00 02		3.21	1.54
F Kα	676.8	2.33 03	8.45	2.09	18.3	Zn Kα	8638.9	2.51 02		2.88	1.44
Fe Lα	705.0	2.15 03	-2.87	2.01	17.6	Ge Kα	9886.4	1.76 02		2.31	1.25

ABSORPTION EDGE

K	7111.2 eV	1.7435 A	L_2	720.8 eV	17.202 A	$M_{2,3}$	53.8 eV	230 A
			L_3	707.4 eV	17.525 A			





For E < 630 eV ——— (129) x 0.949
——— (127)

References: 4, 39, 78, 80, 127, 129

XI. Low-Energy X-Ray Interaction Coefficient Tables

See page 19 for Explanation of Tables

TABLE I. PHOTOABSORPTION CROSS SECTION, μ
ATOMIC SCATTERING FACTOR, $f_1 + if_2$

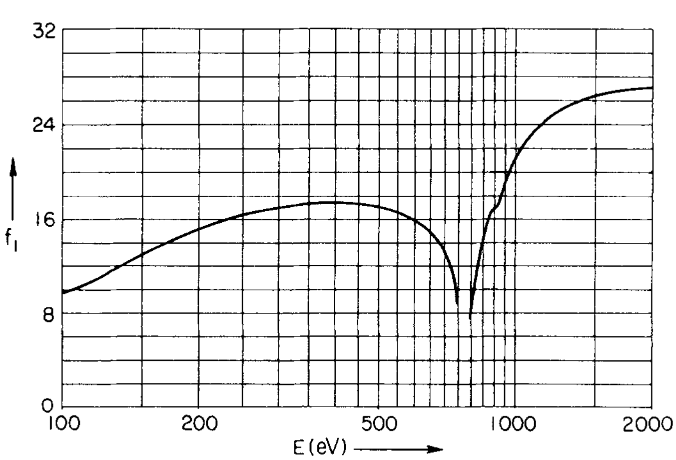
Atomic Weight = 58.93 Z = 27

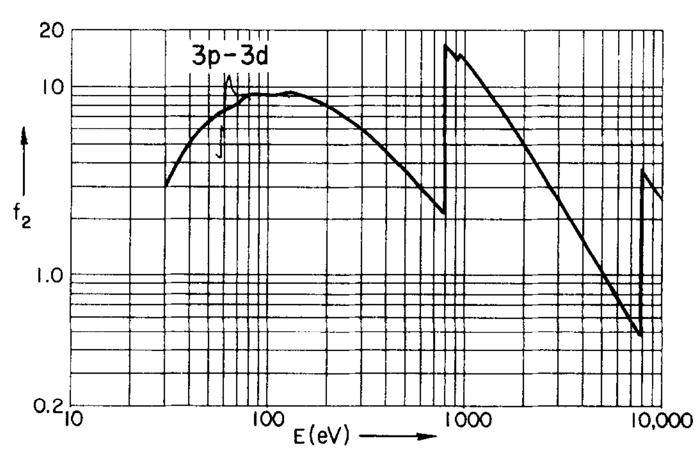
μ(barns/atom) = μ(cm²/gm) x 97.85 COBALT (Co)
Eμ(E) = 713.6 f_2 keVcm²/gm

LINE	E(eV)	μ(cm²/gm)	f_1	f_2	λ(A)	LINE	E(eV)	μ(cm²/gm)	f_1	f_2	λ(A)
Na $L_{2,3}M$	30.5	6.80 04		2.90	407.1	Co Lα	776.2	1.92 03	-0.58	2.09	16.0
Mg $L_{2,3}M$	49.3	8.95 04		6.18	251.5	Ni Lα	851.5	1.27 04	14.80	15.11	14.56
Al $L_{2,3}M$	72.4	7.78 04		7.89	171.4	Cu Lα	929.7	1.17 04	17.99	15.19	13.33
Si $L_{2,3}M$	91.5	6.70 04		8.59	135.5	Zn Lα	1011.7	9.44 03	21.55	13.37	12.25
Be K	108.5	5.71 04	10.14	8.69	114.	Na Kα	1041.0	8.83 03	22.26	12.88	11.91
Sr Mζ	114.0	5.47 04	10.50	8.74	108.7	Ge Lα	1188.0	6.45 03	24.54	10.73	10.44
Y Mζ	132.8	4.76 04	11.97	8.85	93.4	Mg Kα	1253.6	5.67 03	25.15	9.96	9.89
S Lℓ	148.7	4.13 04	12.96	8.59	83.4	Al Kα	1486.7	3.74 03	26.39	7.79	8.34
Zr Mζ	151.1	4.04 04	13.09	8.56	82.1	Si Kα	1740.0	2.52 03	26.94	6.15	7.13
Nb Mζ	171.7	3.40 04	14.14	8.17	72.2	Zr Lα	2042.4	1.67 03	27.15	4.76	6.07
B Kα	183.3	3.09 04	14.61	7.93	67.6	Nb Lα	2165.9	1.43 03		4.33	5.73
Mo Mζ	192.6	2.87 04	14.96	7.74	64.4	Mo Lα	2293.2	1.23 03		3.94	5.41
W N_5N_7	212.2	2.46 04	15.58	7.31	58.4	Cl Kα	2622.4	8.55 02		3.14	4.73
C Kα	277.0	1.56 04	16.80	6.03	44.7	Ag Lα	2984.3	6.02 02		2.52	4.16
Ag Mζ	311.7	1.25 04	17.13	5.46	39.8	Ca Kα	3691.7	3.36 02		1.74	3.36
N Kα	392.4	8.02 03	17.41	4.41	31.6	Ba Lα	4466.3	1.99 02		1.25	2.78
Ti Lℓ	395.3	7.90 03	17.41	4.37	31.4	Ti Kα	4510.8	1.94 02		1.22	2.75
Ti Lα	452.2	6.02 03	17.30	3.81	27.4	V Kα	4952.2	1.50 02		1.04	2.50
V Lα	511.3	4.66 03	16.97	3.34	24.3	Cr Kα	5414.7	1.17 02		0.89	2.29
O Kα	524.9	4.41 03	16.85	3.24	23.6	Mn Kα	5898.8	9.26 01		0.77	2.10
Mn Lℓ	556.3	3.91 03	16.55	3.05	22.3	Co Kα	6930.3	5.96 01		0.58	1.79
Cr Lα	572.8	3.67 03	16.35	2.95	21.6	Ni Kα	7478.2	4.85 01		0.51	1.66
Mn Lα	637.4	2.94 03	15.25	2.62	19.5	Cu Kα	8047.8	3.16 02		3.56	1.54
F Kα	676.8	2.57 03	14.17	2.44	18.3	Zn Kα	8638.9	2.65 02		3.20	1.44
Fe Lα	705.0	2.37 03	13.02	2.34	17.6	Ge Kα	9886.4	1.87 02		2.59	1.25

ABSORPTION EDGE

K	7709.5 eV	1.6082 A	L_2	793.8 eV	15.618 A	$M_{2,3}$	61 eV	202 A
			L_3	779.0 eV	15.915 A			





For E < 500 eV ——— (129) x 0.95
——— (127)

References: 4, 39, 78, 114, 127, 129

XI. Low-Energy X-Ray Interaction Coefficient Tables

See page 19 for Explanation of Tables

TABLE I. PHOTOABSORPTION CROSS SECTION, μ
ATOMIC SCATTERING FACTOR, $f_1 + if_2$

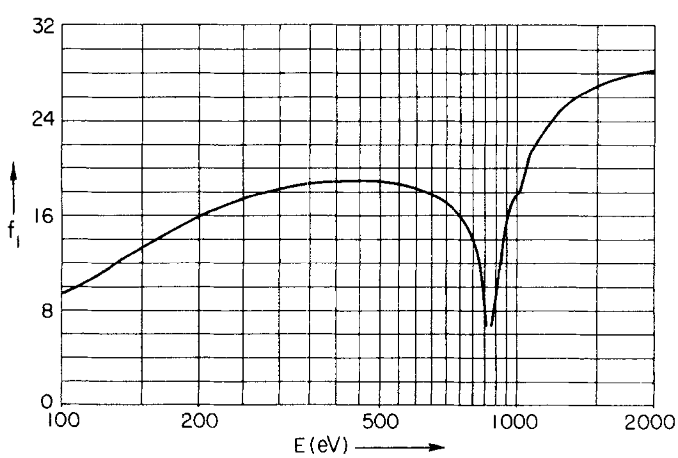
Atomic Weight = 58.71 Z = 28

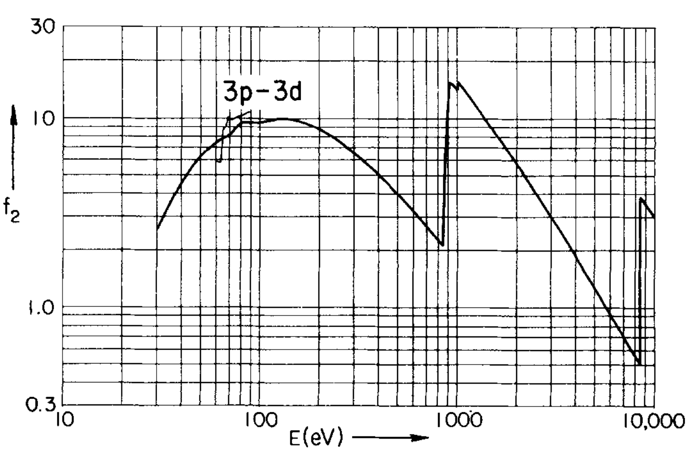
μ(barns/atom) = μ(cm²/gm) x 97.48 NICKEL (Ni)
Eμ(E) = 716.4 f_2 keVcm²/gm

LINE	E(eV)	μ(cm²/gm)	f_1	f_2	λ(A)
Na $L_{2,3}M$	30.5	6.17 04		2.62	407.1
Mg $L_{2,3}M$	49.3	8.98 04		6.18	251.5
Al $L_{2,3}M$	72.4	8.45 04		8.54	171.4
Si $L_{2,3}M$	91.5	7.50 04		9.58	135.5
Be K	108.5	6.44 04	9.74	9.74	114.
Sr Mζ	114.0	6.18 04	10.19	9.83	108.7
Y Mζ	132.8	5.41 04	11.84	10.02	93.4
S Lℓ	148.7	4.72 04	12.97	9.79	83.4
Zr Mζ	151.1	4.63 04	13.13	9.76	82.1
Nb Mζ	171.7	3.91 04	14.37	9.38	72.2
B Kα	183.3	3.57 04	14.94	9.14	67.6
Mo Mζ	192.6	3.33 04	15.37	8.95	64.4
W N_5N_7	212.2	2.86 04	16.14	8.48	58.4
C Kα	277.0	1.82 04	17.69	7.02	44.7
Ag Mζ	311.7	1.46 04	18.15	6.35	39.8
N Kα	392.4	9.34 03	18.64	5.11	31.6
Ti Lℓ	395.3	9.20 03	18.65	5.08	31.4
Ti Lα	452.2	7.00 03	18.68	4.42	27.4
V Lα	511.3	5.41 03	18.52	3.86	24.3
O Kα	524.9	5.12 03	18.45	3.75	23.6
Mn Lℓ	556.3	4.52 03	18.27	3.51	22.3
Cr Lα	572.8	4.25 03	18.16	3.39	21.6
Mn Lα	637.4	3.36 03	17.52	2.99	19.5
F Kα	676.8	2.94 03	16.97	2.78	18.3
Fe Lα	705.0	2.69 03	16.45	2.65	17.6
Co Lα	776.2	2.17 03	14.34	2.35	16.0
Ni Lα	851.5	1.80 03	4.54	2.14	14.56
Cu Lα	929.7	1.17 04	15.30	15.23	13.33
Zn Lα	1011.7	1.09 04	18.90	15.39	12.25
Na Kα	1041.0	1.02 04	20.54	14.80	11.91
Ge Lα	1188.0	7.41 03	24.23	12.29	10.44
Mg Kα	1253.6	6.51 03	25.11	11.39	9.89
Al Kα	1486.7	4.29 03	26.89	8.90	8.34
Si Kα	1740.0	2.87 03	27.70	6.98	7.13
Zr Lα	2042.4	1.90 03	28.04	5.41	6.07
Nb Lα	2165.9	1.63 03		4.93	5.73
Mo Lα	2293.2	1.40 03		4.49	5.41
Cl Kα	2622.4	9.86 02		3.61	4.73
Ag Lα	2984.3	7.00 02		2.92	4.16
Ca Kα	3691.7	3.97 02		2.05	3.36
Ba Lα	4466.3	2.38 02		1.48	2.78
Ti Kα	4510.8	2.32 02		1.46	2.75
V Kα	4952.2	1.80 02		1.24	2.50
Cr Kα	5414.7	1.41 02		1.07	2.29
Mn Kα	5898.8	1.12 02		0.92	2.10
Co Kα	6930.3	7.14 01		0.69	1.79
Ni Kα	7478.2	5.76 01		0.60	1.66
Cu Kα	8047.8	4.67 01		0.52	1.54
Zn Kα	8638.9	3.02 02		3.64	1.44
Ge Kα	9886.4	2.15 02		2.97	1.25

ABSORPTION EDGE

K	8331.6 eV	1.4881 A
L_2	870.6 eV	14.242 A
L_3	853.6 eV	14.525 A
M_3	65.81 eV	188.4 A





For E < 800 eV ——— (129) x 0.94
——— (127)

References: 4, 39, 52, 78, 80, 114, 127, 129

XI. Low-Energy X-Ray Interaction Coefficient Tables

See page 19 for Explanation of Tables

TABLE I. PHOTOABSORPTION CROSS SECTION, μ
ATOMIC SCATTERING FACTOR, $f_1 + if_2$

Atomic Weight = 63.55 Z = 29

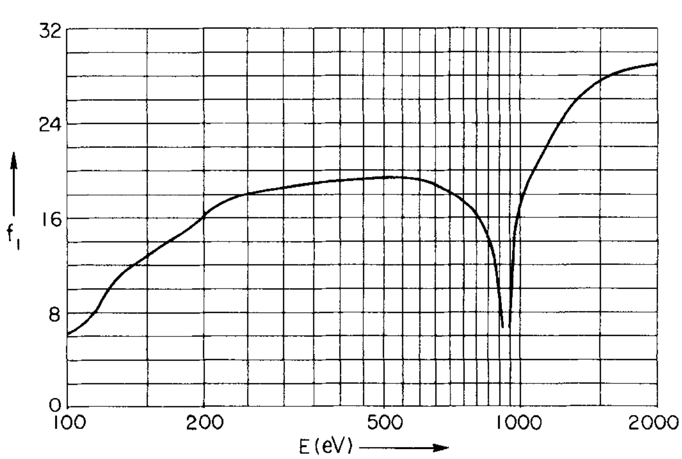
μ(barns/atom) = μ(cm^2/gm) x 105.5 COPPER (Cu)
$E\mu(E)$ = 661.8 f_2 keVcm^2/gm

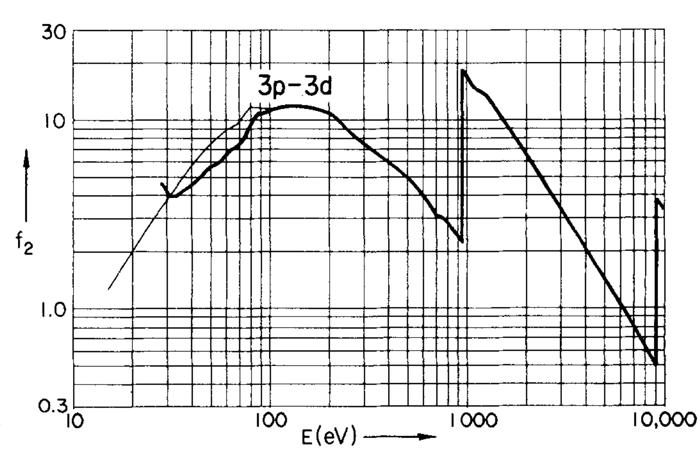
LINE	E(eV)	μ(cm^2/gm)	f_1	f_2	λ(A)
Na $L_{2,3}M$	30.5	8.65 04		3.98	407.1
Mg $L_{2,3}M$	49.3	7.66 04		5.70	251.5
Al $L_{2,3}M$	72.4	7.08 04		7.74	171.4
Si $L_{2,3}M$	91.5	7.81 04		10.79	135.5
Be K	108.5	7.44 04	7.11	12.20	114.
Sr Mζ	114.0	7.40 04	7.97	12.75	108.7
Y Mζ	132.8	6.30 04	11.32	12.65	93.4
S Lℓ	148.7	5.33 04	12.88	11.96	83.4
Zr Mζ	151.1	5.21 04	13.02	11.88	82.1
Nb Mζ	171.7	4.40 04	14.35	11.42	72.2
B Kα	183.3	4.04 04	15.06	11.19	67.6
Mo Mζ	192.6	3.79 04	15.67	11.02	64.4
W N_5N_7	212.2	3.20 04	16.96	10.25	58.4
C Kα	277.0	1.87 04	18.48	7.82	44.7
Ag Mζ	311.7	1.51 04	18.78	7.11	39.8
N Kα	392.4	9.98 03	19.22	5.91	31.6
Ti Lℓ	395.3	9.84 03	19.23	5.88	31.4
Ti Lα	452.2	7.82 03	19.40	5.34	27.4
V Lα	511.3	6.22 03	19.48	4.80	24.3
O Kα	524.9	5.92 03	19.50	4.69	23.6
Mn Lℓ	556.3	5.21 03	19.48	4.38	22.3
Cr Lα	572.8	4.88 03	19.45	4.22	21.6
Mn Lα	637.4	3.75 03	19.07	3.61	19.5
F Kα	676.8	3.19 03	18.65	3.26	18.3
Fe Lα	705.0	2.88 03	18.21	3.07	17.6

LINE	E(eV)	μ(cm^2/gm)	f_1	f_2	λ(A)
Co Lα	776.2	2.54 03	17.03	2.97	16.0
Ni Lα	851.5	1.97 03	14.72	2.54	14.56
Cu Lα	929.7	1.59 03	-0.92	2.23	13.33
Zn Lα	1011.7	1.04 04	17.30	15.85	12.25
Na Kα	1041.0	9.56 03	18.72	15.03	11.91
Ge Lα	1188.0	7.64 03	22.97	13.70	10.44
Mg Kα	1253.6	6.97 03	24.44	13.19	9.89
Al Kα	1486.7	4.55 03	27.29	10.23	8.34
Si Kα	1740.0	3.07 03	28.44	8.07	7.13
Zr Lα	2042.4	2.04 03	28.98	6.28	6.07
Nb Lα	2165.9	1.75 03		5.72	5.73
Mo Lα	2293.2	1.51 03		5.22	5.41
Cl Kα	2622.4	1.06 03		4.19	4.73
Ag Lα	2984.3	7.51 02		3.39	4.16
Ca Kα	3691.7	4.25 02		2.37	3.36
Ba Lα	4466.3	2.54 02		1.72	2.78
Ti Kα	4510.8	2.48 02		1.69	2.75
V Kα	4952.2	1.92 02		1.44	2.50
Cr Kα	5414.7	1.51 02		1.23	2.29
Mn Kα	5898.8	1.19 02		1.06	2.10
Co Kα	6930.3	7.61 01		0.80	1.79
Ni Kα	7478.2	6.15 01		0.70	1.66
Cu Kα	8047.8	5.00 01		0.61	1.54
Zn Kα	8638.9	4.08 01		0.53	1.44
Ge Kα	9886.4	2.24 02		3.34	1.25

ABSORPTION EDGE

K	8980.3 eV	1.3806 A
L_2	952.68 eV	13.014 A
L_3	933.06 eV	13.288 A
M_1	112.1 eV	110.6 A
M_2	77.7 eV	159.5 A
M_3	74.7 eV	166.0 A





For E < 800 eV (82)
(129)

References: 4, 30, 34, 78, 80, 82, 92, 127, 129

XI. Low-Energy X-Ray Interaction Coefficient Tables

See page 19 for Explanation of Tables

TABLE I. PHOTOABSORPTION CROSS SECTION, μ
ATOMIC SCATTERING FACTOR, $f_1 + if_2$

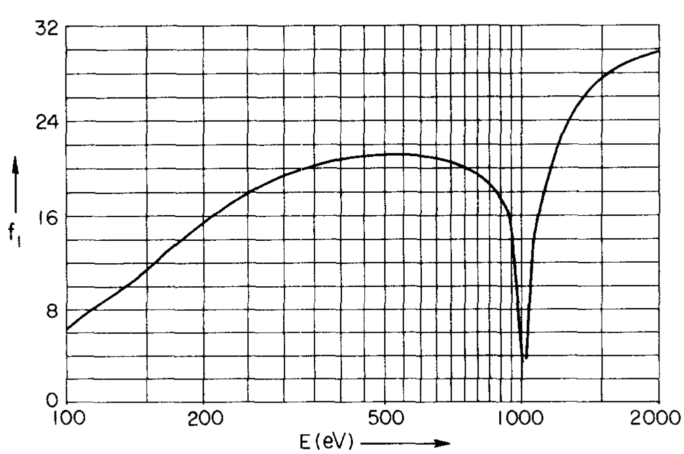
Atomic Weight = 65.38 Z = 30

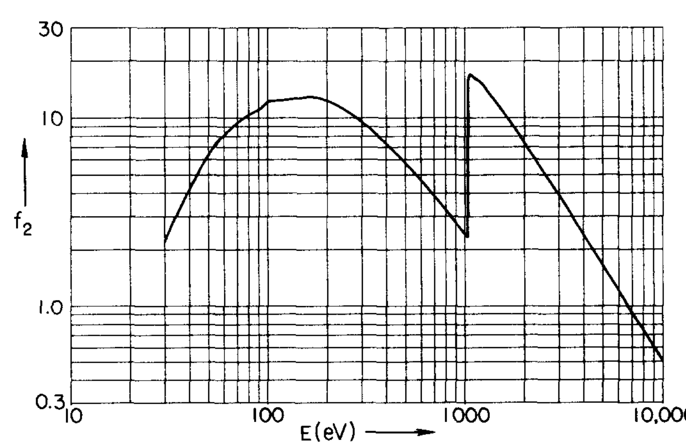
μ(barns/atom) = μ(cm^2/gm) x 108.6 ZINC (Zn)
$E\mu(E)$ = 643.3 f_2 keVcm^2/gm

LINE	E(eV)	μ(cm^2/gm)	f_1	f_2	λ(A)	LINE	E(eV)	μ(cm^2/gm)	f_1	f_2	λ(A)
Na $L_{2,3}M$	30.5	4.85 04		2.30	407.1	Co $L\alpha$	776.2	2.79 03	19.73	3.36	16.0
Mg $L_{2,3}M$	49.3	8.05 04		6.17	251.5	Ni $L\alpha$	851.5	2.24 03	18.59	2.96	14.56
Al $L_{2,3}M$	72.4	8.58 04		9.65	171.4	Cu $L\alpha$	929.7	1.82 03	16.43	2.62	13.33
Si $L_{2,3}M$	91.5	7.86 04		11.18	135.5	Zn $L\alpha$	1011.7	1.52 03	7.53	2.39	12.25
Be K	108.5	7.32 04	7.31	12.35	114.	Na $K\alpha$	1041.0	1.05 04	10.53	17.01	11.91
Sr $M\zeta$	114.0	7.01 04	7.96	12.42	108.7	Ge $L\alpha$	1188.0	8.35 03	21.12	15.42	10.44
Y $M\zeta$	132.8	6.13 04	9.79	12.65	93.4	Mg $K\alpha$	1253.6	7.60 03	23.58	14.81	9.89
S $L\ell$	148.7	5.57 04	11.16	12.88	83.4	Al $K\alpha$	1486.7	5.02 03	27.34	11.60	8.34
Zr $M\zeta$	151.1	5.50 04	11.39	12.91	82.1	Si $K\alpha$	1740.0	3.41 03	28.95	9.22	7.13
Nb $M\zeta$	171.7	4.80 04	13.33	12.81	72.2	Zr $L\alpha$	2042.4	2.27 03	29.73	7.21	6.07
B $K\alpha$	183.3	4.42 04	14.21	12.61	67.6	Nb $L\alpha$	2165.9	1.95 03		6.57	5.73
Mo $M\zeta$	192.6	4.15 04	14.88	12.43	64.4	Mo $L\alpha$	2293.2	1.68 03		6.00	5.41
W N_5N_7	212.2	3.62 04	16.11	11.94	58.4	Cl $K\alpha$	2622.4	1.18 03		4.83	4.73
C $K\alpha$	277.0	2.35 04	18.75	10.10	44.7	Ag $L\alpha$	2984.3	8.41 02		3.90	4.16
Ag $M\zeta$	311.7	1.90 04	19.61	9.19	39.8	Ca $K\alpha$	3691.7	4.76 02		2.73	3.36
N $K\alpha$	392.4	1.22 04	20.71	7.42	31.6	Ba $L\alpha$	4466.3	2.85 02		1.98	2.78
Ti $L\ell$	395.3	1.20 04	20.73	7.36	31.4	Ti $K\alpha$	4510.8	2.77 02		1.94	2.75
Ti $L\alpha$	452.2	9.10 03	21.05	6.40	27.4	V $K\alpha$	4952.2	2.15 02		1.66	2.50
V $L\alpha$	511.3	6.91 03	21.15	5.49	24.3	Cr $K\alpha$	5414.7	1.69 02		1.42	2.29
O $K\alpha$	524.9	6.55 03	21.15	5.34	23.6	Mn $K\alpha$	5898.8	1.33 02		1.22	2.10
Mn $L\ell$	556.3	5.77 03	21.12	4.99	22.3	Co $K\alpha$	6930.3	8.54 01		0.92	1.79
Cr $L\alpha$	572.8	5.40 03	21.08	4.81	21.6	Ni $K\alpha$	7478.2	6.91 01		0.80	1.66
Mn $L\alpha$	637.4	4.28 03	20.84	4.24	19.5	Cu $K\alpha$	8047.8	5.63 01		0.70	1.54
F $K\alpha$	676.8	3.72 03	20.62	3.91	18.3	Zn $K\alpha$	8638.9	4.60 01		0.62	1.44
Fe $L\alpha$	705.0	3.42 03	20.42	3.75	17.6	Ge $K\alpha$	9886.4	2.45 02		3.76	1.25

ABSORPTION EDGE

K	9660.7 eV	1.2834 A	L_1*	1198 eV	10.348 A	M_2	90.5 eV	137.0 A
			L_2	1045.2 eV	11.862 A	M_3	86.2 eV	143.9 A
			L_3	1022.0 eV	12.131 A			





For E < 500 eV ——— (129)

References: 4, 42, 80, 118, 129

XI. Low-Energy X-Ray Interaction Coefficient Tables

See page 19 for Explanation of Tables

TABLE I. PHOTOABSORPTION CROSS SECTION, μ
ATOMIC SCATTERING FACTOR, $f_1 + if_2$

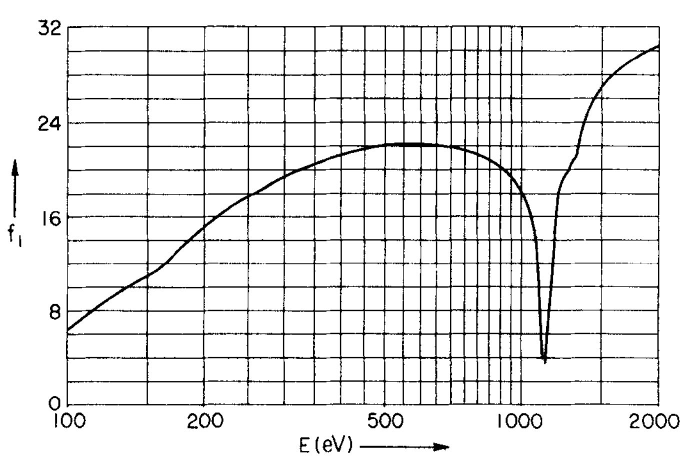
Atomic Weight = 69.72 Z = 31

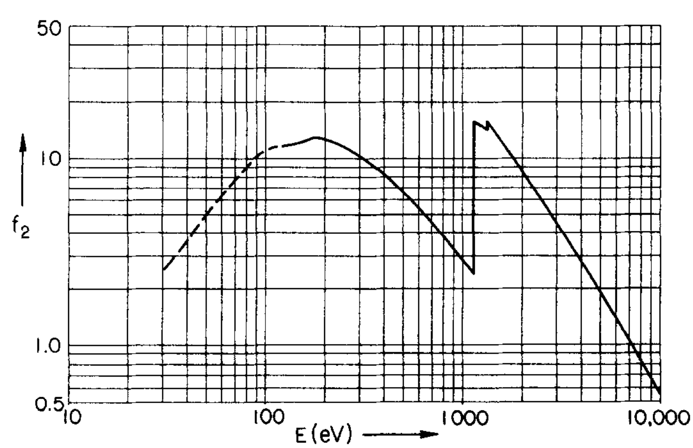
μ(barns/atom) = μ(cm^2/gm) x 115.8 GALLIUM (Ga)
$E\mu(E)$ = 603.2 f_2 keVcm^2/gm

LINE	E(eV)	μ(cm^2/gm)	f_1	f_2	λ(A)	LINE	E(eV)	μ(cm^2/gm)	f_1	f_2	λ(A)
Na $L_{2,3}M$	30.5	5.09 04		2.57	407.1	Co Lα	776.2	3.04 03	21.48	3.91	16.0
Mg $L_{2,3}M$	49.3	6.16 04		5.03	251.5	Ni Lα	851.5	2.45 03	20.85	3.46	14.56
Al $L_{2,3}M$	72.4	6.82 04		8.18	171.4	Cu Lα	929.7	1.99 03	19.78	3.06	13.33
Si $L_{2,3}M$	91.5	6.96 04		10.55	135.5	Zn Lα	1011.7	1.63 03	17.79	2.73	12.25
Be K	108.5	6.37 04	7.35	11.46	114.	Na Kα	1041.0	1.53 03	16.58	2.64	11.91
Sr Mζ	114.0	6.12 04	7.99	11.56	108.7	Ge Lα	1188.0	7.63 03	17.46	15.03	10.44
Y Mζ	132.8	5.41 04	9.66	11.91	93.4	Mg Kα	1253.6	6.99 03	20.39	14.53	9.89
S Lℓ	148.7	4.94 04	10.85	12.18	83.4	Al Kα	1486.7	5.30 03	26.78	13.05	8.34
Zr Mζ	151.1	4.89 04	11.00	12.23	82.1	Si Kα	1740.0	3.60 03	29.26	10.38	7.13
Nb Mζ	171.7	4.51 04	12.71	12.84	72.2	Zr Lα	2042.4	2.40 03	30.48	8.12	6.07
B Kα	183.3	4.20 04	13.80	12.77	67.6	Nb Lα	2165.9	2.06 03		7.40	5.73
Mo Mζ	192.6	3.96 04	14.55	12.62	64.4	Mo Lα	2293.2	1.78 03		6.76	5.41
W N_5N_7	212.2	3.48 04	15.89	12.24	58.4	Cl Kα	2622.4	1.25 03		5.45	4.73
C Kα	277.0	2.33 04	18.76	10.71	44.7	Ag Lα	2984.3	8.91 02		4.41	4.16
Ag Mζ	311.7	1.90 04	19.76	9.81	39.8	Ca Kα	3691.7	5.06 02		3.09	3.36
N Kα	392.4	1.27 04	21.16	8.27	31.6	Ba Lα	4466.3	3.03 02		2.24	2.78
Ti Lℓ	395.3	1.25 04	21.21	8.21	31.4	Ti Kα	4510.8	2.95 02		2.20	2.75
Ti Lα	452.2	9.62 03	21.78	7.21	27.4	V Kα	4952.2	2.29 02		1.88	2.50
V Lα	511.3	7.48 03	22.08	6.34	24.3	Cr Kα	5414.7	1.80 02		1.61	2.29
O Kα	524.9	7.09 03	22.12	6.16	23.6	Mn Kα	5898.8	1.42 02		1.39	2.10
Mn Lℓ	556.3	6.26 03	22.18	5.77	22.3	Co Kα	6930.3	9.13 01		1.05	1.79
Cr Lα	572.8	5.86 03	22.17	5.56	21.6	Ni Kα	7478.2	7.39 01		0.92	1.66
Mn Lα	637.4	4.67 03	22.10	4.93	19.5	Cu Kα	8047.8	6.01 01		0.80	1.54
F Kα	676.8	4.07 03	21.97	4.57	18.3	Zn Kα	8638.9	4.92 01		0.70	1.44
Fe Lα	705.0	3.76 03	21.85	4.39	17.6	Ge Kα	9886.4	3.35 01		0.55	1.25

ABSORPTION EDGE

L_1	1302.8 eV	9.517 A	$M_{2,3}$*	103.6 eV	119.7 A
L_2	1145.0 eV	10.828 A			
L_3	1116.9 eV	11.100 A			





For E < 109 eV ------- (1)

References: 4

XI. Low-Energy X-Ray Interaction Coefficient Tables

See page 19 for Explanation of Tables

TABLE I. PHOTOABSORPTION CROSS SECTION, μ
ATOMIC SCATTERING FACTOR, $f_1 + if_2$

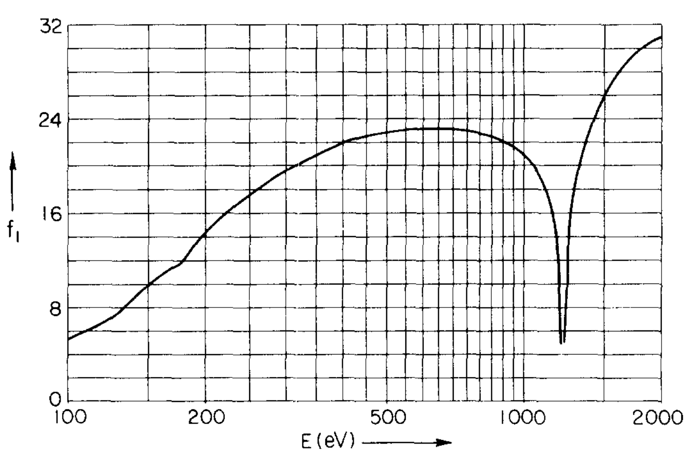
Atomic Weight = 72.59 Z = 32

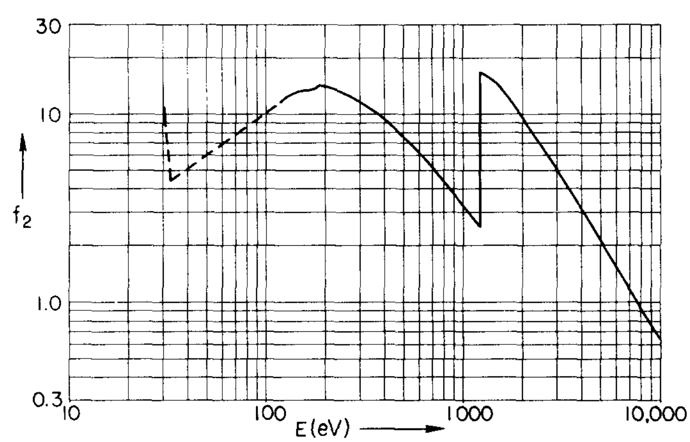
μ(barns/atom) = μ(cm^2/gm) x 120.5 GERMANIUM (Ge)
Eμ(E) = 579.4 f_2 keVcm^2/gm

LINE	E(eV)	μ(cm^2/gm)	f_1	f_2	λ(A)	LINE	E(eV)	μ(cm^2/gm)	f_1	f_2	λ(A)
Na $L_{2,3}M$	30.5	1.62 05		8.50	407.1	Co Lα	776.2	3.39 03	22.87	4.53	16.0
Mg $L_{2,3}M$	49.3	7.04 04		5.99	251.5	Ni Lα	851.5	2.74 03	22.45	4.02	14.56
Al $L_{2,3}M$	72.4	6.40 04		8.00	171.4	Cu Lα	929.7	2.23 03	21.78	3.58	13.33
Si $L_{2,3}M$	91.5	6.04 04		9.53	135.5	Zn Lα	1011.7	1.83 03	20.69	3.19	12.25
Be K	108.5	5.79 04	5.82	10.84	114.	Na Kα	1041.0	1.71 03	20.16	3.08	11.91
Sr Mζ	114.0	5.69 04	6.20	11.20	108.7	Ge Lα	1188.0	1.26 03	12.93	2.58	10.44
Y Mζ	132.8	5.57 04	7.95	12.75	93.4	Mg Kα	1253.6	7.61 03	14.86	16.45	9.89
S Lℓ	148.7	5.15 04	9.67	13.22	83.4	Al Kα	1486.7	5.72 03	25.53	14.68	8.34
Zr Mζ	151.1	5.10 04	9.91	13.29	82.1	Si Kα	1740.0	3.93 03	29.29	11.80	7.13
Nb Mζ	171.7	4.53 04	11.43	13.41	72.2	Zr Lα	2042.4	2.64 03	31.07	9.29	6.07
B Kα	183.3	4.51 04	12.50	14.25	67.6	Nb Lα	2165.9	2.27 03		8.48	5.73
Mo Mζ	192.6	4.24 04	13.66	14.09	64.4	Mo Lα	2293.2	1.96 03		7.76	5.41
W N_5N_7	212.2	3.75 04	15.26	13.71	58.4	Cl Kα	2622.4	1.38 03		6.26	4.73
C Kα	277.0	2.55 04	18.76	12.20	44.7	Ag Lα	2984.3	9.83 02		5.06	4.16
Ag Mζ	311.7	2.08 04	19.99	11.21	39.8	Ca Kα	3691.7	5.57 02		3.55	3.36
N Kα	392.4	1.40 04	21.73	9.51	31.6	Ba Lα	4466.3	3.33 02		2.57	2.78
Ti Lℓ	395.3	1.39 04	21.80	9.45	31.4	Ti Kα	4510.8	3.24 02		2.52	2.75
Ti Lα	452.2	1.06 04	22.55	8.30	27.4	V Kα	4952.2	2.52 02		2.15	2.50
V Lα	511.3	8.30 03	22.96	7.32	24.3	Cr Kα	5414.7	1.97 02		1.84	2.29
O Kα	524.9	7.87 03	23.02	7.13	23.6	Mn Kα	5898.8	1.56 02		1.59	2.10
Mn Lℓ	556.3	6.97 03	23.15	6.69	22.3	Co Kα	6930.3	1.00 02		1.20	1.79
Cr Lα	572.8	6.55 03	23.18	6.47	21.6	Ni Kα	7478.2	8.12 01		1.05	1.66
Mn Lα	637.4	5.22 03	23.24	5.74	19.5	Cu Kα	8047.8	6.62 01		0.92	1.54
F Kα	676.8	4.54 03	23.18	5.30	18.3	Zn Kα	8638.9	5.44 01		0.81	1.44
Fe Lα	705.0	4.18 03	23.10	5.09	17.6	Ge Kα	9886.4	3.72 01		0.63	1.25

ABSORPTION EDGE

L_1	1413.2 eV	8.773 A	$M_{2,3}$*	123 eV	101 A
L_2	1249.4 eV	9.924 A	$M_{4,5}$*	30.1 eV	412 A
L_3	1217.0 eV	10.187 A			





For E < 109 eV ------- (1)

References: 3, 4, 9, 15, 16, 53, 107, 125

XI. Low-Energy X-Ray Interaction Coefficient Tables

See page 19 for Explanation of Tables

TABLE I. PHOTOABSORPTION CROSS SECTION, μ
ATOMIC SCATTERING FACTOR, $f_1 + if_2$

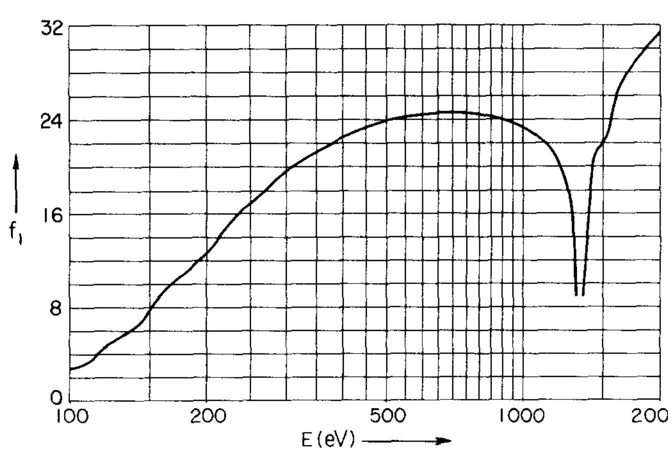
Atomic Weight = 74.92 Z = 33

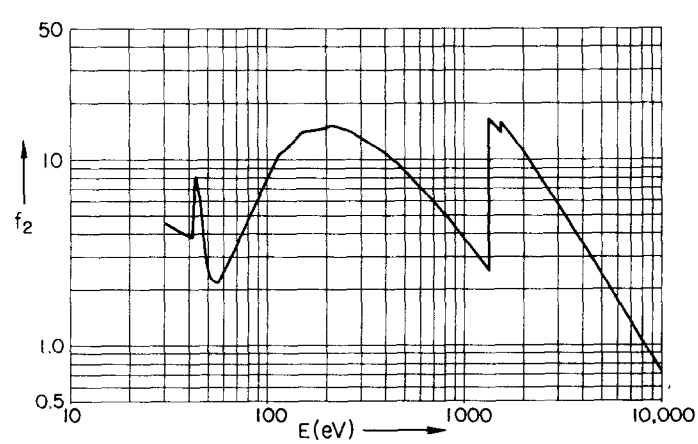
μ(barns/atom) = μ(cm^2/gm) x 124.4 ARSENIC (As)
Eμ(E) = 561.3 f_2 keVcm^2/gm

LINE	E(eV)	μ(cm^2/gm)	f_1	f_2	λ(A)	LINE	E(eV)	μ(cm^2/gm)	f_1	f_2	λ(A)
Na $L_{2,3}M$	30.5	8.35 04		4.53	407.1	Co Lα	776.2	3.79 03	24.47	5.24	16.0
Mg $L_{2,3}M$	49.3	2.84 04		2.50	251.5	Ni Lα	851.5	3.07 03	24.22	4.65	14.56
Al $L_{2,3}M$	72.4	2.99 04		3.85	171.4	Cu Lα	929.7	2.51 03	23.80	4.15	13.33
Si $L_{2,3}M$	91.5	3.98 04		6.49	135.5	Zn Lα	1011.7	2.06 03	23.17	3.71	12.25
Be K	108.5	4.91 04	3.06	9.50	114.	Na Kα	1041.0	1.93 03	22.87	3.57	11.91
Sr Mζ	114.0	5.22 04	3.74	10.60	108.7	Ge Lα	1188.0	1.41 03	20.43	2.98	10.44
Y Mζ	132.8	5.12 04	5.67	12.10	93.4	Mg Kα	1253.6	1.24 03	17.98	2.78	9.89
S Lℓ	148.7	5.27 04	7.48	13.95	83.4	Al Kα	1486.7	5.40 03	22.89	14.30	8.34
Zr Mζ	151.1	5.23 04	7.95	14.06	82.1	Si Kα	1740.0	4.26 03	28.71	13.20	7.13
Nb Mζ	171.7	4.68 04	10.33	14.32	72.2	Zr Lα	2042.4	2.87 03	31.34	10.44	6.07
B Kα	183.3	4.45 04	11.36	14.51	67.6	Nb Lα	2165.9	2.48 03		9.55	5.73
Mo Mζ	192.6	4.25 04	12.08	14.58	64.4	Mo Lα	2293.2	2.14 03		8.74	5.41
W N_5N_7	212.2	4.03 04	13.91	15.22	58.4	Cl Kα	2622.4	1.51 03		7.07	4.73
C Kα	277.0	2.79 04	18.54	13.76	44.7	Ag Lα	2984.3	1.08 03		5.73	4.16
Ag Mζ	311.7	2.29 04	20.08	12.73	39.8	Ca Kα	3691.7	6.12 02		4.02	3.36
N Kα	392.4	1.56 04	22.33	10.92	31.6	Ba Lα	4466.3	3.66 02		2.91	2.78
Ti Lℓ	395.3	1.54 04	22.42	10.86	31.4	Ti Kα	4510.8	3.56 02		2.86	2.75
Ti Lα	452.2	1.19 04	23.42	9.57	27.4	V Kα	4952.2	2.77 02		2.44	2.50
V Lα	511.3	9.28 03	24.01	8.45	24.3	Cr Kα	5414.7	2.17 02		2.09	2.29
O Kα	524.9	8.81 03	24.12	8.23	23.6	Mn Kα	5898.8	1.72 02		1.80	2.10
Mn Lℓ	556.3	7.80 03	24.32	7.73	22.3	Co Kα	6930.3	1.10 02		1.36	1.79
Cr Lα	572.8	7.33 03	24.39	7.47	21.6	Ni Kα	7478.2	8.94 01		1.19	1.66
Mn Lα	637.4	5.84 03	24.58	6.63	19.5	Cu Kα	8047.8	7.30 01		1.05	1.54
F Kα	676.8	5.08 03	24.59	6.12	18.3	Zn Kα	8638.9	6.00 01		0.92	1.44
Fe Lα	705.0	4.68 03	24.56	5.88	17.6	Ge Kα	9886.4	4.12 01		0.72	1.25

ABSORPTION EDGE

L_1	1529.3 eV	8.107 A
L_2	1358.7 eV	9.125 A
L_3	1323.5 eV	9.367 A





For E < 210 eV ———— (99)

References: 99

XI. Low-Energy X-Ray Interaction Coefficient Tables

See page 19 for Explanation of Tables

TABLE I. PHOTOABSORPTION CROSS SECTION, μ
ATOMIC SCATTERING FACTOR, $f_1 + if_2$

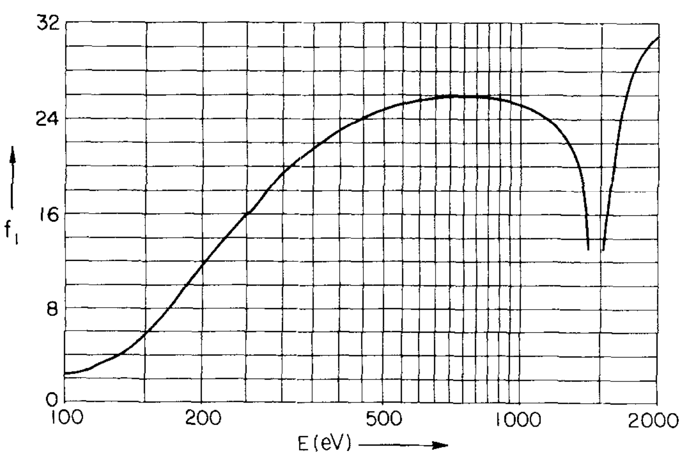
Atomic Weight = 78.96 Z = 34

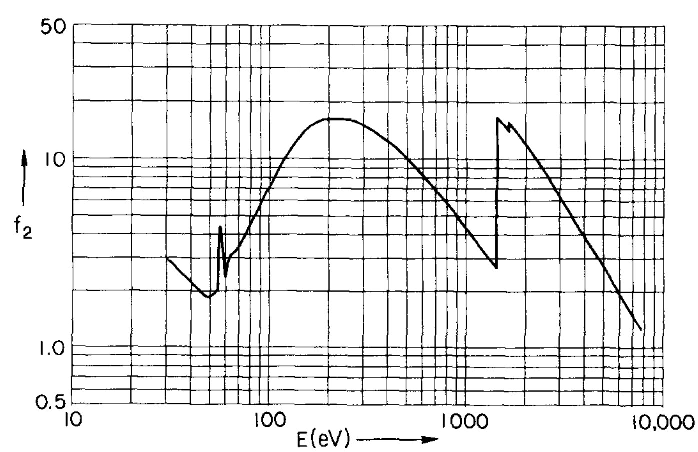
μ(barns/atom) = $\mu(cm^2/gm)$ x 131.1 SELENIUM (Se)
$E\mu(E)$ = 532.6 f_2 $keVcm^2/gm$

LINE	E(eV)	$\mu(cm^2/gm)$	f_1	f_2	λ(A)	LINE	E(eV)	$\mu(cm^2/gm)$	f_1	f_2	λ(A)
Na $L_{2,3}M$	30.5	5.17 04		2.95	407.1	Co $L\alpha$	776.2	4.16 03	25.88	6.06	16.0
Mg $L_{2,3}M$	49.3	2.03 04		1.87	251.5	Ni $L\alpha$	851.5	3.37 03	25.76	5.39	14.56
Al $L_{2,3}M$	72.4	2.64 04		3.59	171.4	Cu $L\alpha$	929.7	2.76 03	25.50	4.81	13.33
Si $L_{2,3}M$	91.5	3.42 04		5.87	135.5	Zn $L\alpha$	1011.7	2.26 03	25.09	4.29	12.25
Be K	108.5	4.12 04	2.53	8.40	114.	Na $K\alpha$	1041.0	2.11 03	24.90	4.13	11.91
Sr $M\zeta$	114.0	4.35 04	2.85	9.32	108.7	Ge $L\alpha$	1188.0	1.54 03	23.50	3.44	10.44
Y $M\zeta$	132.8	4.63 04	4.10	11.55	93.4	Mg $K\alpha$	1253.6	1.36 03	22.47	3.20	9.89
S $L\ell$	148.7	4.85 04	5.58	13.53	83.4	Al $K\alpha$	1486.7	5.62 03	18.87	15.68	8.34
Zr $M\zeta$	151.1	4.84 04	5.90	13.74	82.1	Si $K\alpha$	1740.0	4.46 03	27.45	14.58	7.13
Nb $M\zeta$	171.7	4.75 04	8.35	15.30	72.2	Zr $L\alpha$	2042.4	3.04 03	31.40	11.64	6.07
B $K\alpha$	183.3	4.56 04	9.79	15.69	67.6	Nb $L\alpha$	2165.9	2.63 03		10.67	5.73
Mo $M\zeta$	192.6	4.40 04	10.84	15.92	64.4	Mo $L\alpha$	2293.2	2.27 03		9.79	5.41
W N_5N_7	212.2	4.04 04	12.83	16.09	58.4	Cl $K\alpha$	2622.4	1.61 03		7.95	4.73
C $K\alpha$	277.0	3.02 04	17.93	15.71	44.7	Ag $L\alpha$	2984.3	1.15 03		6.46	4.16
Ag $M\zeta$	311.7	2.49 04	20.00	14.55	39.8	Ca $K\alpha$	3691.7	6.55 02		4.54	3.36
N $K\alpha$	392.4	1.70 04	22.84	12.52	31.6	Ba $L\alpha$	4466.3	3.92 02		3.29	2.78
Ti $L\ell$	395.3	1.68 04	22.92	12.45	31.4	Ti $K\alpha$	4510.8	3.82 02		3.23	2.75
Ti $L\alpha$	452.2	1.30 04	24.16	11.00	27.4	V $K\alpha$	4952.2	2.96 02		2.75	2.50
V $L\alpha$	511.3	1.01 04	24.93	9.74	24.3	Cr $K\alpha$	5414.7	2.32 02		2.36	2.29
O $K\alpha$	524.9	9.63 03	25.07	9.49	23.6	Mn $K\alpha$	5898.8	1.84 02		2.04	2.10
Mn $L\ell$	556.3	8.55 03	25.35	8.93	22.3	Co $K\alpha$	6930.3	1.18 02		1.54	1.79
Cr $L\alpha$	572.8	8.04 03	25.47	8.64	21.6	Ni $K\alpha$	7478.2	9.58 01		1.34	1.66
Mn $L\alpha$	637.4	6.42 03	25.78	7.67	19.5	Cu $K\alpha$	8047.8	7.82 01		1.18	1.54
F $K\alpha$	676.8	5.59 03	25.85	7.09	18.3	Zn $K\alpha$	8638.9	6.43 01		1.04	1.44
Fe $L\alpha$	705.0	5.15 03	25.87	6.81	17.6	Ge $K\alpha$	9886.4	4.42 01		0.82	1.25

ABSORPTION EDGE

L_1	1652.5 eV	7.503 A	M_5	54.43 eV	227.8 A
L_2	1474.7 eV	8.407 A			
L_3	1434.0 eV	8.646 A			





For E < 60 eV ——— (99)

References: 5, 99, 109

XI. Low-Energy X-Ray Interaction Coefficient Tables

See page 19 for Explanation of Tables

TABLE I. PHOTOABSORPTION CROSS SECTION, μ
ATOMIC SCATTERING FACTOR, $f_1 + if_2$

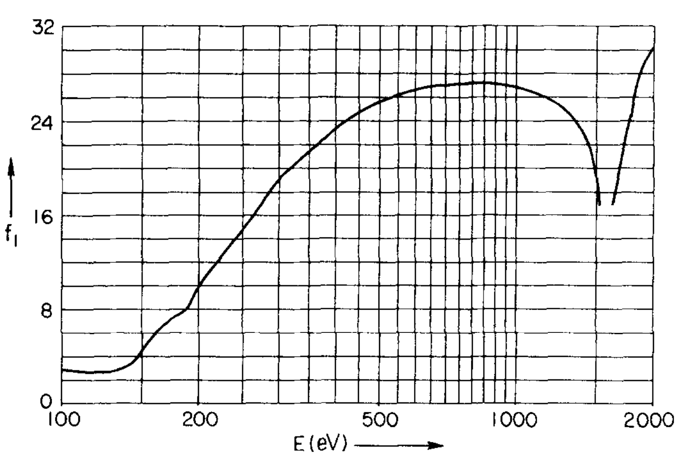
Atomic Weight = 79.91 $Z = 35$

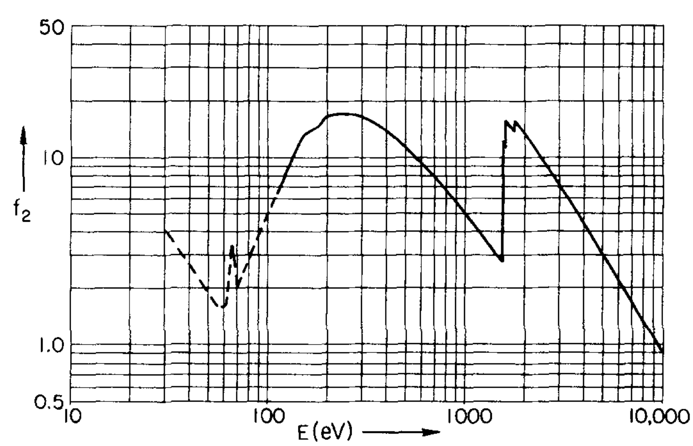
μ(barns/atom) = μ(cm^2/gm) x 132.7 BROMINE (Br)
$E\mu(E)$ = 526.3 f_2 keVcm^2/gm

LINE	E(eV)	μ(cm^2/gm)	f_1	f_2	λ(A)	LINE	E(eV)	μ(cm^2/gm)	f_1	f_2	λ(A)
Na $L_{2,3}M$	30.5	6.88 04		3.98	407.1	Co Lα	776.2	4.67 03	27.20	6.89	16.0
Mg $L_{2,3}M$	49.3	2.01 04		1.88	251.5	Ni Lα	851.5	3.78 03	27.18	6.12	14.56
Al $L_{2,3}M$	72.4	1.64 04		2.25	171.4	Cu Lα	929.7	3.10 03	27.03	5.48	13.33
Si $L_{2,3}M$	91.5	2.36 04		4.09	135.5	Zn Lα	1011.7	2.56 03	26.78	4.91	12.25
Be K	108.5	3.07 04	2.61	6.33	114.	Na Kα	1041.0	2.39 03	26.67	4.73	11.91
Sr Mζ	114.0	3.25 04	2.57	7.04	108.7	Ge Lα	1188.0	1.75 03	25.80	3.94	10.44
Y Mζ	132.8	3.96 04	2.75	9.98	93.4	Mg Kα	1253.6	1.54 03	25.23	3.66	9.89
S Lℓ	148.7	4.57 04	4.15	12.92	83.4	Al Kα	1486.7	1.02 03	20.27	2.88	8.34
Zr Mζ	151.1	4.60 04	4.63	13.21	82.1	Si Kα	1740.0	4.27 03	24.84	14.12	7.13
Nb Mζ	171.7	4.37 04	6.93	14.27	72.2	Zr Lα	2042.4	3.35 03	31.00	13.01	6.07
B Kα	183.3	4.27 04	7.56	14.87	67.6	Nb Lα	2165.9	2.90 03		11.93	5.73
Mo Mζ	192.6	4.49 04	8.54	16.43	64.4	Mo Lα	2293.2	2.51 03		10.95	5.41
W N_5N_7	212.2	4.18 04	11.29	16.86	58.4	Cl Kα	2622.4	1.78 03		8.89	4.73
C Kα	277.0	3.26 04	17.21	17.13	44.7	Ag Lα	2984.3	1.27 03		7.23	4.16
Ag Mζ	311.7	2.70 04	19.69	15.99	39.8	Ca Kα	3691.7	7.25 02		5.09	3.36
N Kα	392.4	1.88 04	23.09	13.98	31.6	Ba Lα	4466.3	4.34 02		3.69	2.78
Ti Lℓ	395.3	1.85 04	23.22	13.91	31.4	Ti Kα	4510.8	4.23 02		3.62	2.75
Ti Lα	452.2	1.44 04	24.74	12.33	27.4	V Kα	4952.2	3.28 02		3.09	2.50
V Lα	511.3	1.13 04	25.72	10.95	24.3	Cr Kα	5414.7	2.58 02		2.65	2.29
O Kα	524.9	1.07 04	25.90	10.68	23.6	Mn Kα	5898.8	2.04 02		2.28	2.10
Mn Lℓ	556.3	9.53 03	26.26	10.07	22.3	Co Kα	6930.3	1.31 02		1.73	1.79
Cr Lα	572.8	8.96 03	26.41	9.74	21.6	Ni Kα	7478.2	1.06 02		1.51	1.66
Mn Lα	637.4	7.17 03	26.86	8.68	19.5	Cu Kα	8047.8	8.69 01		1.33	1.54
F Kα	676.8	6.26 03	27.00	8.05	18.3	Zn Kα	8638.9	7.15 01		1.17	1.44
Fe Lα	705.0	5.77 03	27.06	7.73	17.6	Ge Kα	9886.4	4.92 01		0.92	1.25

ABSORPTION EDGE

L_1	1781 eV	6.959 A	M_5^{**}	71 eV	175 A	N_1	31.1 eV	399 A
L_2	1599 eV	7.753 A						
L_3	1553.0 eV	7.984 A						





For E < 109 eV ------- (1)

References: 128

XI. Low-Energy X-Ray Interaction Coefficient Tables

See page 19 for Explanation of Tables

TABLE I. PHOTOABSORPTION CROSS SECTION, μ
ATOMIC SCATTERING FACTOR, $f_1 + if_2$

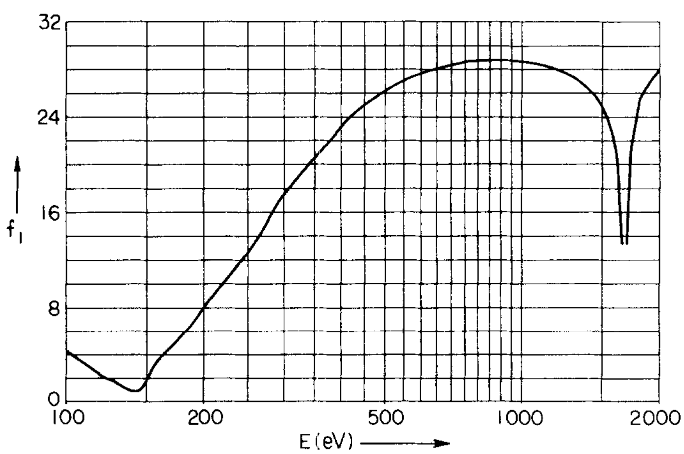
Atomic Weight = 83.80 Z = 36

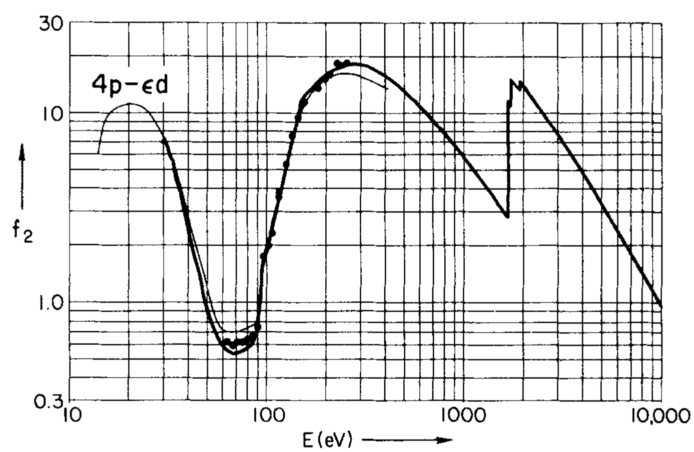
μ(barns/atom) = μ(cm^2/gm) x 139.1 KRYPTON (Kr)
$E\mu(E)$ = 501.9 f_2 keVcm^2/gm

LINE	E(eV)	μ(cm²/gm)	f_1	f_2	λ(A)	LINE	E(eV)	μ(cm²/gm)	f_1	f_2	λ(A)
Na $L_{2,3}M$	30.5	1.21 05		7.37	407.1	Co Lα	776.2	5.19 03	28.79	8.03	16.0
Mg $L_{2,3}M$	49.3	1.03 04		1.01	251.5	Ni Lα	851.5	4.21 03	28.87	7.14	14.56
Al $L_{2,3}M$	72.4	3.77 03		0.54	171.4	Cu Lα	929.7	3.45 03	28.85	6.39	13.33
Si $L_{2,3}M$	91.5	4.55 03		0.83	135.5	Zn Lα	1011.7	2.84 03	28.72	5.72	12.25
Be K	108.5	1.21 04	3.23	2.62	114.	Na Kα	1041.0	2.65 03	28.65	5.50	11.91
Sr Mζ	114.0	1.45 04	2.64	3.29	108.7	Ge Lα	1188.0	1.94 03	28.10	4.59	10.44
Y Mζ	132.8	2.48 04	1.17	6.55	93.4	Mg Kα	1253.6	1.71 03	27.75	4.27	9.89
S Lℓ	148.7	3.82 04	1.60	11.30	83.4	Al Kα	1486.7	1.13 03	25.47	3.35	8.34
Zr Mζ	151.1	3.92 04	2.28	11.79	82.1	Si Kα	1740.0	4.30 03	20.33	14.91	7.13
Nb Mζ	171.7	3.99 04	4.96	13.64	72.2	Zr Lα	2042.4	3.38 03	30.15	13.76	6.07
B Kα	183.3	4.02 04	6.10	14.68	67.6	Nb Lα	2165.9	2.94 03		12.69	5.73
Mo Mζ	192.6	4.05 04	7.21	15.53	64.4	Mo Lα	2293.2	2.56 03		11.70	5.41
W N_5N_7	212.2	3.88 04	9.34	16.40	58.4	Cl Kα	2622.4	1.83 03		9.57	4.73
C Kα	277.0	3.33 04	15.46	18.36	44.7	Ag Lα	2984.3	1.31 03		7.82	4.16
Ag Mζ	311.7	2.83 04	18.44	17.59	39.8	Ca Kα	3691.7	7.50 02		5.52	3.36
N Kα	392.4	2.07 04	22.88	16.17	31.6	Ba Lα	4466.3	4.49 02		4.00	2.78
Ti Lℓ	395.3	2.04 04	23.07	16.09	31.4	Ti Kα	4510.8	4.37 02		3.93	2.75
Ti Lα	452.2	1.59 04	25.21	14.30	27.4	V Kα	4952.2	3.39 02		3.34	2.50
V Lα	511.3	1.25 04	26.54	12.74	24.3	Cr Kα	5414.7	2.66 02		2.86	2.29
O Kα	524.9	1.19 04	26.78	12.43	23.6	Mn Kα	5898.8	2.10 02		2.47	2.10
Mn Lℓ	556.3	1.06 04	27.28	11.75	22.3	Co Kα	6930.3	1.35 02		1.86	1.79
Cr Lα	572.8	9.97 03	27.50	11.38	21.6	Ni Kα	7478.2	1.09 02		1.63	1.66
Mn Lα	637.4	7.99 03	28.18	10.14	19.5	Cu Kα	8047.8	8.91 01		1.43	1.54
F Kα	676.8	6.96 03	28.42	9.38	18.3	Zn Kα	8638.9	7.32 01		1.26	1.44
Fe Lα	705.0	6.42 03	28.53	9.01	17.6	Ge Kα	9886.4	5.04 01		0.99	1.25

ABSORPTION EDGE

L_1	1915 eV	6.47 A	M_4*	95.04 eV	130.45 A
L_2	1729.7 eV	7.16 A	M_5*	93.83 eV	132.14 A
L_3	1677.2 eV	7.392 A			





For E < 120 eV —— (130)
—— (95)
• (86)

References: 8, 11, 18, 86, 95, 108, 130, 131

XI. Low-Energy X-Ray Interaction Coefficient Tables

See page 19 for Explanation of Tables

TABLE I. PHOTOABSORPTION CROSS SECTION, μ
ATOMIC SCATTERING FACTOR, $f_1 + if_2$

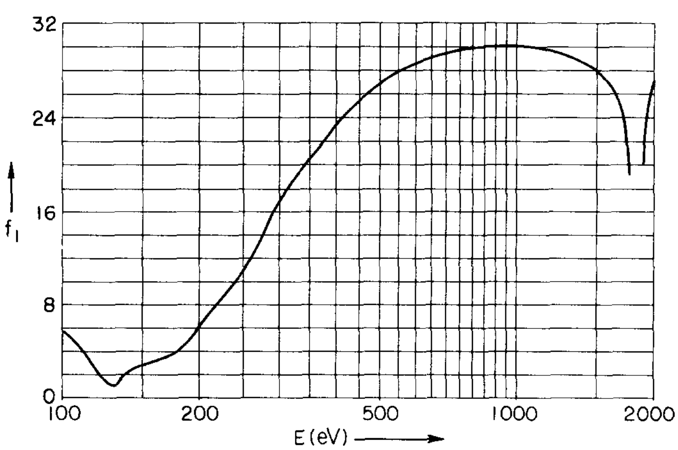
Atomic Weight = 85.47 Z = 37

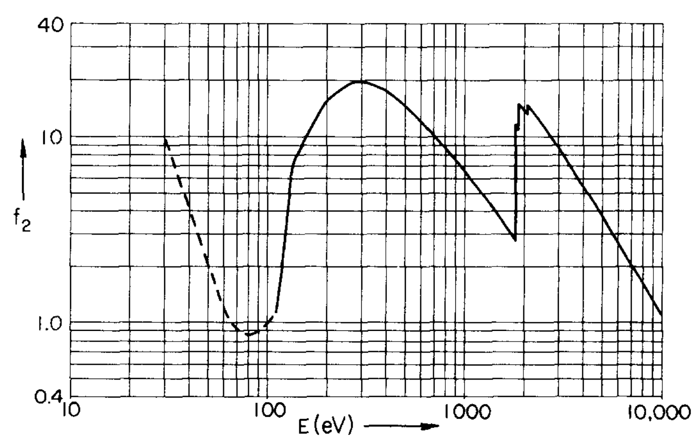
μ(barns/atom) = μ(cm^2/gm) x 141.9 RUBIDIUM (Rb)
$E\mu(E)$ = 492.1 f_2 keVcm^2/gm

LINE	E(eV)	μ(cm^2/gm)	f_1	f_2	λ(A)
Na $L_{2,3}M$	30.5	1.51 05		9.33	407.1
Mg $L_{2,3}M$	49.3	2.09 04		2.09	251.5
Al $L_{2,3}M$	72.4	6.03 03		0.89	171.4
Si $L_{2,3}M$	91.5	4.92 03		0.92	135.5
Be K	108.5	5.02 03	4.48	1.11	114.
Sr $M\zeta$	114.0	7.05 03	3.25	1.63	108.7
Y $M\zeta$	132.8	2.64 04	1.28	7.11	93.4
S $L\ell$	148.7	2.94 04	2.73	8.89	83.4
Zr $M\zeta$	151.1	2.98 04	2.83	9.15	82.1
Nb $M\zeta$	171.7	3.38 04	3.62	11.79	72.2
B $K\alpha$	183.3	3.59 04	4.31	13.36	67.6
Mo $M\zeta$	192.6	3.78 04	5.13	14.78	64.4
W N_5N_7	212.2	3.78 04	7.45	16.28	58.4
C $K\alpha$	277.0	3.55 04	14.28	19.99	44.7
Ag $M\zeta$	311.7	3.02 04	17.96	19.11	39.8
N $K\alpha$	392.4	2.20 04	22.97	17.51	31.6
Ti $L\ell$	395.3	2.17 04	23.16	17.43	31.4
Ti $L\alpha$	452.2	1.70 04	25.56	15.64	27.4
V $L\alpha$	511.3	1.35 04	27.12	14.00	24.3
O $K\alpha$	524.9	1.28 04	27.41	13.67	23.6
Mn $L\ell$	556.3	1.14 04	28.02	12.90	22.3
Cr $L\alpha$	572.8	1.07 04	28.27	12.49	21.6
Mn $L\alpha$	637.4	8.63 03	29.03	11.17	19.5
F $K\alpha$	676.8	7.55 03	29.32	10.38	18.3
Fe $L\alpha$	705.0	6.98 03	29.49	9.99	17.6
Co $L\alpha$	776.2	5.67 03	29.86	8.94	16.0
Ni $L\alpha$	851.5	4.61 03	30.06	7.98	14.56
Cu $L\alpha$	929.7	3.78 03	30.13	7.13	13.33
Zn $L\alpha$	1011.7	3.11 03	30.08	6.38	12.25
Na $K\alpha$	1041.0	2.91 03	30.04	6.15	11.91
Ge $L\alpha$	1188.0	2.14 03	29.68	5.16	10.44
Mg $K\alpha$	1253.6	1.89 03	29.45	4.80	9.89
Al $K\alpha$	1486.7	1.25 03	28.05	3.78	8.34
Si $K\alpha$	1740.0	8.29 02	23.26	2.93	7.13
Zr $L\alpha$	2042.4	3.19 03	27.79	13.24	6.07
Nb $L\alpha$	2165.9	3.15 03		13.86	5.73
Mo $L\alpha$	2293.2	2.75 03		12.82	5.41
Cl $K\alpha$	2622.4	1.98 03		10.56	4.73
Ag $L\alpha$	2984.3	1.43 03		8.67	4.16
Ca $K\alpha$	3691.7	8.20 02		6.15	3.36
Ba $L\alpha$	4466.3	4.93 02		4.47	2.78
Ti $K\alpha$	4510.8	4.79 02		4.39	2.75
V $K\alpha$	4952.2	3.72 02		3.74	2.50
Cr $K\alpha$	5414.7	2.92 02		3.21	2.29
Mn $K\alpha$	5898.8	2.31 02		2.76	2.10
Co $K\alpha$	6930.3	1.48 02		2.08	1.79
Ni $K\alpha$	7478.2	1.20 02		1.82	1.66
Cu $K\alpha$	8047.8	9.79 01		1.60	1.54
Zn $K\alpha$	8638.9	8.04 01		1.41	1.44
Ge $K\alpha$	9886.4	5.54 01		1.11	1.25

ABSORPTION EDGE

L_1	2063 eV	6.003 A
L_2	1866.1 eV	6.644 A
L_3	1806.7 eV	6.862 A
M_5**	110 eV	112.7 A





For E < 109 eV ------- (1)

References: 75, 88, 108

XI. Low-Energy X-Ray Interaction Coefficient Tables

See page 19 for Explanation of Tables

TABLE I. PHOTOABSORPTION CROSS SECTION, μ
ATOMIC SCATTERING FACTOR, $f_1 + if_2$

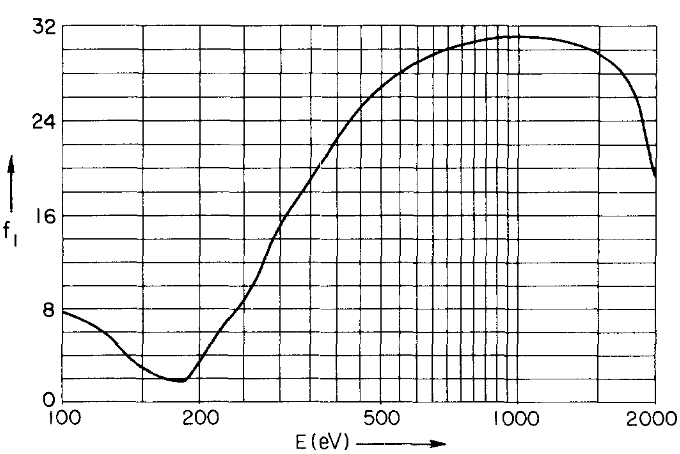
Atomic Weight = 87.62 Z = 38

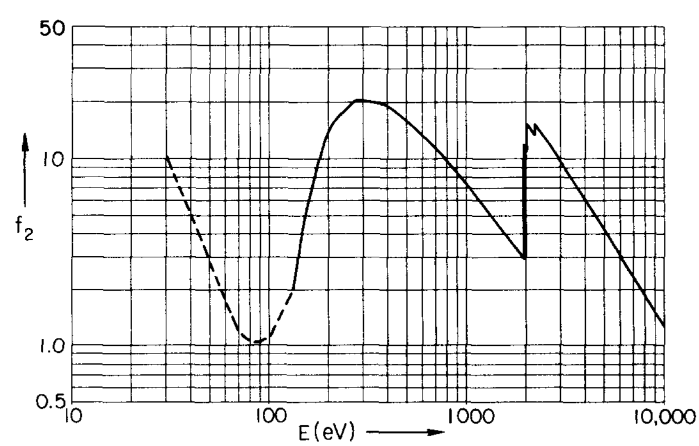
μ(barns/atom) = μ(cm^2/gm) x 145.5 STRONTIUM (Sr)
Eμ(E) = 480.0 f_2 $keVcm^2/gm$

LINE	E(eV)	μ(cm^2/gm)	f_1	f_2	λ(A)	LINE	E(eV)	μ(cm^2/gm)	f_1	f_2	λ(A)
Na $L_{2,3}M$	30.5	1.59 05		10.08	407.1	Co Lα	776.2	6.17 03	30.62	9.97	16.0
Mg $L_{2,3}M$	49.3	2.83 04		2.91	251.5	Ni Lα	851.5	5.03 03	30.91	8.91	14.56
Al $L_{2,3}M$	72.4	7.57 03		1.14	171.4	Cu Lα	929.7	4.13 03	31.06	8.00	13.33
Si $L_{2,3}M$	91.5	5.55 03		1.06	135.5	Zn Lα	1011.7	3.40 03	31.09	7.17	12.25
Be K	108.5	5.89 03	7.13	1.33	114.	Na Kα	1041.0	3.19 03	31.09	6.91	11.91
Sr Mζ	114.0	6.22 03	6.72	1.48	108.7	Ge Lα	1188.0	2.35 03	30.89	5.80	10.44
Y Mζ	132.8	7.58 03	4.76	2.10	93.4	Mg Kα	1253.6	2.07 03	30.71	5.40	9.89
S Lℓ	148.7	1.40 04	2.93	4.33	83.4	Al Kα	1486.7	1.37 03	29.72	4.25	8.34
Zr Mζ	151.1	1.51 04	2.84	4.75	82.1	Si Kα	1740.0	9.43 02	27.35	3.42	7.13
Nb Mζ	171.7	2.26 04	1.85	8.07	72.2	Zr Lα	2042.4	3.47 03	24.53	14.78	6.07
B Kα	183.3	2.73 04	1.71	10.44	67.6	Nb Lα	2165.9	3.03 03		13.66	5.73
Mo Mζ	192.6	3.22 04	2.43	12.93	64.4	Mo Lα	2293.2	3.03 03		14.49	5.41
W N_5N_7	212.2	3.50 04	4.97	15.46	58.4	Cl Kα	2622.4	2.18 03		11.90	4.73
C Kα	277.0	3.53 04	12.30	20.37	44.7	Ag Lα	2984.3	1.57 03		9.75	4.16
Ag Mζ	311.7	3.07 04	16.29	19.91	39.8	Ca Kα	3691.7	9.01 02		6.93	3.36
N Kα	392.4	2.33 04	22.17	19.05	31.6	Ba Lα	4466.3	5.43 02		5.06	2.78
Ti Lℓ	395.3	2.30 04	22.39	18.96	31.4	Ti Kα	4510.8	5.29 02		4.97	2.75
Ti Lα	452.2	1.81 04	25.26	17.09	27.4	V Kα	4952.2	4.12 02		4.25	2.50
V Lα	511.3	1.44 04	27.12	15.38	24.3	Cr Kα	5414.7	3.24 02		3.65	2.29
O Kα	524.9	1.38 04	27.48	15.04	23.6	Mn Kα	5898.8	2.57 02		3.15	2.10
Mn Lℓ	556.3	1.23 04	28.19	14.24	22.3	Co Kα	6930.3	1.66 02		2.39	1.79
Cr Lα	572.8	1.16 04	28.51	13.83	21.6	Ni Kα	7478.2	1.35 02		2.10	1.66
Mn Lα	637.4	9.36 03	29.48	12.43	19.5	Cu Kα	8047.8	1.10 02		1.85	1.54
F Kα	676.8	8.21 03	29.87	11.57	18.3	Zn Kα	8638.9	9.07 01		1.63	1.44
Fe Lα	705.0	7.59 03	30.10	11.15	17.6	Ge Kα	9886.4	6.26 01		1.29	1.25

ABSORPTION EDGE

L_1	2217 eV	5.592 A		M_5**	133 eV	93.2 A
L_2	2008.5 eV	6.173 A				
L_3	1941.1 eV	6.387 A				





For E < 109 eV -------- (1)

References: 85

XI. Low-Energy X-Ray Interaction Coefficient Tables

See page 19 for Explanation of Tables

TABLE I. PHOTOABSORPTION CROSS SECTION, μ
ATOMIC SCATTERING FACTOR, $f_1 + if_2$

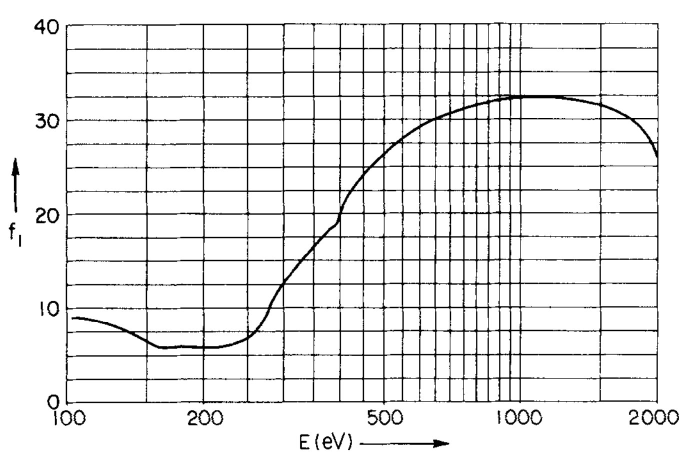
Atomic Weight = 88.91 Z = 39

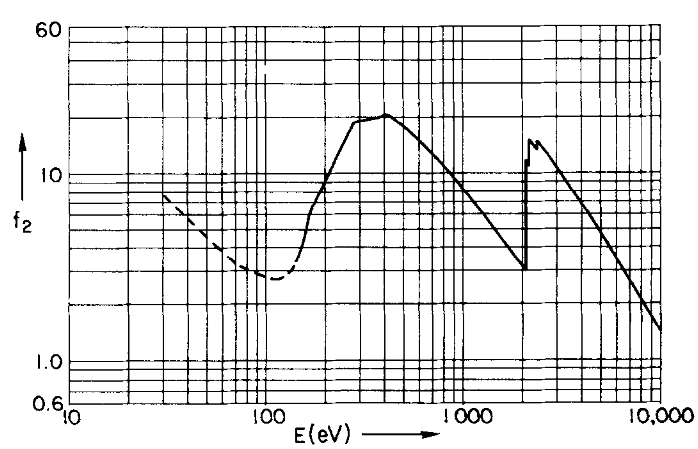
μ(barns/atom) = μ(cm^2/gm) x 147.6 YTTRIUM (Y)
$E\mu(E)$ = 473.1 f_2 keVcm^2/gm

LINE	E(eV)	μ(cm^2/gm)	f_1	f_2	λ(A)	LINE	E(eV)	μ(cm^2/gm)	f_1	f_2	λ(A)
Na $L_{2,3}M$	30.5	1.16 05		7.47	407.1	Co Lα	776.2	6.82 03	31.46	11.19	16.0
Mg $L_{2,3}M$	49.3	4.42 04		4.60	251.5	Ni Lα	851.5	5.57 03	31.89	10.01	14.56
Al $L_{2,3}M$	72.4	2.08 04		3.19	171.4	Cu Lα	929.7	4.58 03	32.17	9.00	13.33
Si $L_{2,3}M$	91.5	1.48 04		2.87	135.5	Zn Lα	1011.7	3.78 03	32.30	8.08	12.25
Be K	108.5	1.19 04	9.55	2.72	114.	Na Kα	1041.0	3.54 03	32.33	7.79	11.91
Sr Mζ	114.0	1.12 04	9.31	2.70	108.7	Ge Lα	1188.0	2.60 03	32.27	6.53	10.44
Y Mζ	132.8	1.06 04	8.17	2.96	93.4	Mg Kα	1253.6	2.30 03	32.15	6.08	9.89
S Lℓ	148.7	1.22 04	6.92	3.83	83.4	Al Kα	1486.7	1.53 03	31.48	4.81	8.34
Zr Mζ	151.1	1.25 04	6.68	3.99	82.1	Si Kα	1740.0	1.04 03	30.00	3.83	7.13
Nb Mζ	171.7	1.78 04	6.11	6.46	72.2	Zr Lα	2042.4	7.05 02	23.37	3.04	6.07
B Kα	183.3	1.92 04	6.03	7.45	67.6	Nb Lα	2165.9	3.26 03		14.90	5.73
Mo Mζ	192.6	2.04 04	5.96	8.31	64.4	Mo Lα	2293.2	2.84 03		13.78	5.41
W N_5N_7	212.2	2.29 04	5.97	10.26	58.4	Cl Kα	2622.4	2.33 03		12.90	4.73
C Kα	277.0	3.14 04	9.77	18.37	44.7	Ag Lα	2984.3	1.70 03		10.70	4.16
Ag Mζ	311.7	2.86 04	13.73	18.83	39.8	Ca Kα	3691.7	9.86 02		7.70	3.36
N Kα	392.4	2.38 04	18.85	19.77	31.6	Ba Lα	4466.3	5.97 02		5.64	2.78
Ti Lℓ	395.3	2.51 04	19.08	20.94	31.4	Ti Kα	4510.8	5.82 02		5.55	2.75
Ti Lα	452.2	1.98 04	24.32	18.96	27.4	V Kα	4952.2	4.53 02		4.74	2.50
V Lα	511.3	1.59 04	26.86	17.16	24.3	Cr Kα	5414.7	3.56 02		4.08	2.29
O Kα	524.9	1.51 04	27.33	16.79	23.6	Mn Kα	5898.8	2.82 02		3.52	2.10
Mn Lℓ	556.3	1.35 04	28.27	15.92	22.3	Co Kα	6930.3	1.82 02		2.66	1.79
Cr Lα	572.8	1.28 04	28.70	15.46	21.6	Ni Kα	7478.2	1.48 02		2.33	1.66
Mn Lα	637.4	1.03 04	29.97	13.90	19.5	Cu Kα	8047.8	1.21 02		2.05	1.54
F Kα	676.8	9.05 03	30.48	12.94	18.3	Zn Kα	8638.9	9.91 01		1.81	1.44
Fe Lα	705.0	8.37 03	30.79	12.47	17.6	Ge Kα	9886.4	6.83 01		1.43	1.25

ABSORPTION EDGE

L_1	2377 eV	5.217 A		M_5**	156 eV	79.5 A
L_2	2154.0 eV	5.756 A				
L_3	2079.4 eV	5.962 A				





For E < 109 eV ------- (1)

References: 38

XI. Low-Energy X-Ray Interaction Coefficient Tables

See page 19 for Explanation of Tables

TABLE I. PHOTOABSORPTION CROSS SECTION, μ
ATOMIC SCATTERING FACTOR, $f_1 + if_2$

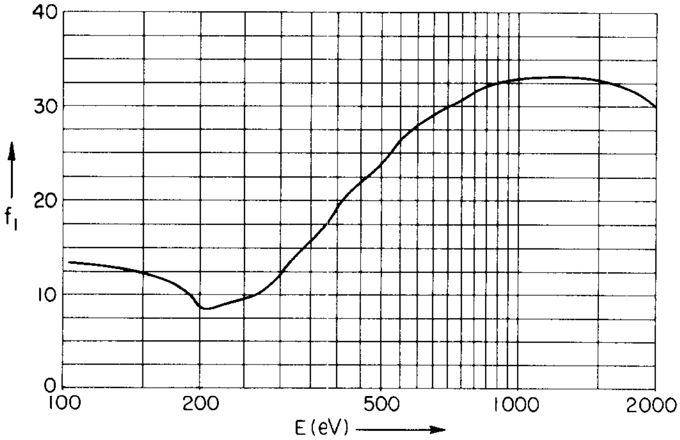
Atomic Weight = 91.22 Z = 40

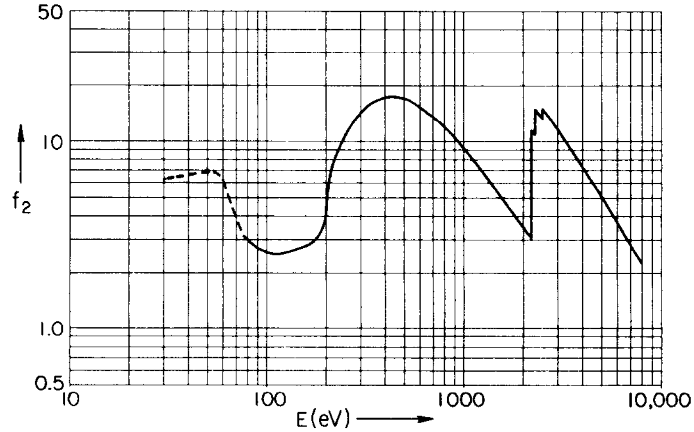
μ(barns/atom) = μ(cm^2/gm) x 151.5 ZIRCONIUM (Zr)
Eμ(E) = 461.1 f_2 keVcm^2/gm

LINE	E(eV)	μ(cm^2/gm)	f_1	f_2	λ(A)	LINE	E(eV)	μ(cm^2/gm)	f_1	f_2	λ(A)
Na $L_{2,3}M$	30.5	9.97 04		6.58	407.1	Co Lα	776.2	7.39 03	31.21	12.44	16.0
Mg $L_{2,3}M$	49.3	6.46 04		6.90	251.5	Ni Lα	851.5	6.04 03	32.11	11.14	14.56
Al $L_{2,3}M$	72.4	2.26 04		3.55	171.4	Cu Lα	929.7	4.97 03	32.64	10.02	13.33
Si $L_{2,3}M$	91.5	1.37 04		2.72	135.5	Zn Lα	1011.7	4.11 03	32.97	9.01	12.25
Be K	108.5	1.09 04	13.26	2.55	114.	Na Kα	1041.0	3.85 03	33.05	8.69	11.91
Sr Mζ	114.0	1.02 04	13.13	2.53	108.7	Ge Lα	1188.0	2.84 03	33.23	7.31	10.44
Y Mζ	132.8	9.27 03	12.70	2.67	93.4	Mg Kα	1253.6	2.51 03	33.20	6.81	9.89
S Lℓ	148.7	8.61 03	12.27	2.78	83.4	Al Kα	1486.7	1.67 03	32.82	5.39	8.34
Zr Mζ	151.1	8.52 03	12.18	2.79	82.1	Si Kα	1740.0	1.15 03	31.84	4.33	7.13
Nb Mζ	171.7	7.96 03	11.21	2.96	72.2	Zr Lα	2042.4	7.78 02	29.07	3.44	6.07
B Kα	183.3	8.27 03	10.38	3.29	67.6	Nb Lα	2165.9	6.74 02		3.16	5.73
Mo Mζ	192.6	8.53 03	9.35	3.56	64.4	Mo Lα	2293.2	2.19 03		10.89	5.41
W N_5N_7	212.2	1.59 04	8.23	7.33	58.4	Cl Kα	2622.4	2.50 03		14.21	4.73
C Kα	277.0	2.16 04	10.65	12.98	44.7	Ag Lα	2984.3	1.82 03		11.77	4.16
Ag Mζ	311.7	2.25 04	13.42	15.17	39.8	Ca Kα	3691.7	1.06 03		8.47	3.36
N Kα	392.4	2.04 04	18.85	17.39	31.6	Ba Lα	4466.3	6.42 02		6.21	2.78
Ti Lℓ	395.3	2.03 04	19.11	17.36	31.4	Ti Kα	4510.8	6.25 02		6.11	2.75
Ti Lα	452.2	1.71 04	22.06	16.72	27.4	V Kα	4952.2	4.87 02		5.23	2.50
V Lα	511.3	1.52 04	24.48	16.81	24.3	Cr Kα	5414.7	3.84 02		4.50	2.29
O Kα	524.9	1.48 04	25.24	16.82	23.6	Mn Kα	5898.8	3.04 02		3.89	2.10
Mn Lℓ	556.3	1.33 04	26.66	16.09	22.3	Co Kα	6930.3	1.97 02		2.95	1.79
Cr Lα	572.8	1.27 04	27.20	15.73	21.6	Ni Kα	7478.2	1.60 02		2.59	1.66
Mn Lα	637.4	1.05 04	28.83	14.48	19.5	Cu Kα	8047.8	1.31 02		2.28	1.54
F Kα	676.8	9.42 03	29.59	13.82	18.3	Zn Kα	8638.9	1.08 02		2.02	1.44
Fe Lα	705.0	8.76 03	30.07	13.39	17.6	Ge Kα	9886.4	7.43 01		1.59	1.25

ABSORPTION EDGE

L_1	2541 eV	4.879 A	M_5**	180 eV	68.9 A
L_2	2305.3 eV	5.378 A			
L_3	2222.5 eV	5.579 A			





For 76 eV < E < 776 eV ———— (28-N)

For E < 76 eV - - - - - - (1)

References: 28, 114

XI. Low-Energy X-Ray Interaction Coefficient Tables

See page 19 for Explanation of Tables

TABLE I. PHOTOABSORPTION CROSS SECTION, μ
ATOMIC SCATTERING FACTOR, $f_1 + if_2$

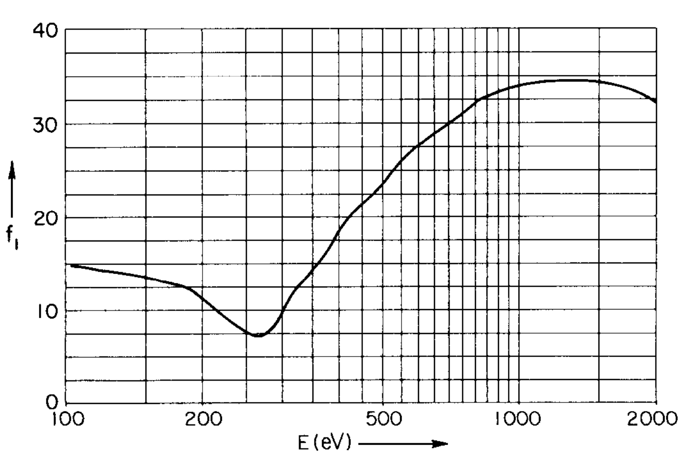
Atomic Weight = 92.91 Z = 41

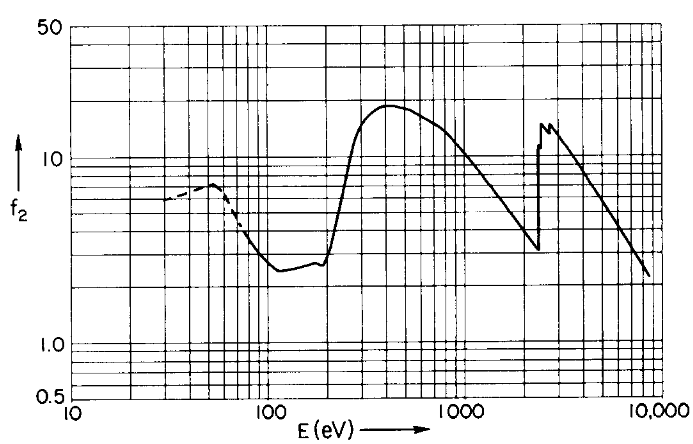
μ(barns/atom) = μ(cm^2/gm) x 154.3 NIOBIUM (Nb)
Eμ(E) = 452.7 f_2 keVcm^2/gm

LINE	E(eV)	μ(cm^2/gm)	f_1	f_2	λ(A)
Na $L_{2,3}M$	30.5	9.00 04		6.06	407.1
Mg $L_{2,3}M$	49.3	6.52 04		7.10	251.5
Al $L_{2,3}M$	72.4	2.70 04		4.32	171.4
Si $L_{2,3}M$	91.5	1.50 04		3.03	135.5
Be K	108.5	1.06 04	14.62	2.55	114.
Sr Mζ	114.0	9.69 03	14.42	2.44	108.7
Y Mζ	132.8	8.52 03	13.90	2.50	93.4
S Lℓ	148.7	7.75 03	13.50	2.54	83.4
Zr Mζ	151.1	7.65 03	13.43	2.55	82.1
Nb Mζ	171.7	7.14 03	12.83	2.71	72.2
B Kα	183.3	6.56 03	12.38	2.65	67.6
Mo Mζ	192.6	6.12 03	11.75	2.60	64.4
W N_5N_7	212.2	7.17 03	10.11	3.36	58.4
C Kα	277.0	1.94 04	7.64	11.86	44.7
Ag Mζ	311.7	2.28 04	11.33	15.67	39.8
N Kα	392.4	2.14 04	17.82	18.54	31.6
Ti Lℓ	395.3	2.12 04	18.14	18.50	31.4
Ti Lα	452.2	1.78 04	21.57	17.82	27.4
V Lα	511.3	1.57 04	24.17	17.75	24.3
O Kα	524.9	1.53 04	24.90	17.74	23.6
Mn Lℓ	556.3	1.39 04	26.30	17.13	22.3
Cr Lα	572.8	1.33 04	26.86	16.82	21.6
Mn Lα	637.4	1.12 04	28.66	15.76	19.5
F Kα	676.8	1.02 04	29.55	15.20	18.3
Fe Lα	705.0	9.52 03	30.13	14.83	17.6
Co Lα	776.2	8.17 03	31.60	14.00	16.0
Ni Lα	851.5	6.68 03	32.84	12.55	14.56
Cu Lα	929.7	5.50 03	33.55	11.29	13.33
Zn Lα	1011.7	4.55 03	34.02	10.16	12.25
Na Kα	1041.0	4.26 03	34.15	9.80	11.91
Ge Lα	1188.0	3.14 03	34.47	8.23	10.44
Mg Kα	1253.6	2.77 03	34.50	7.67	9.89
Al Kα	1486.7	1.85 03	34.34	6.07	8.34
Si Kα	1740.0	1.24 03	33.62	4.78	7.13
Zr Lα	2042.4	8.36 02	31.83	3.77	6.07
Nb Lα	2165.9	7.26 02		3.47	5.73
Mo Lα	2293.2	6.34 02		3.21	5.41
Cl Kα	2622.4	2.34 03		13.57	4.73
Ag Lα	2984.3	1.95 03		12.88	4.16
Ca Kα	3691.7	1.14 03		9.32	3.36
Ba Lα	4466.3	6.95 02		6.85	2.78
Ti Kα	4510.8	6.77 02		6.74	2.75
V Kα	4952.2	5.28 02		5.77	2.50
Cr Kα	5414.7	4.15 02		4.97	2.29
Mn Kα	5898.8	3.29 02		4.29	2.10
Co Kα	6930.3	2.12 02		3.25	1.79
Ni Kα	7478.2	1.72 02		2.85	1.66
Cu Kα	8047.8	1.41 02		2.51	1.54
Zn Kα	8638.9	1.16 02		2.21	1.44
Ge Kα	9886.4	8.00 01		1.75	1.25

ABSORPTION EDGE

L_1	2710 eV	4.575 A		M_5**	204 eV	60.8 A
L_2	2464.1 eV	5.031 A				
L_3	2370.6 eV	5.230 A				





For 76 eV < E < 776 eV ———— (28-N)
For E < 76 eV - - - - - - - (1)

References: 28, 114

XI. Low-Energy X-Ray Interaction Coefficient Tables

See page 19 for Explanation of Tables

TABLE I. PHOTOABSORPTION CROSS SECTION, μ
ATOMIC SCATTERING FACTOR, $f_1 + if_2$

Atomic Weight = 95.94 Z = 42

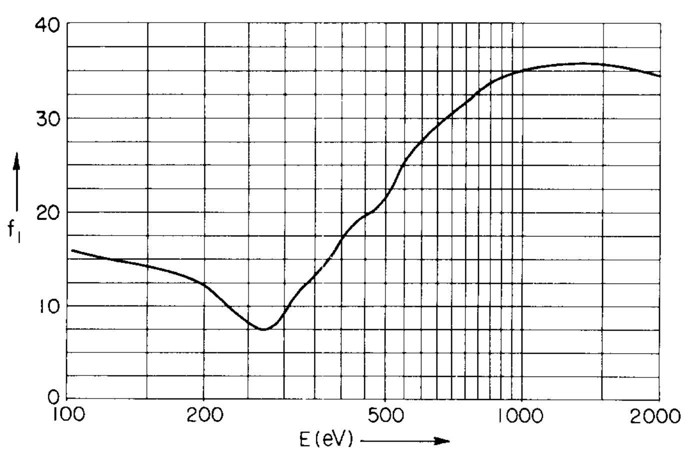
μ(barns/atom) = μ(cm^2/gm) x 159.3 MOLYBDENUM (Mo)
$E\mu(E)$ = 438.4 f_2 keVcm^2/gm

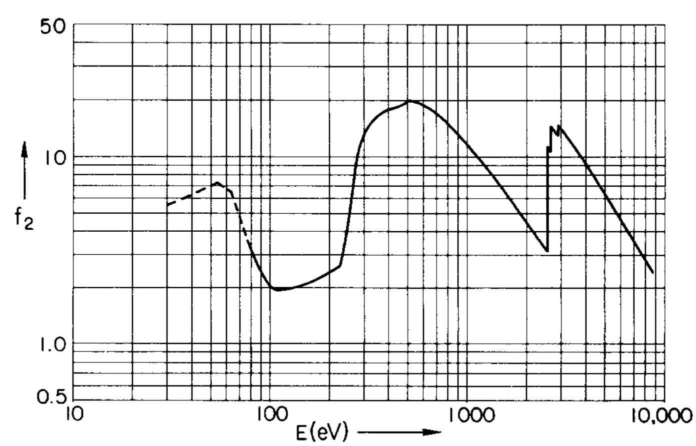
LINE	E(eV)	μ(cm^2/gm)	f_1	f_2	λ(A)
Na $L_{2,3}M$	30.5	7.97 04		5.53	407.1
Mg $L_{2,3}M$	49.3	6.16 04		6.92	251.5
Al $L_{2,3}M$	72.4	2.50 04		4.13	171.4
Si $L_{2,3}M$	91.5	1.10 04		2.29	135.5
Be K	108.5	7.97 03	15.08	1.97	114.
Sr $M\zeta$	114.0	7.50 03	14.87	1.95	108.7
Y $M\zeta$	132.8	6.85 03	14.36	2.07	93.4
S $L\ell$	148.7	6.41 03	13.98	2.17	83.4
Zr $M\zeta$	151.1	6.34 03	13.92	2.19	82.1
Nb $M\zeta$	171.7	5.77 03	13.31	2.26	72.2
B $K\alpha$	183.3	5.61 03	12.86	2.34	67.6
Mo $M\zeta$	192.6	5.48 03	12.44	2.41	64.4
W N_5N_7	212.2	5.21 03	10.99	2.52	58.4
C $K\alpha$	277.0	1.64 04	7.50	10.39	44.7
Ag $M\zeta$	311.7	2.04 04	10.64	14.54	39.8
N $K\alpha$	392.4	2.02 04	16.45	18.05	31.6
Ti $L\ell$	395.3	2.00 04	16.75	18.04	31.4
Ti $L\alpha$	452.2	1.73 04	19.64	17.85	27.4
V $L\alpha$	511.3	1.68 04	22.37	19.63	24.3
O $K\alpha$	524.9	1.67 04	23.57	20.03	23.6
Mn $L\ell$	556.3	1.52 04	25.78	19.25	22.3
Cr $L\alpha$	572.8	1.44 04	26.58	18.87	21.6
Mn $L\alpha$	637.4	1.21 04	28.93	17.53	19.5
F $K\alpha$	676.8	1.09 04	30.02	16.83	18.3
Fe $L\alpha$	705.0	1.02 04	30.70	16.36	17.6

LINE	E(eV)	μ(cm^2/gm)	f_1	f_2	λ(A)
Co $L\alpha$	776.2	8.66 03	32.35	15.32	16.0
Ni $L\alpha$	851.5	7.09 03	33.71	13.76	14.56
Cu $L\alpha$	929.7	5.85 03	34.51	12.40	13.33
Zn $L\alpha$	1011.7	4.85 03	35.08	11.18	12.25
Na $K\alpha$	1041.0	4.54 03	35.24	10.79	11.91
Ge $L\alpha$	1188.0	3.35 03	35.68	9.08	10.44
Mg $K\alpha$	1253.6	2.96 03	35.76	8.46	9.89
Al $K\alpha$	1486.7	1.98 03	35.72	6.71	8.34
Si $K\alpha$	1740.0	1.35 03	35.24	5.36	7.13
Zr $L\alpha$	2042.4	9.11 02	34.04	4.24	6.07
Nb $L\alpha$	2165.9	7.88 02		3.89	5.73
Mo $L\alpha$	2293.2	6.84 02		3.57	5.41
Cl $K\alpha$	2622.4	1.77 03		10.58	4.73
Ag $L\alpha$	2984.3	2.03 03		13.78	4.16
Ca $K\alpha$	3691.7	1.20 03		10.06	3.36
Ba $L\alpha$	4466.3	7.31 02		7.44	2.78
Ti $K\alpha$	4510.8	7.12 02		7.32	2.75
V $K\alpha$	4952.2	5.57 02		6.29	2.50
Cr $K\alpha$	5414.7	4.39 02		5.42	2.29
Mn $K\alpha$	5898.8	3.49 02		4.69	2.10
Co $K\alpha$	6930.3	2.25 02		3.56	1.79
Ni $K\alpha$	7478.2	1.83 02		3.12	1.66
Cu $K\alpha$	8047.8	1.50 02		2.75	1.54
Zn $K\alpha$	8638.9	1.23 02		2.43	1.44
Ge $K\alpha$	9886.4	8.51 01		1.92	1.25

ABSORPTION EDGE

L_1	2881 eV	4.304 A
L_2	2627.4 eV	4.719 A
L_3	2523.4 eV	4.913 A
M_5**	228 eV	54.4 A





For 76 eV < E < 776 eV ———— (28-N)
For E < 76 eV - - - - - - (1)

References: 28, 114

XI. Low-Energy X-Ray Interaction Coefficient Tables

See page 19 for Explanation of Tables

TABLE I. PHOTOABSORPTION CROSS SECTION, μ
ATOMIC SCATTERING FACTOR, $f_1 + if_2$

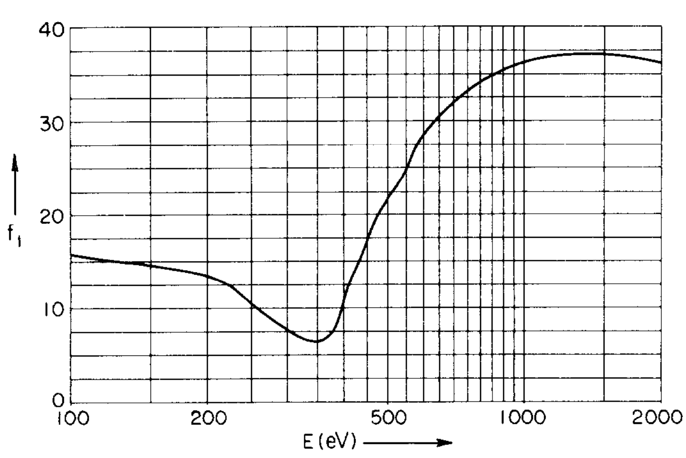
Atomic Weight = 98.91 Z = 43

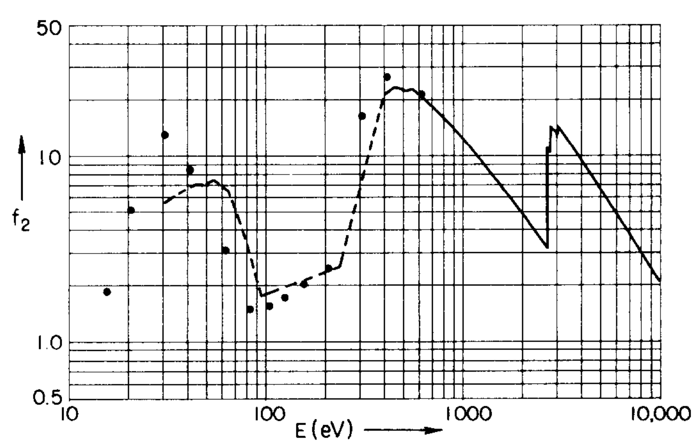
μ(barns/atom) = μ(cm^2/gm) x 164.2 TECHNETIUM (Tc)
$E\mu(E)$ = 425.2 f_2 keVcm^2/gm

LINE	E(eV)	μ(cm^2/gm)	f_1	f_2	λ(A)	LINE	E(eV)	μ(cm^2/gm)	f_1	f_2	λ(A)
Na $L_{2,3}M$	30.5	7.90 04		5.66	407.1	Co Lα	776.2	9.05 03	33.71	16.51	16.0
Mg $L_{2,3}M$	49.3	6.17 04		7.15	251.5	Ni Lα	851.5	7.45 03	34.85	14.91	14.56
Al $L_{2,3}M$	72.4	2.62 04		4.47	171.4	Cu Lα	929.7	6.17 03	35.69	13.49	13.33
Si $L_{2,3}M$	91.5	8.83 03		1.90	135.5	Zn Lα	1011.7	5.11 03	36.30	12.16	12.25
Be K	108.5	7.30 03	15.42	1.86	114.	Na Kα	1041.0	4.79 03	36.48	11.73	11.91
Sr Mζ	114.0	7.08 03	15.26	1.90	108.7	Ge Lα	1188.0	3.53 03	36.96	9.87	10.44
Y Mζ	132.8	6.46 03	14.84	2.02	93.4	Mg Kα	1253.6	3.12 03	37.02	9.20	9.89
S Lℓ	148.7	6.04 03	14.54	2.11	83.4	Al Kα	1486.7	2.11 03	37.07	7.37	8.34
Zr Mζ	151.1	5.98 03	14.49	2.13	82.1	Si Kα	1740.0	1.45 03	36.74	5.93	7.13
Nb Mζ	171.7	5.55 03	14.07	2.24	72.2	Zr Lα	2042.4	9.83 02	35.87	4.72	6.07
B Kα	183.3	5.33 03	13.79	2.30	67.6	Nb Lα	2165.9	8.51 02		4.33	5.73
Mo Mζ	192.6	5.18 03	13.53	2.35	64.4	Mo Lα	2293.2	7.39 02		3.99	5.41
W N_5N_7	212.2	4.89 03	12.84	2.44	58.4	Cl Kα	2622.4	5.29 02		3.26	4.73
C Kα	277.0	7.95 03	8.74	5.18	44.7	Ag Lα	2984.3	1.90 03		13.34	4.16
Ag Mζ	311.7	1.16 04	7.06	8.49	39.8	Ca Kα	3691.7	1.25 03		10.84	3.36
N Kα	392.4	2.29 04	9.46	21.14	31.6	Ba Lα	4466.3	7.65 02		8.04	2.78
Ti Lℓ	395.3	2.32 04	10.11	21.56	31.4	Ti Kα	4510.8	7.46 02		7.91	2.75
Ti Lα	452.2	2.20 04	17.57	23.43	27.4	V Kα	4952.2	5.84 02		6.80	2.50
V Lα	511.3	1.88 04	22.61	22.55	24.3	Cr Kα	5414.7	4.61 02		5.87	2.29
O Kα	524.9	1.81 04	23.30	22.36	23.6	Mn Kα	5898.8	3.67 02		5.08	2.10
Mn Lℓ	556.3	1.75 04	25.57	22.85	22.3	Co Kα	6930.3	2.37 02		3.87	1.79
Cr Lα	572.8	1.65 04	27.01	22.19	21.6	Ni Kα	7478.2	1.93 02		3.40	1.66
Mn Lα	637.4	1.34 04	30.15	20.11	19.5	Cu Kα	8047.8	1.58 02		2.99	1.54
F Kα	676.8	1.19 04	31.39	18.86	18.3	Zn Kα	8638.9	1.30 02		2.65	1.44
Fe Lα	705.0	1.10 04	32.12	18.25	17.6	Ge Kα	9886.4	9.00 01		2.09	1.25

ABSORPTION EDGE

L_1	3055 eV	4.058 A		M_5**	253 eV	49.0 A
L_2	2794.8 eV	4.436 A				
L_3	2678.0 eV	4.630 A				





For E < 400 eV ------- (1)
• (38)

References: 38

XI. Low-Energy X-Ray Interaction Coefficient Tables

See page 19 for Explanation of Tables

TABLE I. PHOTOABSORPTION CROSS SECTION, μ
ATOMIC SCATTERING FACTOR, $f_1 + if_2$

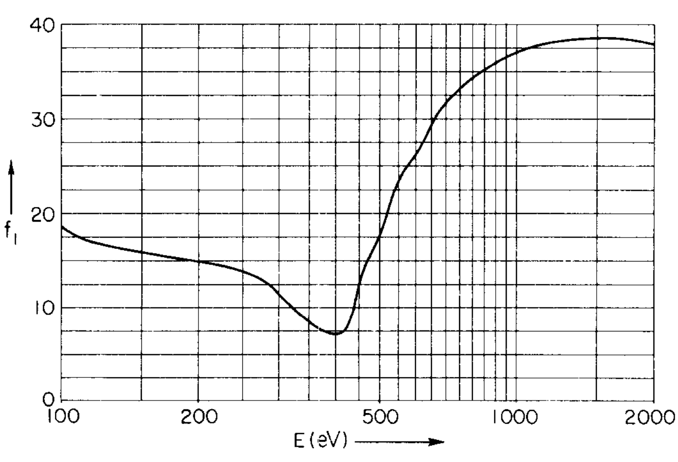
Atomic Weight = 101.1 Z = 44

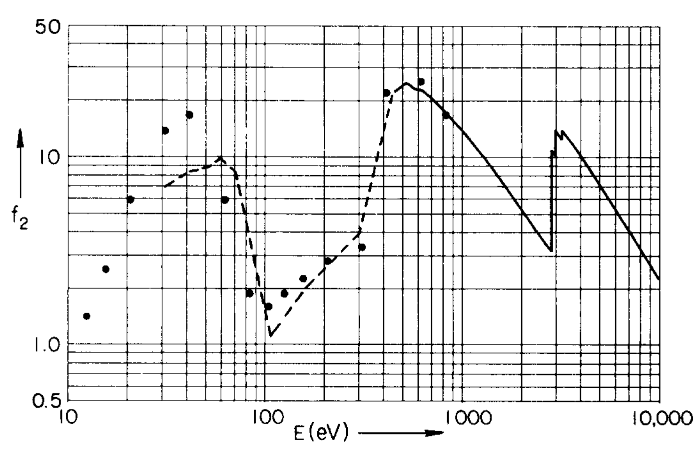
μ(barns/atom) = μ(cm^2/gm) x 167.8 RUTHENIUM (Ru)
$E\mu(E)$ = 416.1 f_2 keVcm^2/gm

LINE	E(eV)	μ(cm^2/gm)	f_1	f_2	λ(A)	LINE	E(eV)	μ(cm^2/gm)	f_1	f_2	λ(A)
Na $L_{2,3}M$	30.5	9.51 04		6.96	407.1	Co Lα	776.2	9.90 03	33.81	18.46	16.0
Mg $L_{2,3}M$	49.3	7.41 04		8.77	251.5	Ni Lα	851.5	8.13 03	35.29	16.63	14.56
Al $L_{2,3}M$	72.4	4.03 04		7.00	171.4	Cu Lα	929.7	6.74 03	36.34	15.05	13.33
Si $L_{2,3}M$	91.5	9.79 03		2.15	135.5	Zn Lα	1011.7	5.61 03	37.13	13.63	12.25
Be K	108.5	4.43 03	17.49	1.16	114.	Na Kα	1041.0	5.25 03	37.37	13.14	11.91
Sr Mζ	114.0	4.54 03	17.09	1.24	108.7	Ge Lα	1188.0	3.87 03	38.11	11.06	10.44
Y Mζ	132.8	4.89 03	16.27	1.56	93.4	Mg Kα	1253.6	3.42 03	38.23	10.31	9.89
S Lℓ	148.7	5.17 03	15.84	1.85	83.4	Al Kα	1486.7	2.31 03	38.50	8.26	8.34
Zr Mζ	151.1	5.21 03	15.79	1.89	82.1	Si Kα	1740.0	1.57 03	38.33	6.55	7.13
Nb Mζ	171.7	5.34 03	15.43	2.20	72.2	Zr Lα	2042.4	1.05 03	37.64	5.15	6.07
B Kα	183.3	5.36 03	15.22	2.36	67.6	Nb Lα	2165.9	9.07 02		4.72	5.73
Mo Mζ	192.6	5.38 03	15.05	2.49	64.4	Mo Lα	2293.2	7.86 02		4.33	5.41
W N_5N_7	212.2	5.42 03	14.67	2.76	58.4	Cl Kα	2622.4	5.65 02		3.56	4.73
C Kα	277.0	5.52 03	12.84	3.67	44.7	Ag Lα	2984.3	1.94 03		13.91	4.16
Ag Mζ	311.7	6.43 03	10.53	4.81	39.8	Ca Kα	3691.7	1.31 03		11.60	3.36
N Kα	392.4	1.41 04	7.15	13.26	31.6	Ba Lα	4466.3	8.10 02		8.69	2.78
Ti Lℓ	395.3	1.44 04	7.14	13.69	31.4	Ti Kα	4510.8	7.90 02		8.56	2.75
Ti Lα	452.2	2.06 04	13.08	22.41	27.4	V Kα	4952.2	6.20 02		7.38	2.50
V Lα	511.3	1.98 04	19.01	24.38	24.3	Cr Kα	5414.7	4.90 02		6.38	2.29
O Kα	524.9	1.97 04	20.76	24.82	23.6	Mn Kα	5898.8	3.91 02		5.54	2.10
Mn Lℓ	556.3	1.78 04	23.91	23.76	22.3	Co Kα	6930.3	2.53 02		4.22	1.79
Cr Lα	572.8	1.69 04	24.92	23.20	21.6	Ni Kα	7478.2	2.06 02		3.70	1.66
Mn Lα	637.4	1.47 04	28.67	22.47	19.5	Cu Kα	8047.8	1.69 02		3.26	1.54
F Kα	676.8	1.30 04	30.65	21.07	18.3	Zn Kα	8638.9	1.39 02		2.89	1.44
Fe Lα	705.0	1.20 04	31.69	20.39	17.6	Ge Kα	9886.4	9.60 01		2.28	1.25

ABSORPTION EDGE

L_1	3233 eV	3.835 A	
L_2	2966.3 eV	4.180 A	
L_3	2837.7 eV	4.369 A	
M_5**	280 eV	44.3 A	





For E < 450 eV ------- (1)
• (38)

References: 38

XI. Low-Energy X-Ray Interaction Coefficient Tables

See page 19 for Explanation of Tables

TABLE I. PHOTOABSORPTION CROSS SECTION, μ
ATOMIC SCATTERING FACTOR, $f_1 + if_2$

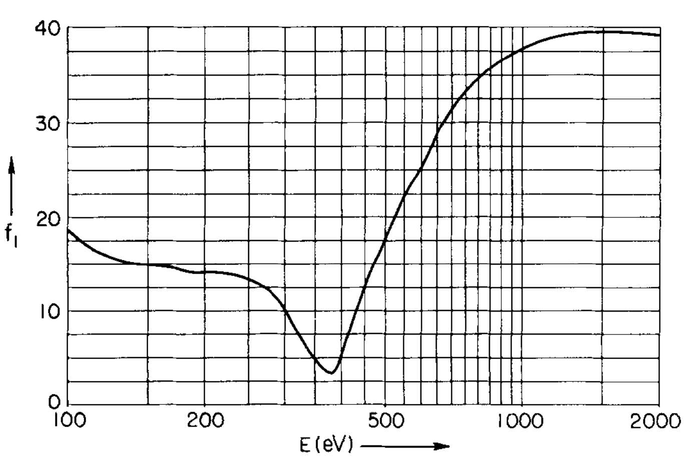
Atomic Weight = 102.9 Z = 45

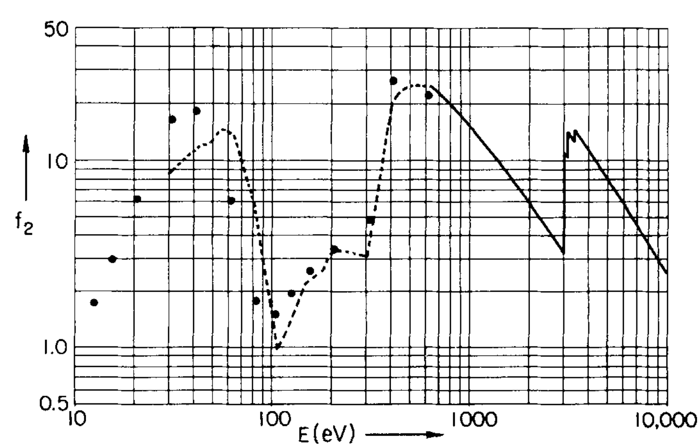
μ(barns/atom) = μ(cm^2/gm) x 170.9 RHODIUM (Rh)
$E\mu(E)$ = 408.7 f_2 keVcm^2/gm

LINE	E(eV)	μ(cm^2/gm)	f_1	f_2	λ(A)	LINE	E(eV)	μ(cm^2/gm)	f_1	f_2	λ(A)
Na $L_{2,3}M$	30.5	1.18 05		8.78	407.1	Co Lα	776.2	1.07 04	34.06	20.24	16.0
Mg $L_{2,3}M$	49.3	1.05 05		12.68	251.5	Ni Lα	851.5	8.78 03	35.77	18.29	14.56
Al $L_{2,3}M$	72.4	4.75 04		8.41	171.4	Cu Lα	929.7	7.28 03	36.99	16.55	13.33
Si $L_{2,3}M$	91.5	1.06 04		2.37	135.5	Zn Lα	1011.7	6.04 03	37.90	14.95	12.25
Be K	108.5	3.91 03	17.11	1.04	114.	Na Kα	1041.0	5.66 03	38.16	14.42	11.91
Sr Mζ	114.0	4.11 03	16.50	1.15	108.7	Ge Lα	1188.0	4.18 03	38.94	12.15	10.44
Y Mζ	132.8	5.34 03	15.29	1.74	93.4	Mg Kα	1253.6	3.70 03	39.14	11.34	9.89
S Lℓ	148.7	6.15 03	14.98	2.24	83.4	Al Kα	1486.7	2.50 03	39.48	9.10	8.34
Zr Mζ	151.1	6.13 03	14.94	2.27	82.1	Si Kα	1740.0	1.72 03	39.42	7.33	7.13
Nb Mζ	171.7	5.98 03	14.52	2.51	72.2	Zr Lα	2042.4	1.16 03	38.93	5.81	6.07
B Kα	183.3	6.00 03	14.15	2.69	67.6	Nb Lα	2165.9	1.01 03		5.33	5.73
Mo Mζ	192.6	6.62 03	13.98	3.12	64.4	Mo Lα	2293.2	8.71 02		4.89	5.41
W N_5N_7	212.2	6.44 03	14.08	3.34	58.4	Cl Kα	2622.4	6.17 02		3.96	4.73
C Kα	277.0	4.65 03	12.05	3.15	44.7	Ag Lα	2984.3	4.38 02		3.20	4.16
Ag Mζ	311.7	5.00 03	8.53	3.81	39.8	Ca Kα	3691.7	1.44 03		12.97	3.36
N Kα	392.4	1.83 04	3.69	17.61	31.6	Ba Lα	4466.3	8.86 02		9.68	2.78
Ti Lℓ	395.3	1.91 04	4.16	18.49	31.4	Ti Kα	4510.8	8.64 02		9.53	2.75
Ti Lα	452.2	2.16 04	13.10	23.84	27.4	V Kα	4952.2	6.78 02		8.21	2.50
V Lα	511.3	2.00 04	18.76	25.00	24.3	Cr Kα	5414.7	5.36 02		7.10	2.29
O Kα	524.9	1.97 04	20.08	25.26	23.6	Mn Kα	5898.8	4.27 02		6.16	2.10
Mn Lℓ	556.3	1.83 04	22.71	24.88	22.3	Co Kα	6930.3	2.77 02		4.70	1.79
Cr Lα	572.8	1.76 04	23.77	24.66	21.6	Ni Kα	7478.2	2.26 02		4.13	1.66
Mn Lα	637.4	1.57 04	28.11	24.53	19.5	Cu Kα	8047.8	1.85 02		3.64	1.54
F Kα	676.8	1.39 04	30.46	23.05	18.3	Zn Kα	8638.9	1.52 02		3.22	1.44
Fe Lα	705.0	1.29 04	31.67	22.32	17.6	Ge Kα	9886.4	1.05 02		2.55	1.25

ABSORPTION EDGE

L_1	3417 eV	3.629 A	M_5**	307 eV	40.4 A
L_2	3144.8 eV	3.9425 A			
L_3	3002.1 eV	4.1299 A			





For E < 650 eV ------- (1)
• (38)

References: 38

XI. Low-Energy X-Ray Interaction Coefficient Tables

See page 19 for Explanation of Tables

TABLE I. PHOTOABSORPTION CROSS SECTION, μ
ATOMIC SCATTERING FACTOR, $f_1 + if_2$

Atomic Weight = 106.4 Z = 46

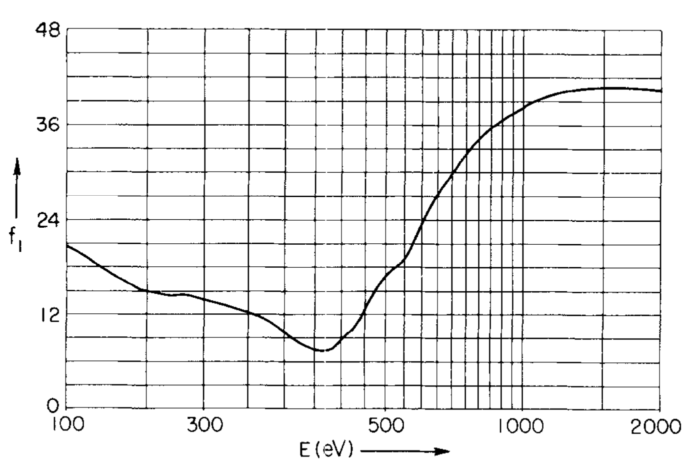
μ(barns/atom) = μ(cm^2/gm) x 176.7 PALLADIUM (Pd)
Eμ(E) = 395.3 f_2 $keVcm^2$/gm

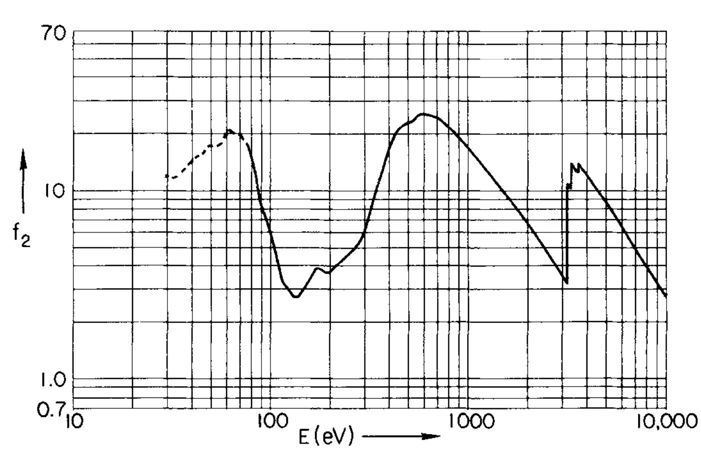
LINE	E(eV)	μ(cm^2/gm)	f_1	f_2	λ(A)
Na $L_{2,3}M$	30.5	1.53 05		11.81	407.1
Mg $L_{2,3}M$	49.3	1.40 05		17.45	251.5
Al $L_{2,3}M$	72.4	1.02 05		18.70	171.4
Si $L_{2,3}M$	91.5	3.14 04		7.26	135.5
Be K	108.5	1.47 04	19.61	4.04	114.0
Sr Mζ	114.0	1.14 04	18.69	3.29	108.7
Y Mζ	132.8	7.90 03	16.40	2.65	93.4
S Lℓ	148.7	8.28 03	15.14	3.12	83.4
Zr Mζ	151.1	8.34 03	15.02	3.19	82.1
Nb Mζ	171.7	9.22 03	14.61	4.00	72.2
B Kα	183.3	8.20 03	14.60	3.80	67.6
Mo Mζ	192.6	7.46 03	14.26	3.63	64.4
W N_5N_7	212.2	7.46 03	13.51	4.00	58.4
C Kα	277.0	7.46 03	11.18	5.23	44.7
Ag Mζ	311.7	9.07 03	9.06	7.15	39.8
N Kα	392.4	1.67 04	8.25	16.57	31.6
Ti Lℓ	395.3	1.68 04	8.51	16.82	31.4
Ti Lα	452.2	1.93 04	12.83	22.08	27.4
V Lα	511.3	1.79 04	17.44	23.09	24.3
O Kα	524.9	1.76 04	17.93	23.30	23.6
Mn Lℓ	556.3	1.78 04	19.72	25.11	22.3
Cr Lα	572.8	1.80 04	21.45	26.07	21.6
Mn Lα	637.4	1.56 04	26.63	25.13	19.5
F Kα	676.8	1.44 04	28.84	24.61	18.3
Fe Lα	705.0	1.36 04	30.43	24.26	17.6

LINE	E(eV)	μ(cm^2/gm)	f_1	f_2	λ(A)
Co Lα	776.2	1.14 04	33.65	22.40	16.0
Ni Lα	851.5	9.40 03	35.90	20.24	14.56
Cu Lα	929.7	7.81 03	37.41	18.36	13.33
Zn Lα	1011.7	6.52 03	38.59	16.67	12.25
Na Kα	1041.0	6.10 03	38.95	16.07	11.91
Ge Lα	1188.0	4.50 03	40.04	13.51	10.44
Mg Kα	1253.6	3.97 03	40.23	12.59	9.89
Al Kα	1486.7	2.68 03	40.68	10.08	8.34
Si Kα	1740.0	1.86 03	40.72	8.19	7.13
Zr Lα	2042.4	1.27 03	40.42	6.54	6.07
Nb Lα	2165.9	1.10 03		6.00	5.73
Mo Lα	2293.2	9.50 02		5.51	5.41
Cl Kα	2622.4	6.73 02		4.46	4.73
Ag Lα	2984.3	4.75 02		3.59	4.16
Ca Kα	3691.7	1.46 03		13.64	3.36
Ba Lα	4466.3	9.23 02		10.42	2.78
Ti Kα	4510.8	9.00 02		10.27	2.75
V Kα	4952.2	7.11 02		8.91	2.50
Cr Kα	5414.7	5.65 02		7.74	2.29
Mn Kα	5898.8	4.51 02		6.73	2.10
Co Kα	6930.3	2.94 02		5.15	1.79
Ni Kα	7478.2	2.39 02		4.52	1.66
Cu Kα	8047.8	1.96 02		3.99	1.54
Zn Kα	8638.9	1.61 02		3.52	1.44
Ge Kα	9886.4	1.11 02		2.78	1.25

ABSORPTION EDGE

L_1	3607 eV	3.4369 A		M_5**	335 eV	37.0 A
L_2	3330.3 eV	3.7228 A				
L_3	3173.0 eV	3.9074 A				





For 65 eV < E < 776 eV ——— (28-N)
For E < 65 eV - - - - - (1)

References: 28

XI. Low-Energy X-Ray Interaction Coefficient Tables

See page 19 for Explanation of Tables

TABLE I. PHOTOABSORPTION CROSS SECTION, μ
ATOMIC SCATTERING FACTOR, $f_1 + if_2$

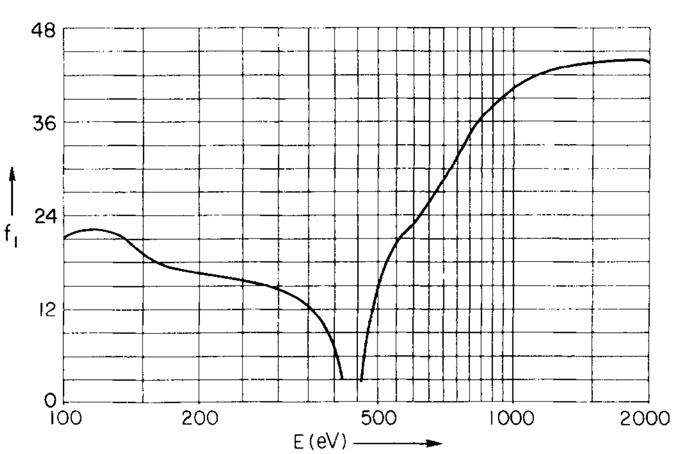
Atomic Weight = 112.4 Z = 48

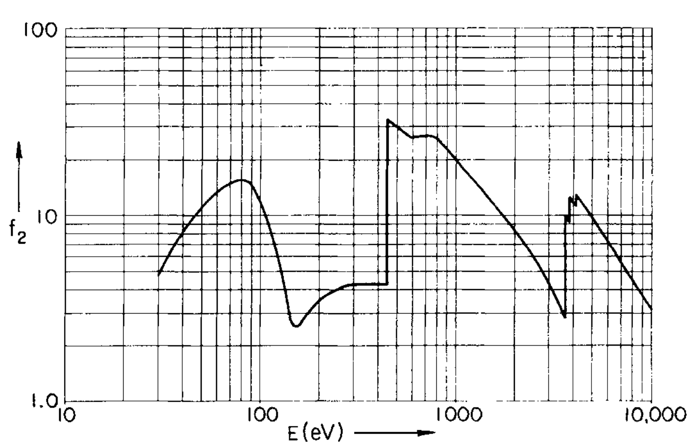
μ(barns/atom) = μ(cm^2/gm) x 186.6 CADMIUM (Cd)
$E\mu(E)$ = 374.2 f_2 keVcm^2/gm

LINE	E(eV)	μ(cm^2/gm)	f_1	f_2	λ(A)	LINE	E(eV)	μ(cm^2/gm)	f_1	f_2	λ(A)
Na $L_{2,3}M$	30.5	6.15 04		5.00	407.1	Co Lα	776.2	1.27 04	33.39	26.36	16.0
Mg $L_{2,3}M$	49.3	8.23 04		10.84	251.5	Ni Lα	851.5	1.04 04	36.80	23.75	14.56
Al $L_{2,3}M$	72.4	7.77 04		15.03	171.4	Cu Lα	929.7	8.72 03	38.93	21.67	13.33
Si $L_{2,3}M$	91.5	5.68 04		13.89	135.5	Zn Lα	1011.7	7.28 03	40.59	19.68	12.25
Be K	108.5	3.19 04	22.05	9.25	114.	Na Kα	1041.0	6.82 03	41.09	18.97	11.91
Sr Mζ	114.0	2.58 04	22.33	7.86	108.7	Ge Lα	1188.0	5.01 03	42.56	15.91	10.44
Y Mζ	132.8	1.11 04	21.45	3.94	93.4	Mg Kα	1253.6	4.42 03	42.92	14.81	9.89
S Lℓ	148.7	6.12 03	19.07	2.43	83.4	Al Kα	1486.7	2.97 03	43.58	11.81	8.34
Zr Mζ	151.1	6.14 03	18.72	2.48	82.1	Si Kα	1740.0	2.10 03	43.86	9.76	7.13
Nb Mζ	171.7	6.43 03	17.26	2.95	72.2	Zr Lα	2042.4	1.44 03	43.92	7.86	6.07
B Kα	183.3	6.57 03	16.82	3.22	67.6	Nb Lα	2165.9	1.25 03		7.21	5.73
Mo Mζ	192.6	6.69 03	16.59	3.44	64.4	Mo Lα	2293.2	1.08 03		6.61	5.41
W N_5N_7	212.2	6.59 03	16.25	3.74	58.4	Cl Kα	2622.4	7.54 02		5.29	4.73
C Kα	277.0	5.79 03	15.11	4.29	44.7	Ag Lα	2984.3	5.19 02		4.14	4.16
Ag Mζ	311.7	5.17 03	14.13	4.31	39.8	Ca Kα	3691.7	9.43 02		9.30	3.36
N Kα	392.4	4.15 03	8.17	4.35	31.6	Ba Lα	4466.3	9.29 02		11.09	2.78
Ti Lℓ	395.3	4.12 03	7.72	4.35	31.4	Ti Kα	4510.8	9.06 02		10.93	2.75
Ti Lα	452.2	2.66 04	-1.52	32.11	27.4	V Kα	4952.2	7.14 02		9.45	2.50
V Lα	511.3	2.12 04	16.69	28.95	24.3	Cr Kα	5414.7	5.67 02		8.20	2.29
O Kα	524.9	2.02 04	18.36	28.32	23.6	Mn Kα	5898.8	4.53 02		7.14	2.10
Mn Lℓ	556.3	1.82 04	21.12	27.01	22.3	Co Kα	6930.3	2.95 02		5.47	1.79
Cr Lα	572.8	1.72 04	21.90	26.31	21.6	Ni Kα	7478.2	2.41 02		4.81	1.66
Mn Lα	637.4	1.57 04	25.12	26.77	19.5	Cu Kα	8047.8	1.98 02		4.25	1.54
F Kα	676.8	1.49 04	27.37	26.89	18.3	Zn Kα	8638.9	1.63 02		3.76	1.44
Fe Lα	705.0	1.43 04	29.07	26.92	17.6	Ge Kα	9886.4	1.13 02		2.98	1.25

ABSORPTION EDGE

L_1	4019.0 eV	3.0849 A	$M_{4,5}$	440.8 eV	28.13 A
L_2	3728.0 eV	3.3257 A			
L_3	3537.6 eV	3.5047 A			





For E < 136 eV ———— (116)

References: 108, 116

XI. Low-Energy X-Ray Interaction Coefficient Tables

See page 19 for Explanation of Tables

TABLE I. PHOTOABSORPTION CROSS SECTION, μ
ATOMIC SCATTERING FACTOR, $f_1 + if_2$

Atomic Weight = 107.9 Z = 47

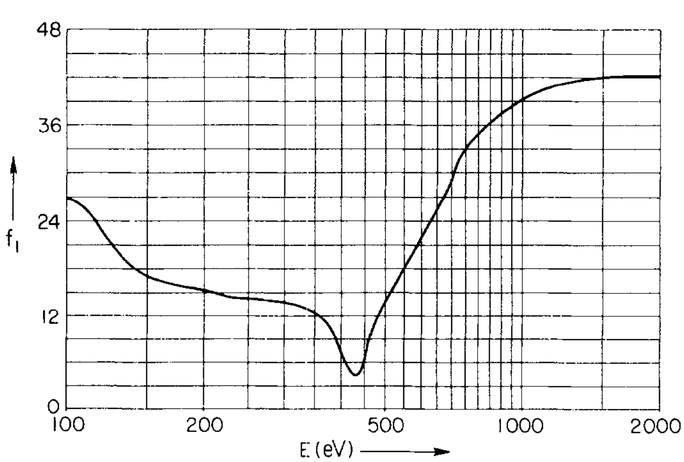
μ(barns/atom) = μ(cm^2/gm) x 179.1 SILVER (Ag)
$E\mu(E)$ = 389.9 f_2 keVcm^2/gm

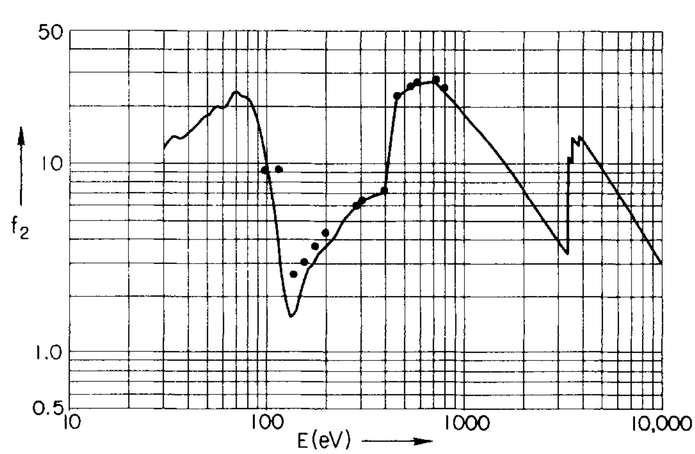
LINE	E(eV)	μ(cm^2/gm)	f_1	f_2	λ(A)
Na $L_{2,3}M$	30.5	1.58 05		12.37	407.1
Mg $L_{2,3}M$	49.3	1.41 05		17.86	251.5
Al $L_{2,3}M$	72.4	1.24 05		23.08	171.4
Si $L_{2,3}M$	91.5	6.48 04		15.21	135.5
Be K	108.5	2.04 04	25.52	5.67	114.
Sr $M\zeta$	114.0	1.25 04	24.31	3.64	108.7
Y $M\zeta$	132.8	4.65 03	19.29	1.58	93.4
S $L\ell$	148.7	5.74 03	17.07	2.19	83.4
Zr $M\zeta$	151.1	5.99 03	16.89	2.32	82.1
Nb $M\zeta$	171.7	6.90 03	15.89	3.04	72.2
B $K\alpha$	183.3	7.31 03	15.57	3.43	67.6
Mo $M\zeta$	192.6	7.28 03	15.34	3.60	64.4
W N_5N_7	212.2	7.31 03	14.79	3.98	58.4
C $K\alpha$	277.0	8.19 03	13.79	5.81	44.7
Ag $M\zeta$	311.7	8.05 03	13.39	6.43	39.8
N $K\alpha$	392.4	7.17 03	8.21	7.21	31.6
Ti $L\ell$	395.3	7.55 03	7.59	7.65	31.4
Ti $L\alpha$	452.2	1.92 04	6.49	22.28	27.4
V $L\alpha$	511.3	1.86 04	14.73	24.43	24.3
O $K\alpha$	524.9	1.85 04	15.94	24.91	23.6
Mn $L\ell$	556.3	1.80 04	18.54	25.72	22.3
Cr $L\alpha$	572.8	1.78 04	19.92	26.14	21.6
Mn $L\alpha$	637.4	1.63 04	24.59	26.59	19.5
F $K\alpha$	676.8	1.55 04	27.28	26.85	18.3
Fe $L\alpha$	705.0	1.49 04	29.68	27.02	17.6

LINE	E(eV)	μ(cm^2/gm)	f_1	f_2	λ(A)
Co $L\alpha$	776.2	1.21 04	33.90	24.08	16.0
Ni $L\alpha$	851.5	1.00 04	36.25	21.86	14.56
Cu $L\alpha$	929.7	8.33 03	38.03	19.85	13.33
Zn $L\alpha$	1011.7	6.93 03	39.36	17.97	12.25
Na $K\alpha$	1041.0	6.50 03	39.75	17.34	11.91
Ge $L\alpha$	1188.0	4.81 03	40.99	14.65	10.44
Mg $K\alpha$	1253.6	4.25 03	41.29	13.67	9.89
Al $K\alpha$	1486.7	2.89 03	42.00	11.01	8.34
Si $K\alpha$	1740.0	1.97 03	42.19	8.79	7.13
Zr $L\alpha$	2042.4	1.32 03	41.91	6.93	6.07
Nb $L\alpha$	2165.9	1.14 03		6.35	5.73
Mo $L\alpha$	2293.2	9.91 02		5.83	5.41
Cl $K\alpha$	2622.4	7.09 02		4.77	4.73
Ag $L\alpha$	2984.3	5.14 02		3.93	4.16
Ca $K\alpha$	3691.7	1.35 03		12.83	3.36
Ba $L\alpha$	4466.3	9.73 02		11.14	2.78
Ti $K\alpha$	4510.8	9.49 02		10.97	2.75
V $K\alpha$	4952.2	7.49 02		9.51	2.50
Cr $K\alpha$	5414.7	5.95 02		8.26	2.29
Mn $K\alpha$	5898.8	4.75 02		7.19	2.10
Co $K\alpha$	6930.3	3.10 02		5.50	1.79
Ni $K\alpha$	7478.2	2.52 02		4.84	1.66
Cu $K\alpha$	8047.8	2.07 02		4.27	1.54
Zn $K\alpha$	8638.9	1.70 02		3.78	1.44
Ge $K\alpha$	9886.4	1.18 02		2.99	1.25

ABSORPTION EDGE

L_1	3807.2 eV	3.2564 A	M_4	402.2 eV	30.82 A
L_2	3525.8 eV	3.5164 A	M_5	398.1 eV	31.14 A
L_3	3351.0 eV	3.6999 A			





For E < 367 eV ——— (82)
• (28-N)

References: 9, 14, 28, 30, 34, 82, 92, 114, 133

XI. Low-Energy X-Ray Interaction Coefficient Tables

See page 19 for Explanation of Tables

TABLE I. PHOTOABSORPTION CROSS SECTION, μ
ATOMIC SCATTERING FACTOR, $f_1 + if_2$

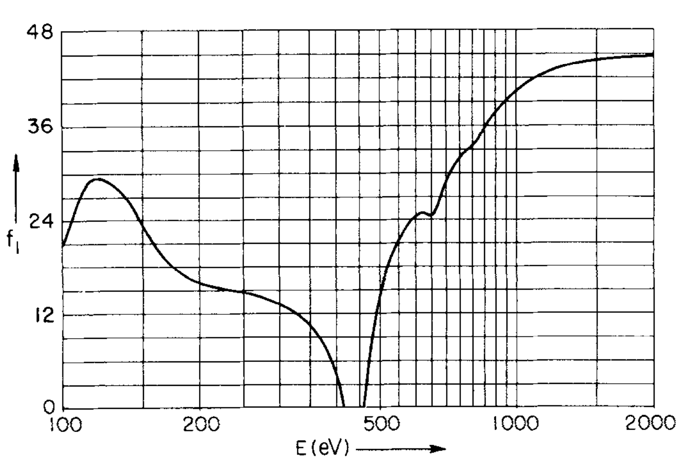
Atomic Weight = 114.8 Z = 49

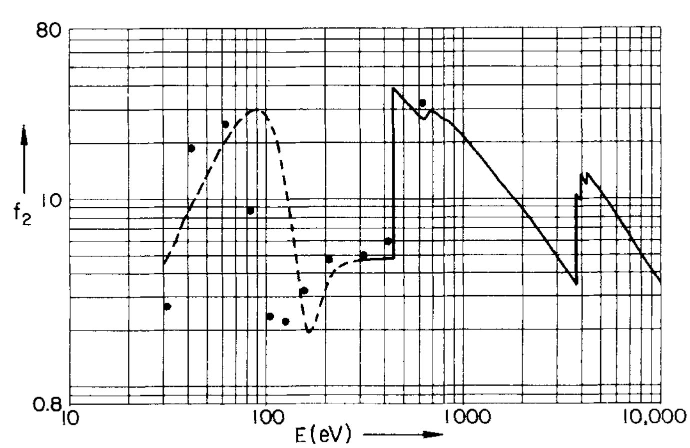
μ(barns/atom) = μ(cm^2/gm) x 190.6 INDIUM (In)
$E\mu(E)$ = 366.3 f_2 keVcm^2/gm

LINE	E(eV)	μ(cm^2/gm)	f_1	f_2	λ(A)	LINE	E(eV)	μ(cm^2/gm)	f_1	f_2	λ(A)
Na $L_{2,3}M$	30.5	5.58 04		4.64	407.1	Co $L\alpha$	776.2	1.25 04	32.89	26.39	16.0
Mg $L_{2,3}M$	49.3	9.77 04		13.14	251.5	Ni $L\alpha$	851.5	1.11 04	35.95	25.75	14.56
Al $L_{2,3}M$	72.4	1.31 05		25.95	171.4	Cu $L\alpha$	929.7	9.20 03	38.79	23.34	13.33
Si $L_{2,3}M$	91.5	1.19 05		29.61	135.5	Zn $L\alpha$	1011.7	7.70 03	40.66	21.27	12.25
Be K	108.5	7.99 04	26.19	23.65	114.	Na $K\alpha$	1041.0	7.22 03	41.23	20.51	11.91
Sr $M\zeta$	114.0	6.41 04	28.76	19.94	108.7	Ge $L\alpha$	1188.0	5.32 03	42.90	17.25	10.44
Y $M\zeta$	132.8	2.29 04	28.26	8.29	93.4	Mg $K\alpha$	1253.6	4.70 03	43.34	16.07	9.89
S $L\ell$	148.7	7.29 03	24.22	2.96	83.4	Al $K\alpha$	1486.7	3.17 03	44.22	12.86	8.34
Zr $M\zeta$	151.1	6.33 03	23.39	2.61	82.1	Si $K\alpha$	1740.0	2.21 03	44.53	10.47	7.13
Nb $M\zeta$	171.7	4.34 03	18.77	2.04	72.2	Zr $L\alpha$	2042.4	1.51 03	44.50	8.42	6.07
B $K\alpha$	183.3	5.13 03	17.20	2.57	67.6	Nb $L\alpha$	2165.9	1.31 03		7.75	5.73
Mo $M\zeta$	192.6	5.80 03	16.46	3.05	64.4	Mo $L\alpha$	2293.2	1.14 03		7.15	5.41
W N_5N_7	212.2	6.66 03	15.61	3.86	58.4	Cl $K\alpha$	2622.4	8.21 02		5.88	4.73
C $K\alpha$	277.0	6.14 03	14.07	4.64	44.7	Ag $L\alpha$	2984.3	5.93 02		4.83	4.16
Ag $M\zeta$	311.7	5.51 03	12.82	4.69	39.8	Ca $K\alpha$	3691.7	3.41 02		3.44	3.36
N $K\alpha$	392.4	4.47 03	6.14	4.79	31.6	Ba $L\alpha$	4466.3	1.05 03		12.81	2.78
Ti $L\ell$	395.3	4.44 03	5.67	4.79	31.4	Ti $K\alpha$	4510.8	1.03 03		12.62	2.75
Ti $L\alpha$	452.2	3.06 04	-7.58	37.74	27.4	V $K\alpha$	4952.2	8.10 02		10.95	2.50
V $L\alpha$	511.3	2.35 04	16.58	32.81	24.3	Cr $K\alpha$	5414.7	6.44 02		9.52	2.29
O $K\alpha$	524.9	2.22 04	18.65	31.83	23.6	Mn $K\alpha$	5898.8	5.16 02		8.30	2.10
Mn $L\ell$	556.3	1.96 04	22.01	29.80	22.3	Co $K\alpha$	6930.3	3.37 02		6.37	1.79
Cr $L\alpha$	572.8	1.84 04	23.21	28.80	21.6	Ni $K\alpha$	7478.2	2.75 02		5.61	1.66
Mn $L\alpha$	637.4	1.49 04	24.57	25.85	19.5	Cu $K\alpha$	8047.8	2.26 02		4.96	1.54
F $K\alpha$	676.8	1.59 04	26.29	29.39	18.3	Zn $K\alpha$	8638.9	1.86 02		4.40	1.44
Fe $L\alpha$	705.0	1.49 04	29.42	28.65	17.6	Ge $K\alpha$	9886.4	1.29 02		3.49	1.25

ABSORPTION EDGE

L_1	4237.3 eV	2.9260 A	M_5**	443 eV	28.0 A
L_2	3939.3 eV	3.1473 A			
L_3	3730.2 eV	3.3237 A			





For E < 280 eV ------- (1)
• (38)

References: 15, 105

XI. Low-Energy X-Ray Interaction Coefficient Tables

See page 19 for Explanation of Tables

TABLE I. PHOTOABSORPTION CROSS SECTION, μ
ATOMIC SCATTERING FACTOR, $f_1 + if_2$

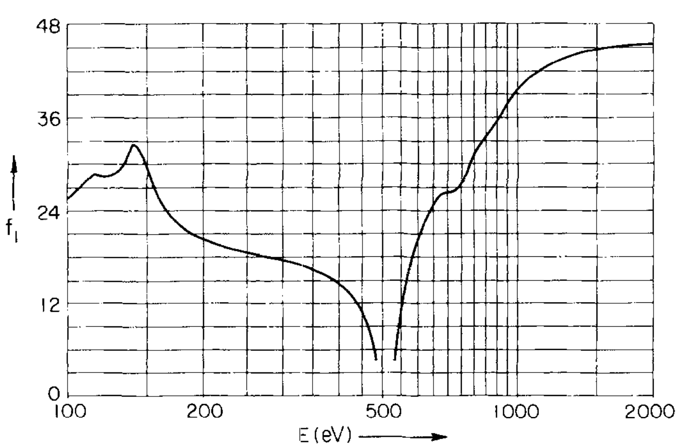
Atomic Weight = 118.7 Z = 50

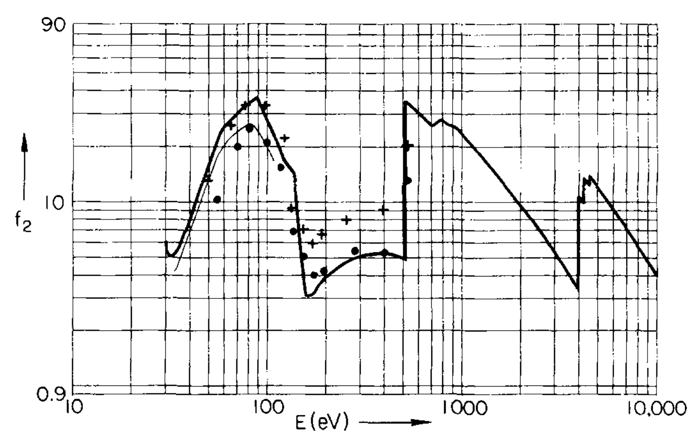
μ(barns/atom) = μ(cm^2/gm) x 197.1 TIN (Sn)
$E\mu(E)$ = 354.3 f_2 keVcm^2/gm

LINE	E(eV)	μ(cm^2/gm)	f_1	f_2	λ(A)	LINE	E(eV)	μ(cm^2/gm)	f_1	f_2	λ(A)
Na $L_{2,3}M$	30.5	6.09 04		5.23	407.1	Co $L\alpha$	776.2	1.27 04	29.40	27.83	16.0
Mg $L_{2,3}M$	49.3	1.11 05		15.46	251.5	Ni $L\alpha$	851.5	1.09 04	33.68	26.07	14.56
Al $L_{2,3}M$	72.4	1.53 05		31.33	171.4	Cu $L\alpha$	929.7	9.62 03	36.90	25.24	13.33
Si $L_{2,3}M$	91.5	1.32 05		34.06	135.5	Zn $L\alpha$	1011.7	8.06 03	39.82	23.00	12.25
Be K	108.5	7.47 04	27.54	22.88	114.	Na $K\alpha$	1041.0	7.55 03	40.58	22.18	11.91
Sr $M\zeta$	114.0	6.19 04	28.94	19.90	108.7	Ge $L\alpha$	1188.0	5.57 03	42.84	18.68	10.44
Y $M\zeta$	132.8	3.99 04	29.79	14.96	93.4	Mg $K\alpha$	1253.6	4.93 03	43.45	17.42	9.89
S $L\ell$	148.7	1.23 04	30.25	5.16	83.4	Al $K\alpha$	1486.7	3.33 03	44.67	13.97	8.34
Zr $M\zeta$	151.1	1.02 04	29.14	4.37	82.1	Si $K\alpha$	1740.0	2.33 03	45.24	11.43	7.13
Nb $M\zeta$	171.7	6.56 03	23.07	3.18	72.2	Zr $L\alpha$	2042.4	1.60 03	45.44	9.23	6.07
B $K\alpha$	183.3	6.77 03	21.57	3.50	67.6	Nb $L\alpha$	2165.9	1.39 03		8.51	5.73
Mo $M\zeta$	192.6	6.96 03	20.81	3.78	64.4	Mo $L\alpha$	2293.2	1.21 03		7.85	5.41
W N_5N_7	212.2	6.95 03	19.80	4.16	58.4	Cl $K\alpha$	2622.4	8.73 02		6.46	4.73
C $K\alpha$	277.0	6.33 03	18.14	4.95	44.7	Ag $L\alpha$	2984.3	6.29 02		5.30	4.16
Ag $M\zeta$	311.7	5.75 03	17.51	5.06	39.8	Ca $K\alpha$	3691.7	3.57 02		3.72	3.36
N $K\alpha$	392.4	4.76 03	15.04	5.27	31.6	Ba $L\alpha$	4466.3	1.09 03		13.70	2.78
Ti $L\ell$	395.3	4.73 03	14.92	5.27	31.4	Ti $K\alpha$	4510.8	1.06 03		13.52	2.75
Ti $L\alpha$	452.2	3.94 03	10.57	5.03	27.4	V $K\alpha$	4952.2	8.50 02		11.88	2.50
V $L\alpha$	511.3	2.43 04	-35.11	35.09	24.3	Cr $K\alpha$	5414.7	6.82 02		10.42	2.29
O $K\alpha$	524.9	2.31 04	0.85	34.20	23.6	Mn $K\alpha$	5898.8	5.49 02		9.14	2.10
Mn $L\ell$	556.3	2.06 04	13.53	32.29	22.3	Co $K\alpha$	6930.3	3.62 02		7.07	1.79
Cr $L\alpha$	572.8	1.94 04	16.87	31.29	21.6	Ni $K\alpha$	7478.2	2.96 02		6.24	1.66
Mn $L\alpha$	637.4	1.56 04	24.11	28.13	19.5	Cu $K\alpha$	8047.8	2.43 02		5.52	1.54
F $K\alpha$	676.8	1.38 04	26.14	26.27	18.3	Zn $K\alpha$	8638.9	2.01 02		4.90	1.44
Fe $L\alpha$	705.0	1.28 04	26.33	25.36	17.6	Ge $K\alpha$	9886.4	1.39 02		3.88	1.25

ABSORPTION EDGE

L_1	4464.8 eV	2.7769 A	$M_{4,5}$	511 eV	24.28 A
L_2	4157.3 eV	2.9823 A			
L_3	3928.8 eV	3.1557 A			





For E < 130 eV ——— (19)
• (32)
——— (34)
+ (22)

References: 16, 19, 22, 30, 32, 34, 107

XI. Low-Energy X-Ray Interaction Coefficient Tables

See page 19 for Explanation of Tables

TABLE I. PHOTOABSORPTION CROSS SECTION, μ
ATOMIC SCATTERING FACTOR, $f_1 + if_2$

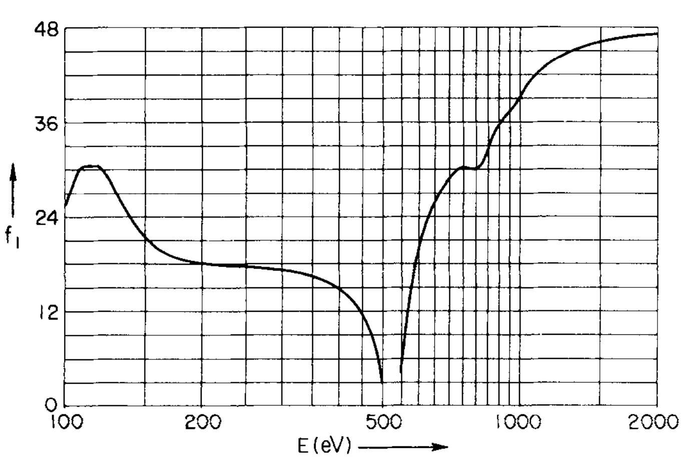
Atomic Weight = 121.8 Z = 5

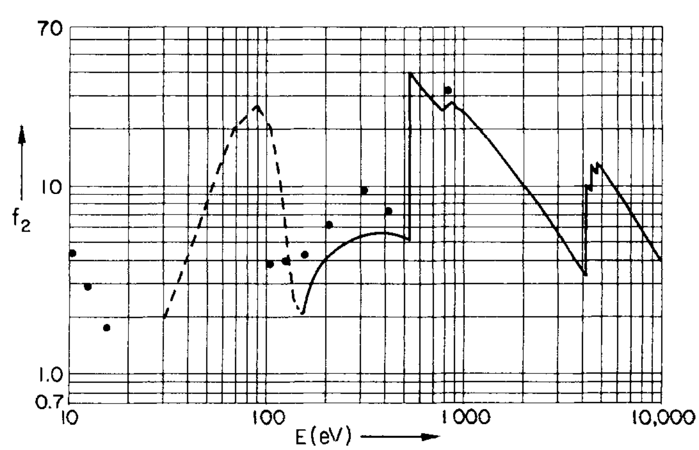
μ(barns/atom) = μ(cm^2/gm) x 202.1 ANTIMONY (Sb)
$E\mu(E)$ = 345.4 f_2 keVcm^2/gm

LINE	E(eV)	μ(cm²/gm)	f_1	f_2	λ(A)
Na $L_{2,3}M$	30.5	2.32 04		2.05	407.1
Mg $L_{2,3}M$	49.3	5.75 04		8.20	251.5
Al $L_{2,3}M$	72.4	1.03 05		21.53	171.4
Si $L_{2,3}M$	91.5	9.68 04		25.65	135.5
Be K	108.5	5.14 04	30.23	16.15	114.
Sr Mζ	114.0	3.63 04	30.46	11.99	108.7
Y Mζ	132.8	7.77 03	25.90	2.99	93.4
S Lℓ	148.7	4.87 03	21.70	2.10	83.4
Zr Mζ	151.1	4.79 03	21.20	2.09	82.1
Nb Mζ	171.7	6.60 03	18.98	3.28	72.2
B Kα	183.3	6.85 03	18.54	3.63	67.6
Mo Mζ	192.6	7.07 03	18.29	3.94	64.4
W N_5N_7	212.2	7.10 03	17.95	4.36	58.4
C Kα	277.0	6.60 03	17.33	5.29	44.7
Ag Mζ	311.7	6.01 03	17.01	5.43	39.8
N Kα	392.4	5.02 03	15.11	5.70	31.6
Ti Lℓ	395.3	4.98 03	15.01	5.70	31.4
Ti Lα	452.2	4.19 03	11.48	5.48	27.4
V Lα	511.3	3.54 03	-1.79	5.24	24.3
O Kα	524.9	3.42 03	-19.00	5.19	23.6
Mn Lℓ	556.3	2.34 04	8.28	37.64	22.3
Cr Lα	572.8	2.18 04	14.03	36.12	21.6
Mn Lα	637.4	1.70 04	24.79	31.42	19.5
F Kα	676.8	1.47 04	27.76	28.75	18.3
Fe Lα	705.0	1.35 04	29.01	27.48	17.6
Co Lα	776.2	1.10 04	30.09	24.78	16.0
Ni Lα	851.5	1.13 04	32.71	27.85	14.56
Cu Lα	929.7	9.51 03	36.71	25.59	13.33
Zn Lα	1011.7	8.45 03	39.59	24.73	12.25
Na Kα	1041.0	7.92 03	40.71	23.86	11.91
Ge Lα	1188.0	5.86 03	43.64	20.15	10.44
Mg Kα	1253.6	5.18 03	44.39	18.81	9.89
Al Kα	1486.7	3.52 03	46.00	15.13	8.34
Si Kα	1740.0	2.44 03	46.75	12.26	7.13
Zr Lα	2042.4	1.66 03	47.01	9.84	6.07
Nb Lα	2165.9	1.44 03		9.06	5.73
Mo Lα	2293.2	1.26 03		8.35	5.41
Cl Kα	2622.4	9.04 02		6.86	4.73
Ag Lα	2984.3	6.53 02		5.64	4.16
Ca Kα	3691.7	3.74 02		4.00	3.36
Ba Lα	4466.3	9.77 02		12.62	2.78
Ti Kα	4510.8	9.52 02		12.42	2.75
V Kα	4952.2	8.63 02		12.37	2.50
Cr Kα	5414.7	6.88 02		10.79	2.29
Mn Kα	5898.8	5.52 02		9.43	2.10
Co Kα	6930.3	3.62 02		7.26	1.79
Ni Kα	7478.2	2.96 02		6.41	1.66
Cu Kα	8047.8	2.43 02		5.67	1.54
Zn Kα	8638.9	2.01 02		5.03	1.44
Ge Kα	9886.4	1.40 02		4.00	1.25

ABSORPTION EDGE

L_1	4698.4 eV	2.6388 A	M_5**	528 eV	23.5 A
L_2	4381.9 eV	2.8294 A			
L_3	4132.3 eV	3.0003 A			





For E < 160 eV ------- (1)
• (38)

References: 14, 21, 117

XI. Low-Energy X-Ray Interaction Coefficient Tables

See page 19 for Explanation of Tables

TABLE I. PHOTOABSORPTION CROSS SECTION, μ
ATOMIC SCATTERING FACTOR, $f_1 + if_2$

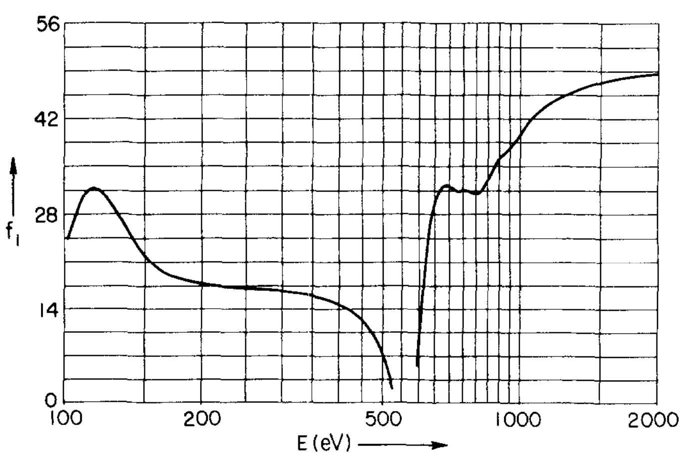
Atomic Weight = 127.6 Z = 52

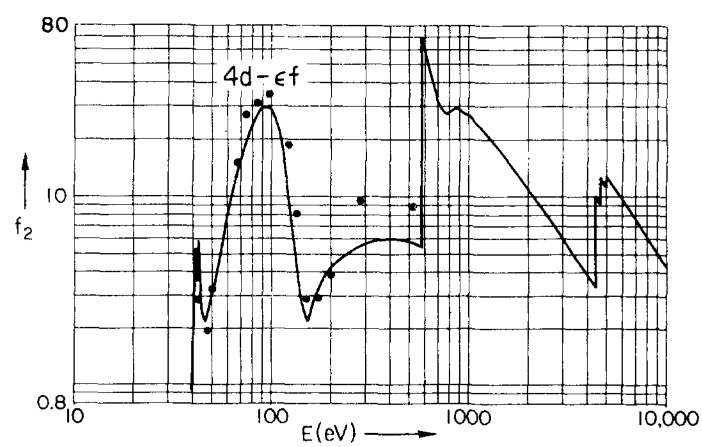
μ(barns/atom) = μ(cm²/gm) x 211.9 TELLURIUM (Te)
$E\mu(E)$ = 329.6 f_2 keVcm²/gm

LINE	E(eV)	μ(cm²/gm)	f_1	f_2	λ(A)	LINE	E(eV)	μ(cm²/gm)	f_1	f_2	λ(A)
Na $L_{2,3}M$	30.5	4.81 02		0.04	407.1	Co Lα	776.2	1.14 04	31.11	26.82	16.0
Mg $L_{2,3}M$	49.3	1.91 04		2.86	251.5	Ni Lα	851.5	1.14 04	33.42	29.52	14.56
Al $L_{2,3}M$	72.4	8.46 04		18.59	171.4	Cu Lα	929.7	9.72 03	37.35	27.42	13.33
Si $L_{2,3}M$	91.5	1.04 05		28.96	135.5	Zn Lα	1011.7	8.66 03	40.35	26.57	12.25
Be K	108.5	6.79 04	28.72	22.33	114.	Na Kα	1041.0	8.13 03	41.57	25.66	11.91
Sr Mζ	114.0	4.83 04	31.59	16.70	108.7	Ge Lα	1188.0	6.03 03	44.70	21.72	10.44
Y Mζ	132.8	1.13 04	27.48	4.55	93.4	Mg Kα	1253.6	5.34 03	45.53	20.30	9.89
S Lℓ	148.7	5.06 03	22.36	2.28	83.4	Al Kα	1486.7	3.64 03	47.33	16.39	8.34
Zr Mζ	151.1	4.73 03	21.71	2.17	82.1	Si Kα	1740.0	2.51 03	48.23	13.27	7.13
Nb Mζ	171.7	6.48 03	18.85	3.37	72.2	Zr Lα	2042.4	1.70 03	48.56	10.55	6.07
B Kα	183.3	6.76 03	18.25	3.76	67.6	Nb Lα	2165.9	1.47 03		9.68	5.73
Mo Mζ	192.6	7.00 03	17.91	4.09	64.4	Mo Lα	2293.2	1.28 03		8.89	5.41
W N_5N_7	212.2	7.08 03	17.49	4.56	58.4	Cl Kα	2622.4	9.12 02		7.26	4.73
C Kα	277.0	6.67 03	16.80	5.60	44.7	Ag Lα	2984.3	6.57 02		5.95	4.16
Ag Mζ	311.7	6.11 03	16.52	5.77	39.8	Ca Kα	3691.7	3.82 02		4.27	3.36
N Kα	392.4	5.15 03	14.91	6.13	31.6	Ba Lα	4466.3	7.19 02		9.74	2.78
Ti Lℓ	395.3	5.11 03	14.83	6.13	31.4	Ti Kα	4510.8	7.01 02		9.59	2.75
Ti Lα	452.2	4.34 03	12.14	5.95	27.4	V Kα	4952.2	8.59 02		12.91	2.50
V Lα	511.3	3.69 03	5.32	5.73	24.3	Cr Kα	5414.7	6.91 02		11.35	2.29
O Kα	524.9	3.57 03	2.28	5.68	23.6	Mn Kα	5898.8	5.58 02		9.98	2.10
Mn Lℓ	556.3	3.28 03	-13.42	5.54	22.3	Co Kα	6930.3	3.68 02		7.75	1.79
Cr Lα	572.8	3.95 04	-66.11	68.59	21.6	Ni Kα	7478.2	3.02 02		6.85	1.66
Mn Lα	637.4	2.25 04	27.94	43.48	19.5	Cu Kα	8047.8	2.48 02		6.06	1.54
F Kα	676.8	1.64 04	32.20	33.67	18.3	Zn Kα	8638.9	2.06 02		5.39	1.44
Fe Lα	705.0	1.39 04	31.90	29.72	17.6	Ge Kα	9886.4	1.43 02		4.28	1.25

ABSORPTION EDGE

L_1	4939.7 eV	2.5099 A	M_5**	572 eV	21.7 A
L_2	4612.6 eV	2.6879 A			
L_3	4341.8 eV	2.8555 A			





For E < 250 eV ——— (67)
• (22)

References: 2, 14, 22, 32, 67

XI. Low-Energy X-Ray Interaction Coefficient Tables

See page 19 for Explanation of Tables

TABLE I. PHOTOABSORPTION CROSS SECTION, μ
ATOMIC SCATTERING FACTOR, $f_1 + if_2$

Atomic Weight = 126.9 Z = 53

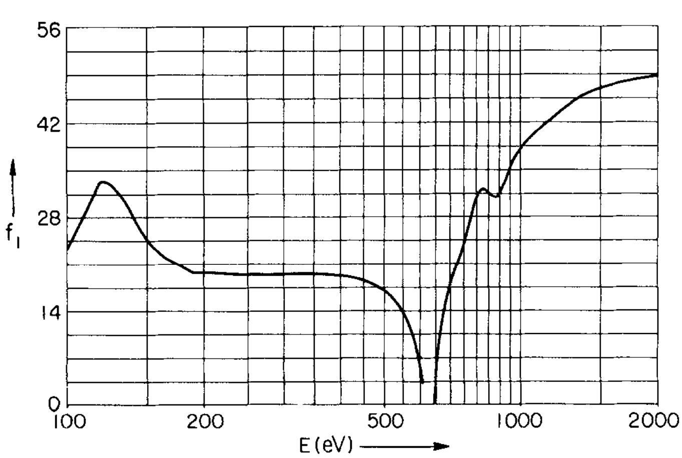
μ(barns/atom) = μ(cm^2/gm) x 210.7 IODINE (I)
$E\mu(E)$ = 331.4 f_2 keVcm^2/gm

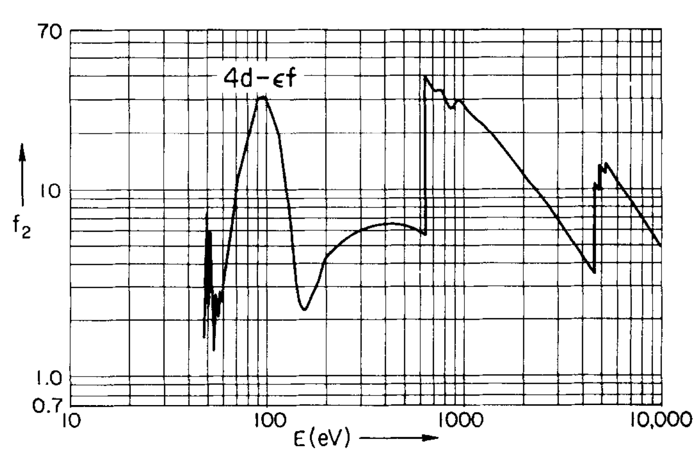
LINE	E(eV)	μ(cm^2/gm)	f_1	f_2	λ(A)
Na $L_{2,3}M$	30.5	2.17 04		2.00	407.1
Mg $L_{2,3}M$	49.3	3.61 04		5.37	251.5
Al $L_{2,3}M$	72.4	5.84 04		12.75	171.4
Si $L_{2,3}M$	91.5	1.11 05		30.52	135.5
Be K	108.5	6.97 04	28.11	22.82	114.
Sr $M\zeta$	114.0	5.79 04	31.24	19.90	108.7
Y $M\zeta$	132.8	1.36 04	30.45	5.43	93.4
S $L\ell$	148.7	5.21 03	24.78	2.34	83.4
Zr $M\zeta$	151.1	5.03 03	24.22	2.29	82.1
Nb $M\zeta$	171.7	5.57 03	21.06	2.89	72.2
B $K\alpha$	183.3	5.88 03	20.03	3.25	67.6
Mo $M\zeta$	192.6	7.20 03	19.58	4.18	64.4
W N_5N_7	212.2	7.35 03	19.50	4.70	58.4
C $K\alpha$	277.0	7.09 03	19.33	5.93	44.7
Ag $M\zeta$	311.7	6.55 03	19.42	6.16	39.8
N $K\alpha$	392.4	5.61 03	19.14	6.64	31.6
Ti $L\ell$	395.3	5.58 03	19.13	6.65	31.4
Ti $L\alpha$	452.2	4.75 03	18.32	6.48	27.4
V $L\alpha$	511.3	4.04 03	16.17	6.24	24.3
O $K\alpha$	524.9	3.91 03	15.42	6.18	23.6
Mn $L\ell$	556.3	3.60 03	12.93	6.03	22.3
Cr $L\alpha$	572.8	3.44 03	10.98	5.95	21.6
Mn $L\alpha$	637.4	2.04 04	-8.36	39.13	19.5
F $K\alpha$	676.8	1.72 04	14.57	35.20	18.3
Fe $L\alpha$	705.0	1.56 04	18.96	33.24	17.6

LINE	E(eV)	μ(cm^2/gm)	f_1	f_2	λ(A)
Co $L\alpha$	776.2	1.24 04	27.93	29.09	16.0
Ni $L\alpha$	851.5	1.02 04	31.41	26.12	14.56
Cu $L\alpha$	929.7	1.07 04	33.48	30.04	13.33
Zn $L\alpha$	1011.7	8.88 03	38.44	27.10	12.25
Na $K\alpha$	1041.0	8.37 03	39.33	26.30	11.91
Ge $L\alpha$	1188.0	6.47 03	42.81	23.18	10.44
Mg $K\alpha$	1253.6	5.82 03	44.08	22.02	9.89
Al $K\alpha$	1486.7	3.97 03	46.78	17.78	8.34
Si $K\alpha$	1740.0	2.76 03	48.05	14.48	7.13
Zr $L\alpha$	2042.4	1.89 03	48.63	11.67	6.07
Nb $L\alpha$	2165.9	1.65 03		10.77	5.73
Mo $L\alpha$	2293.2	1.44 03		9.95	5.41
Cl $K\alpha$	2622.4	1.04 03		8.24	4.73
Ag $L\alpha$	2984.3	7.58 02		6.83	4.16
Ca $K\alpha$	3691.7	4.43 02		4.93	3.36
Ba $L\alpha$	4466.3	2.67 02		3.60	2.78
Ti $K\alpha$	4510.8	2.60 02		3.54	2.75
V $K\alpha$	4952.2	8.69 02		12.99	2.50
Cr $K\alpha$	5414.7	8.01 02		13.09	2.29
Mn $K\alpha$	5898.8	6.45 02		11.47	2.10
Co $K\alpha$	6930.3	4.24 02		8.87	1.79
Ni $K\alpha$	7478.2	3.47 02		7.83	1.66
Cu $K\alpha$	8047.8	2.86 02		6.94	1.54
Zn $K\alpha$	8638.9	2.36 02		6.16	1.44
Ge $K\alpha$	9886.4	1.64 02		4.90	1.25

ABSORPTION EDGE

L_1	5192 eV	2.3880 A	$M_{4,5}$	631 eV	19.66 A	$N_{4,5}$	55.2 eV	224 A
L_2	4854.0 eV	2.5542 A						
L_3	4558.7 eV	2.7196 A						





For E < 160 eV ——— (72)

References: 72

XI. Low-Energy X-Ray Interaction Coefficient Tables

See page 19 for Explanation of Tables

TABLE I. PHOTOABSORPTION CROSS SECTION, μ
ATOMIC SCATTERING FACTOR, $f_1 + if_2$

Atomic Weight = 131.3 Z = 54

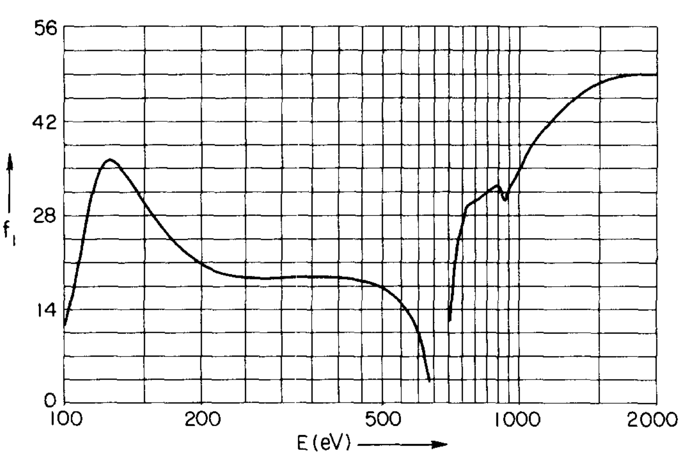
μ(barns/atom) = μ(cm^2/gm) x 218.0 XENON (Xe)
$E\mu(E)$ = 320.3 f_2 keVcm^2/gm

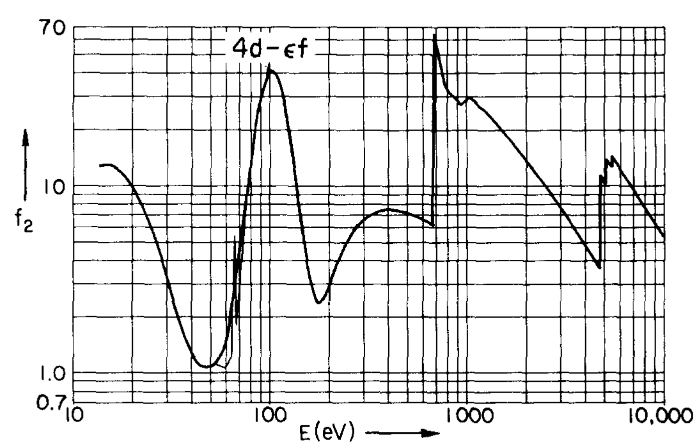
LINE	E(eV)	μ(cm²/gm)	f_1	f_2	λ(A)
Na $L_{2,3}M$	30.5	3.25 04		3.09	407.1
Mg $L_{2,3}M$	49.3	7.16 03		1.10	251.5
Al $L_{2,3}M$	72.4	2.61 04		5.89	171.4
Si $L_{2,3}M$	91.5	1.13 05		32.37	135.5
Be K	108.5	1.08 05	23.53	36.63	114.
Sr Mζ	114.0	8.95 04	30.35	31.85	108.7
Y Mζ	132.8	2.94 04	34.91	12.17	93.4
S Lℓ	148.7	1.10 04	30.08	5.10	83.4
Zr Mζ	151.1	9.55 03	29.36	4.50	82.1
Nb Mζ	171.7	4.44 03	24.33	2.38	72.2
B Kα	183.3	4.10 03	22.42	2.35	67.6
Mo Mζ	192.6	4.29 03	21.28	2.58	64.4
W N_5N_7	212.2	5.12 03	19.71	3.39	58.4
C Kα	277.0	6.75 03	18.52	5.84	44.7
Ag Mζ	311.7	6.71 03	18.68	6.52	39.8
N Kα	392.4	5.74 03	18.80	7.03	31.6
Ti Lℓ	395.3	5.70 03	18.78	7.03	31.4
Ti Lα	452.2	5.09 03	18.15	7.18	27.4
V Lα	511.3	4.34 03	16.66	6.93	24.3
O Kα	524.9	4.20 03	16.09	6.88	23.6
Mn Lℓ	556.3	3.87 03	14.37	6.71	22.3
Cr Lα	572.8	3.70 03	13.10	6.62	21.6
Mn Lα	637.4	3.15 03	2.15	6.26	19.5
F Kα	676.8	2.73 04	-23.60	57.57	18.3
Fe Lα	705.0	2.28 04	14.74	50.17	17.6

LINE	E(eV)	μ(cm²/gm)	f_1	f_2	λ(A)
Co Lα	776.2	1.34 04	29.95	32.37	16.0
Ni Lα	851.5	1.08 04	31.86	28.71	14.56
Cu Lα	929.7	8.92 03	31.36	25.89	13.33
Zn Lα	1011.7	9.31 03	35.62	29.40	12.25
Na Kα	1041.0	8.78 03	37.44	28.52	11.91
Ge Lα	1188.0	6.84 03	42.12	25.37	10.44
Mg Kα	1253.6	6.18 03	43.73	24.17	9.89
Al Kα	1486.7	4.20 03	47.03	19.49	8.34
Si Kα	1740.0	2.95 03	48.57	16.00	7.13
Zr Lα	2042.4	2.03 03	49.40	12.97	6.07
Nb Lα	2165.9	1.77 03		11.98	5.73
Mo Lα	2293.2	1.55 03		11.09	5.41
Cl Kα	2622.4	1.12 03		9.19	4.73
Ag Lα	2984.3	8.19 02		7.63	4.16
Ca Kα	3691.7	4.79 02		5.52	3.36
Ba Lα	4466.3	2.90 02		4.04	2.78
Ti Kα	4510.8	2.82 02		3.97	2.75
V Kα	4952.2	6.87 02		10.61	2.50
Cr Kα	5414.7	7.41 02		12.52	2.29
Mn Kα	5898.8	6.89 02		12.68	2.10
Co Kα	6930.3	4.55 02		9.85	1.79
Ni Kα	7478.2	3.73 02		8.71	1.66
Cu Kα	8047.8	3.07 02		7.72	1.54
Zn Kα	8638.9	2.55 02		6.86	1.44
Ge Kα	9886.4	1.77 02		5.47	1.25

ABSORPTION EDGE

L_1	5452.8 eV	2.2737 A	M_3*	928.1 eV	13.359 A
L_2	5103.7 eV	2.4292 A	M_5**	672 eV	18.5 A
L_3	4782.2 eV	2.5926 A			





For E < 450 eV ——— (119)
——— (130)

References: 8, 11, 13, 17, 18, 32, 86, 119, 130

XI. Low-Energy X-Ray Interaction Coefficient Tables

See page 19 for Explanation of Tables

TABLE I. PHOTOABSORPTION CROSS SECTION, μ
ATOMIC SCATTERING FACTOR, $f_1 + if_2$

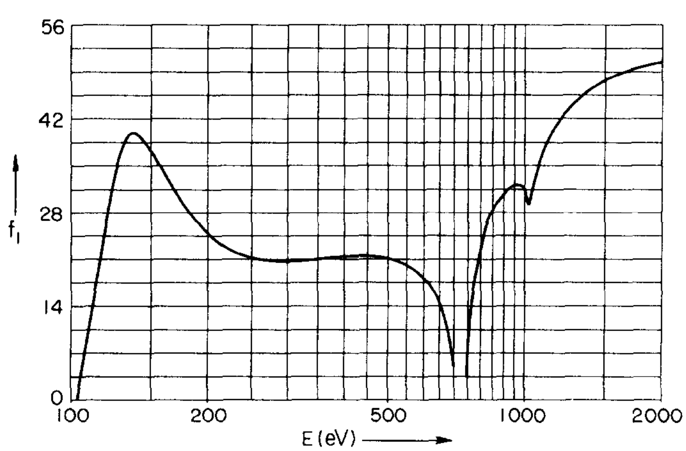
Atomic Weight = 132.9 Z = 55

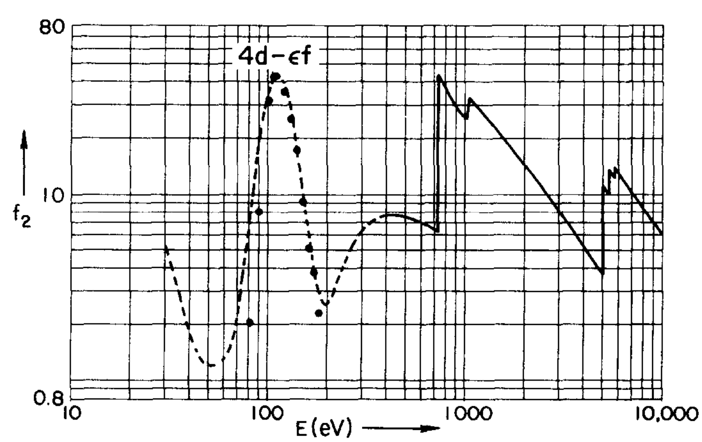
μ(barns/atom) = μ(cm^2/gm) x 220.7 CESIUM (Cs)
Eμ(E) = 316.4 f_2 keVcm^2/gm

LINE	E(eV)	μ(cm^2/gm)	f_1	f_2	λ(A)	LINE	E(eV)	μ(cm^2/gm)	f_1	f_2	λ(A)
Na $L_{2,3}M$	30.5	4.92 04		4.74	407.1	Co Lα	776.2	1.54 04	18.82	37.79	16.0
Mg $L_{2,3}M$	49.3	7.77 03		1.21	251.5	Ni Lα	851.5	1.15 04	28.81	30.94	14.56
Al $L_{2,3}M$	72.4	1.37 04		3.12	171.4	Cu Lα	929.7	9.42 03	31.85	27.67	13.33
Si $L_{2,3}M$	91.5	7.67 04		22.17	135.5	Zn Lα	1011.7	7.84 03	29.70	25.05	12.25
Be K	108.5	1.24 05	9.70	42.45	114.	Na Kα	1041.0	9.85 03	31.08	32.40	11.91
Sr Mζ	114.0	1.17 05	19.22	42.31	108.7	Ge Lα	1188.0	7.39 03	41.74	27.74	10.44
Y Mζ	132.8	5.90 04	39.46	24.74	93.4	Mg Kα	1253.6	6.57 03	43.67	26.04	9.89
S Lℓ	148.7	2.30 04	37.34	10.79	83.4	Al Kα	1486.7	4.48 03	47.59	21.02	8.34
Zr Mζ	151.1	2.00 04	36.61	9.53	82.1	Si Kα	1740.0	3.12 03	49.53	17.14	7.13
Nb Mζ	171.7	6.84 03	30.32	3.71	72.2	Zr Lα	2042.4	2.14 03	50.56	13.78	6.07
B Kα	183.3	4.73 03	27.55	2.74	67.6	Nb Lα	2165.9	1.86 03		12.70	5.73
Mo Mζ	192.6	4.16 03	25.82	2.53	64.4	Mo Lα	2293.2	1.62 03		11.72	5.41
W N_5N_7	212.2	4.38 03	23.23	2.94	58.4	Cl Kα	2622.4	1.17 03		9.67	4.73
C Kα	277.0	6.51 03	20.67	5.70	44.7	Ag Lα	2984.3	8.50 02		8.01	4.16
Ag Mζ	311.7	6.78 03	20.75	6.68	39.8	Ca Kα	3691.7	5.00 02		5.84	3.36
N Kα	392.4	6.16 03	21.39	7.63	31.6	Ba Lα	4466.3	3.09 02		4.36	2.78
Ti Lℓ	395.3	6.12 03	21.41	7.65	31.4	Ti Kα	4510.8	3.01 02		4.29	2.75
Ti Lα	452.2	5.34 03	21.56	7.63	27.4	V Kα	4952.2	2.37 02		3.70	2.50
V Lα	511.3	4.59 03	20.88	7.41	24.3	Cr Kα	5414.7	7.81 02		13.36	2.29
O Kα	524.9	4.44 03	20.65	7.37	23.6	Mn Kα	5898.8	7.13 02		13.29	2.10
Mn Lℓ	556.3	4.10 03	19.86	7.20	22.3	Co Kα	6930.3	4.77 02		10.44	1.79
Cr Lα	572.8	3.93 03	19.31	7.10	21.6	Ni Kα	7478.2	3.92 02		9.27	1.66
Mn Lα	637.4	3.35 03	15.62	6.74	19.5	Cu Kα	8047.8	3.24 02		8.24	1.54
F Kα	676.8	3.03 03	10.68	6.48	18.3	Zn Kα	8638.9	2.69 02		7.34	1.44
Fe Lα	705.0	2.85 03	2.40	6.36	17.6	Ge Kα	9886.4	1.88 02		5.87	1.25

ABSORPTION EDGE

L_1	5721 eV	2.1673 A	M_5**	726 eV	17.1 A
L_2	5358.1 eV	2.3139 A			
L_3	5011.3 eV	2.4740 A			





For E < 400 eV ------- (1)
• (90)

References: 90

XI. Low-Energy X-Ray Interaction Coefficient Tables

See page 19 for Explanation of Tables

TABLE I. PHOTOABSORPTION CROSS SECTION, μ
ATOMIC SCATTERING FACTOR, $f_1 + if_2$

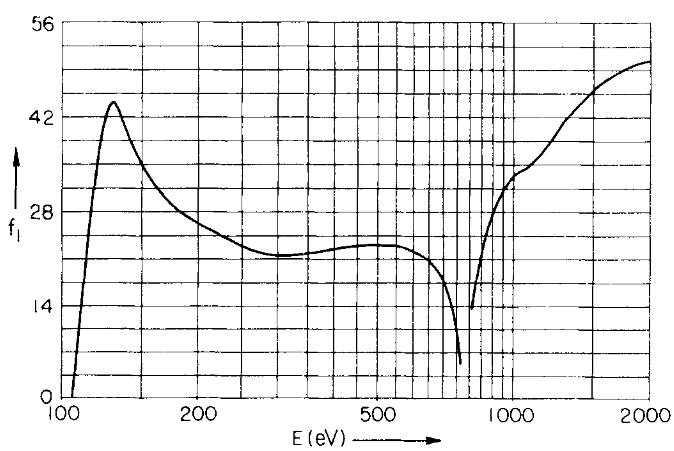
Atomic Weight = 137.3 Z = 56

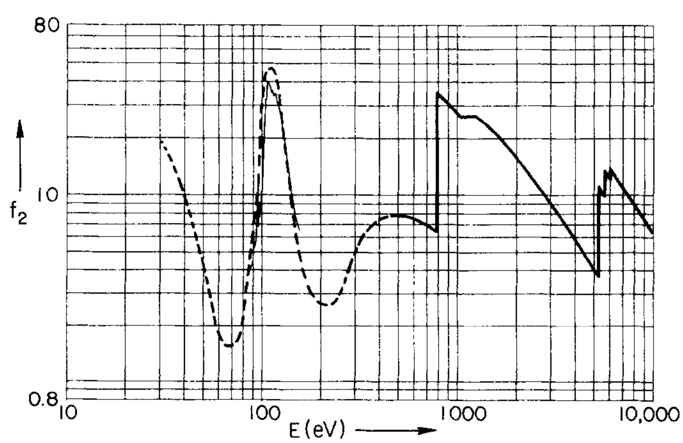
μ(barns/atom) = μ(cm^2/gm) x 228.0 BARIUM (Ba)
$E\mu(E)$ = 306.2 f_2 keVcm^2/gm

LINE	E(eV)	μ(cm^2/gm)	f_1	f_2	λ(A)
Na $L_{2,3}M$	30.5	1.89 05		18.75	407.1
Mg $L_{2,3}M$	49.3	2.71 04		4.36	251.5
Al $L_{2,3}M$	72.4	6.78 03		1.60	171.4
Si $L_{2,3}M$	91.5	2.45 04		7.32	135.5
Be K	108.5	1.32 05	9.06	46.72	114.0
Sr Mζ	114.0	1.24 05	23.85	46.14	108.7
Y Mζ	132.8	3.40 04	43.41	14.75	93.4
S Lℓ	148.7	1.26 04	35.51	6.14	83.4
Zr Mζ	151.1	1.13 04	34.55	5.59	82.1
Nb Mζ	171.7	5.89 03	29.54	3.30	72.2
B Kα	183.3	4.94 03	27.97	2.96	67.6
Mo Mζ	192.6	4.33 03	26.99	2.72	64.4
W N_5N_7	212.2	3.79 03	25.40	2.62	58.4
C Kα	277.0	4.45 03	22.00	4.02	44.7
Ag Mζ	311.7	5.35 03	21.65	5.45	39.8
N Kα	392.4	5.73 03	22.50	7.34	31.6
Ti Lℓ	395.3	5.71 03	22.54	7.37	31.4
Ti Lα	452.2	5.22 03	23.09	7.70	27.4
V Lα	511.3	4.63 03	23.05	7.73	24.3
O Kα	524.9	4.56 03	23.05	7.81	23.6
Mn Lℓ	556.3	4.21 03	22.90	7.65	22.3
Cr Lα	572.8	4.05 03	22.68	7.56	21.6
Mn Lα	637.4	3.46 03	21.12	7.20	19.5
F Kα	676.8	3.16 03	19.28	6.97	18.3
Fe Lα	705.0	2.96 03	17.20	6.82	17.6
Co Lα	776.2	2.53 03	-7.35	6.41	16.0
Ni Lα	851.5	1.16 04	22.06	32.28	14.56
Cu Lα	929.7	9.74 03	29.78	29.58	13.33
Zn Lα	1011.7	8.10 03	33.68	26.76	12.25
Na Kα	1041.0	7.62 03	34.11	25.88	11.91
Ge Lα	1188.0	6.70 03	37.60	26.00	10.44
Mg Kα	1253.6	6.36 03	39.86	26.05	9.89
Al Kα	1486.7	4.67 03	45.62	22.65	8.34
Si Kα	1740.0	3.31 03	48.77	18.80	7.13
Zr Lα	2042.4	2.30 03	50.50	15.35	6.07
Nb Lα	2165.9	2.01 03		14.21	5.73
Mo Lα	2293.2	1.76 03		13.17	5.41
Cl Kα	2622.4	1.28 03		10.96	4.73
Ag Lα	2984.3	9.36 02		9.12	4.16
Ca Kα	3691.7	5.51 02		6.64	3.36
Ba Lα	4466.3	3.36 02		4.89	2.78
Ti Kα	4510.8	3.27 02		4.81	2.75
V Kα	4952.2	2.54 02		4.10	2.50
Cr Kα	5414.7	6.05 02		10.69	2.29
Mn Kα	5898.8	6.58 02		12.67	2.10
Co Kα	6930.3	5.03 02		11.39	1.79
Ni Kα	7478.2	4.15 02		10.14	1.66
Cu Kα	8047.8	3.44 02		9.03	1.54
Zn Kα	8638.9	2.86 02		8.06	1.44
Ge Kα	9886.4	2.00 02		6.45	1.25

ABSORPTION EDGE

L_1	5996 eV	2.0678 A	M_4	796.7 eV	15.56 A
L_2	5623.3 eV	2.2048 A	M_5	780.1 eV	15.89 A
L_3	5247.0 eV	2.3629 A			





For E < 500 eV ------- (1)
———— (134)

References: 77, 87, 104, 134

XI. Low-Energy X-Ray Interaction Coefficient Tables

See page 19 for Explanation of Tables

TABLE I. PHOTOABSORPTION CROSS SECTION, μ
ATOMIC SCATTERING FACTOR, $f_1 + if_2$

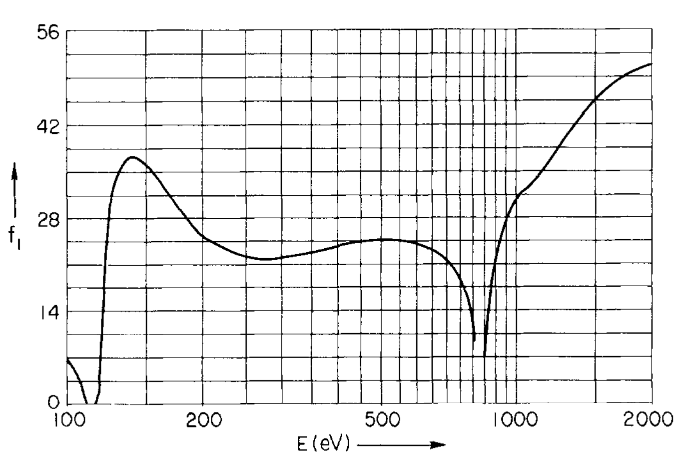
Atomic Weight = 138.9 Z = 57

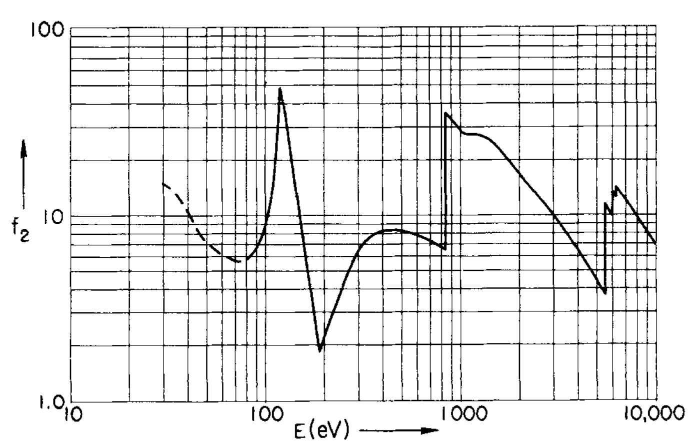
μ(barns/atom) = μ(cm²/gm) x 230.6 LANTHANUM (La)
Eμ(E) = 302.8 f_2 keVcm²/gm

LINE	E(eV)	μ(cm²/gm)	f_1	f_2	λ(A)	LINE	E(eV)	μ(cm²/gm)	f_1	f_2	λ(A)
Na $L_{2,3}M$	30.5	1.48 05		14.84	407.1	Co Lα	776.2	2.65 03	15.67	6.79	16.0
Mg $L_{2,3}M$	49.3	4.45 04		7.25	251.5	Ni Lα	851.5	1.23 04	9.49	34.70	14.56
Al $L_{2,3}M$	72.4	2.36 04		5.63	171.4	Cu Lα	929.7	1.02 04	25.95	31.19	13.33
Si $L_{2,3}M$	91.5	2.29 04		6.93	135.5	Zn Lα	1011.7	8.44 03	31.46	28.20	12.25
Be K	108.5	3.73 04	2.14	13.35	114.	Na Kα	1041.0	7.93 03	32.23	27.26	11.91
Sr Mζ	114.0	6.33 04	-1.87	23.84	108.7	Ge Lα	1188.0	6.92 03	36.58	27.14	10.44
Y Mζ	132.8	5.57 04	35.93	24.41	93.4	Mg Kα	1253.6	6.55 03	38.92	27.10	9.89
S Lℓ	148.7	2.24 04	36.21	11.01	83.4	Al Kα	1486.7	4.92 03	45.23	24.17	8.34
Zr Mζ	151.1	1.96 04	35.72	9.79	82.1	Si Kα	1740.0	3.48 03	48.95	20.02	7.13
Nb Mζ	171.7	6.02 03	30.87	3.41	72.2	Zr Lα	2042.4	2.43 03	50.91	16.41	6.07
B Kα	183.3	3.73 03	28.45	2.26	67.6	Nb Lα	2165.9	2.13 03		15.22	5.73
Mo Mζ	192.6	2.99 03	26.41	1.90	64.4	Mo Lα	2293.2	1.87 03		14.14	5.41
W N_5N_7	212.2	3.85 03	24.31	2.70	58.4	Cl Kα	2622.4	1.37 03		11.84	4.73
C Kα	277.0	6.03 03	21.68	5.52	44.7	Ag Lα	2984.3	1.01 03		9.91	4.16
Ag Mζ	311.7	6.75 03	22.20	6.95	39.8	Ca Kα	3691.7	5.96 02		7.27	3.36
N Kα	392.4	6.32 03	23.54	8.19	31.6	Ba Lα	4466.3	3.64 02		5.37	2.78
Ti Lℓ	395.3	6.30 03	23.59	8.23	31.4	Ti Kα	4510.8	3.55 02		5.28	2.75
Ti Lα	452.2	5.56 03	24.32	8.30	27.4	V Kα	4952.2	2.75 02		4.49	2.50
V Lα	511.3	4.83 03	24.55	8.16	24.3	Cr Kα	5414.7	2.13 02		3.81	2.29
O Kα	524.9	4.69 03	24.56	8.13	23.6	Mn Kα	5898.8	5.19 02		10.11	2.10
Mn Lℓ	556.3	4.35 03	24.46	7.99	22.3	Co Kα	6930.3	5.40 02		12.35	1.79
Cr Lα	572.8	4.18 03	24.35	7.91	21.6	Ni Kα	7478.2	4.44 02		10.98	1.66
Mn Lα	637.4	3.60 03	23.41	7.59	19.5	Cu Kα	8047.8	3.68 02		9.77	1.54
F Kα	676.8	3.28 03	22.33	7.32	18.3	Zn Kα	8638.9	3.06 02		8.72	1.44
Fe Lα	705.0	3.10 03	21.23	7.20	17.6	Ge Kα	9886.4	2.14 02		6.98	1.25

ABSORPTION EDGE

L_1	6268 eV	1.9780 A	M_5**	832 eV	14.9 A
L_2	5889 eV	2.1053 A			
L_3	5484 eV	2.261 A			





For 80 eV < E < 400 eV ———— (139) x .71
For E < 80 eV ------- (1)

References: 29, 31, 32, 58, 66, 89, 139

XI. Low-Energy X-Ray Interaction Coefficient Tables

See page 19 for Explanation of Tables

TABLE I. PHOTOABSORPTION CROSS SECTION, μ
ATOMIC SCATTERING FACTOR, $f_1 + if_2$

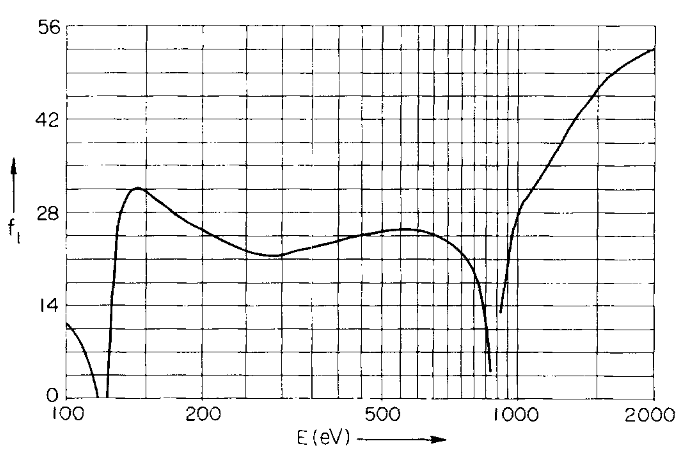
Atomic Weight = 140.1 Z = 58

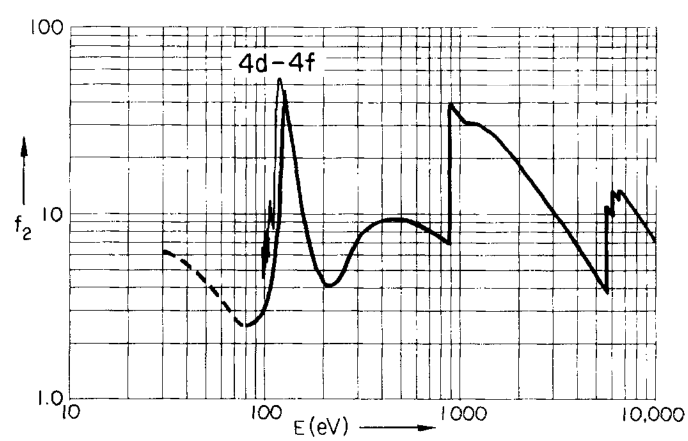
μ(barns/atom) = μ(cm²/gm) x 232.6 CERIUM (Ce)
Eμ(E) = 300.2 f_2 keVcm²/gm

LINE	E(eV)	μ(cm²/gm)	f_1	f_2	λ(A)	LINE	E(eV)	μ(cm²/gm)	f_1	f_2	λ(A)
Na $L_{2,3}M$	30.5	6.09 04		6.17	407.1	Co Lα	776.2	2.88 03	20.32	7.45	16.0
Mg $L_{2,3}M$	49.3	2.61 04		4.28	251.5	Ni Lα	851.5	2.46 03	10.59	6.96	14.56
Al $L_{2,3}M$	72.4	1.08 04		2.62	171.4	Cu Lα	929.7	1.15 04	18.26	35.58	13.33
Si $L_{2,3}M$	91.5	8.62 03		2.63	135.5	Zn Lα	1011.7	9.39 03	28.70	31.63	12.25
Be K	108.5	1.18 04	8.28	4.26	114.	Na Kα	1041.0	8.80 03	30.15	30.50	11.91
Sr Mζ	114.0	1.59 04	4.64	6.05	108.7	Ge Lα	1188.0	7.60 03	36.14	30.06	10.44
Y Mζ	132.8	6.11 04	28.59	27.05	93.4	Mg Kα	1253.6	7.16 03	38.98	29.89	9.89
S Lℓ	148.7	2.51 04	31.36	12.41	83.4	Al Kα	1486.7	5.34 03	46.27	26.45	8.34
Zr Mζ	151.1	2.22 04	30.99	11.16	82.1	Si Kα	1740.0	3.75 03	50.55	21.75	7.13
Nb Mζ	171.7	1.09 04	28.17	6.26	72.2	Zr Lα	2042.4	2.59 03	52.76	17.59	6.07
B Kα	183.3	8.25 03	26.76	5.04	67.6	Nb Lα	2165.9	2.25 03		16.24	5.73
Mo Mζ	192.6	7.23 03	25.92	4.64	64.4	Mo Lα	2293.2	1.96 03		15.00	5.41
W N_5N_7	212.2	5.79 03	24.37	4.09	58.4	Cl Kα	2622.4	1.42 03		12.41	4.73
C Kα	277.0	6.48 03	21.58	5.98	44.7	Ag Lα	2984.3	1.03 03		10.29	4.16
Ag Mζ	311.7	7.42 03	21.98	7.70	39.8	Ca Kα	3691.7	6.09 02		7.48	3.36
N Kα	392.4	6.86 03	23.62	8.97	31.6	Ba Lα	4466.3	3.74 02		5.57	2.78
Ti Lℓ	395.3	6.83 03	23.68	9.00	31.4	Ti Kα	4510.8	3.65 02		5.48	2.75
Ti Lα	452.2	6.11 03	24.65	9.20	27.4	V Kα	4952.2	2.86 02		4.72	2.50
V Lα	511.3	5.38 03	25.23	9.15	24.3	Cr Kα	5414.7	2.26 02		4.07	2.29
O Kα	524.9	5.21 03	25.32	9.10	23.6	Mn Kα	5898.8	5.37 02		10.55	2.10
Mn Lℓ	556.3	4.81 03	25.41	8.92	22.3	Co Kα	6930.3	5.46 02		12.59	1.79
Cr Lα	572.8	4.62 03	25.38	8.81	21.6	Ni Kα	7478.2	4.52 02		11.27	1.66
Mn Lα	637.4	3.95 03	24.87	8.39	19.5	Cu Kα	8047.8	3.76 02		10.09	1.54
F Kα	676.8	3.58 03	24.18	8.08	18.3	Zn Kα	8638.9	3.14 02		9.03	1.44
Fe Lα	705.0	3.38 03	23.44	7.93	17.6	Ge Kα	9886.4	2.21 02		7.27	1.25

ABSORPTION EDCE

L_1	6548 eV	1.8934 A	M_5**	883 eV	14.0 A
L_2	6161 eV	2.0124 A			
L_3	5723 eV	2.166 A			





For 80 eV < E < 500 eV ———— (139) x .616
For E < 80 eV - - - - - - - (1)
———— (102)

References: 29, 31, 32, 48, 58, 66, 81, 89, 102, 139

XI. Low-Energy X-Ray Interaction Coefficient Tables

See page 19 for Explanation of Tables

TABLE I. PHOTOABSORPTION CROSS SECTION, μ
ATOMIC SCATTERING FACTOR, $f_1 + if_2$

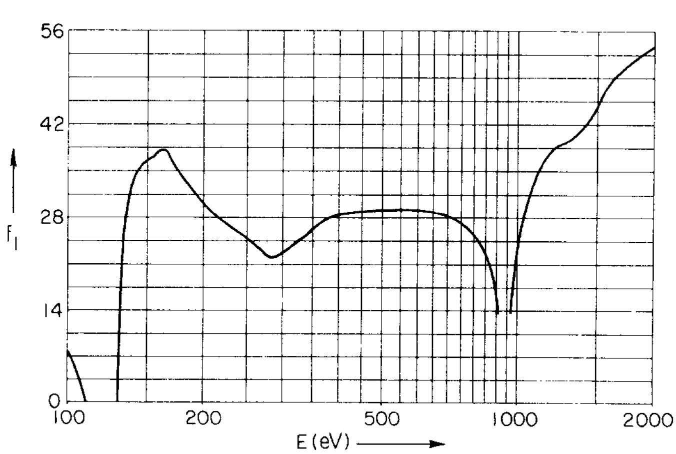
Atomic Weight = 140.9 Z = 59

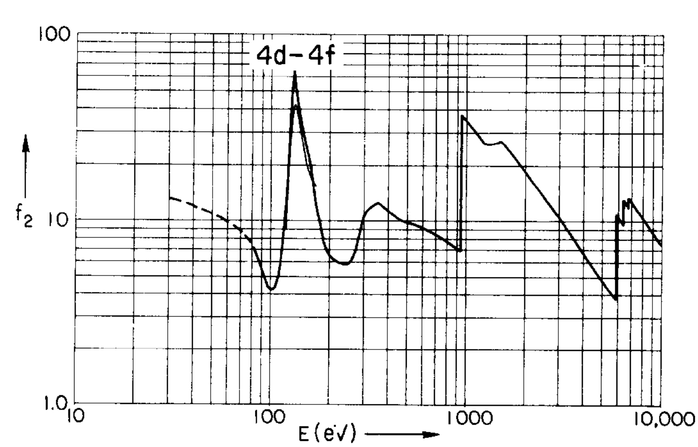
μ(barns/atom) = μ(cm²/gm) x 233.9 PRASEODYMIUM (Pr)
Eμ(E) = 298.5 f_2 keVcm²/gm

LINE	E(eV)	μ(cm²/gm)	f_1	f_2	λ(A)	LINE	E(eV)	μ(cm²/gm)	f_1	f_2	λ(A)
Na $L_{2,3}M$	30.5	1.29 05		13.18	407.1	Co Lα	776.2	3.04 03	26.39	7.91	16.0
Mg $L_{2,3}M$	49.3	6.63 04		10.95	251.5	Ni Lα	851.5	2.59 03	22.59	7.39	14.56
Al $L_{2,3}M$	72.4	3.47 04		8.41	171.4	Cu Lα	929.7	2.22 03	7.55	6.91	13.33
Si $L_{2,3}M$	91.5	1.73 04		5.31	135.5	Zn Lα	1011.7	1.01 04	25.26	34.06	12.25
Be K	108.5	1.31 04	1.89	4.77	114.	Na Kα	1041.0	9.41 03	29.18	32.81	11.91
Sr Mζ	114.0	1.87 04	-5.82	7.13	108.7	Ge Lα	1188.0	6.91 03	38.09	27.51	10.44
Y Mζ	132.8	1.23 05	24.14	54.65	93.4	Mg Kα	1253.6	6.10 03	39.14	25.61	9.89
S Lℓ	148.7	5.45 04	36.70	27.13	83.4	Al Kα	1486.7	5.31 03	43.81	26.45	8.34
Zr Mζ	151.1	4.99 04	36.84	25.26	82.1	Si Kα	1740.0	3.88 03	50.63	22.63	7.13
Nb Mζ	171.7	2.04 04	36.00	11.73	72.2	Zr Lα	2042.4	2.66 03	53.43	18.17	6.07
B Kα	183.3	1.44 04	33.48	8.87	67.6	Nb Lα	2165.9	2.31 03		16.73	5.73
Mo Mζ	192.6	1.13 04	31.59	7.31	64.4	Mo Lα	2293.2	2.01 03		15.42	5.41
W N_5N_7	212.2	8.68 03	28.53	6.17	58.4	Cl Kα	2622.4	1.45 03		12.71	4.73
C Kα	277.0	8.07 03	22.24	7.48	44.7	Ag Lα	2984.3	1.05 03		10.52	4.16
Ag Mζ	311.7	1.11 04	23.69	11.56	39.8	Ca Kα	3691.7	6.21 02		7.68	3.36
N Kα	392.4	8.69 03	28.32	11.42	31.6	Ba Lα	4466.3	3.86 02		5.77	2.78
Ti Lℓ	395.3	8.56 03	28.38	11.34	31.4	Ti Kα	4510.8	3.76 02		5.69	2.75
Ti Lα	452.2	6.77 03	29.03	10.25	27.4	V Kα	4952.2	2.98 02		4.94	2.50
V Lα	511.3	5.66 03	29.07	9.70	24.3	Cr Kα	5414.7	2.38 02		4.32	2.29
O Kα	524.9	5.50 03	29.10	9.68	23.6	Mn Kα	5898.8	1.92 02		3.79	2.10
Mn Lℓ	556.3	5.08 03	29.18	9.47	22.3	Co Kα	6930.3	5.66 02		13.13	1.79
Cr Lα	572.8	4.88 03	29.17	9.36	21.6	Ni Kα	7478.2	4.70 02		11.78	1.66
Mn Lα	637.4	4.17 03	28.92	8.91	19.5	Cu Kα	8047.8	3.92 02		10.57	1.54
F Kα	676.8	3.78 03	28.51	8.58	18.3	Zn Kα	8638.9	3.28 02		9.48	1.44
Fe Lα	705.0	3.57 03	28.07	8.42	17.6	Ge Kα	9886.4	2.31 02		7.66	1.25

ABSORPTION EDGE

L_1	6834 eV	1.8141 A	M_4	944.8 eV	13.122 A
L_2	6439 eV	1.9255 A	M_5	925.7 eV	13.394 A
L_3	5963 eV	2.0791 A			





For 80 eV < E < 500 eV ———— (139) x 1.38
For E < 80 eV - - - - - - (1)
———— (48)

References: 29, 31, 32, 48, 58, 139

XI. Low-Energy X-Ray Interaction Coefficient Tables

See page 19 for Explanation of Tables

TABLE I. PHOTOABSORPTION CROSS SECTION, μ
ATOMIC SCATTERING FACTOR, $f_1 + if_2$

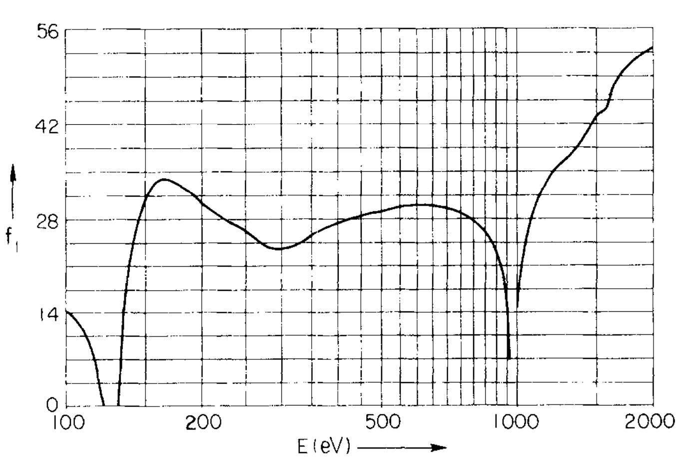
Atomic Weight = 144.2 Z = 60

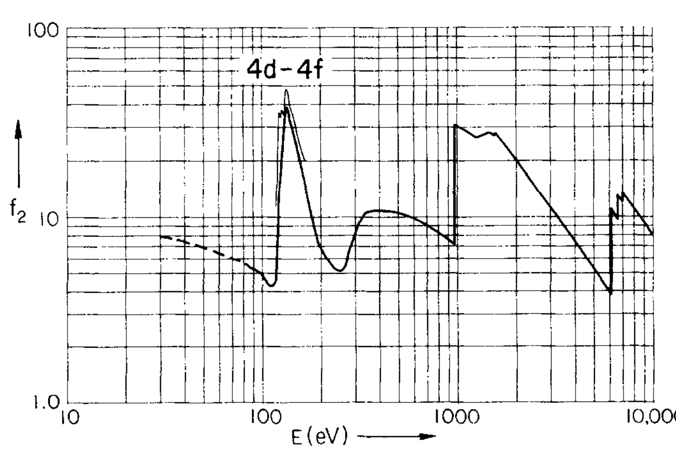
μ(barns/atom) = μ(cm²/gm) x 239.5 NEODYMIUM (Nd)
Eμ(E) = 291.6 f_2 keVcm²/gm

LINE	E(eV)	μ(cm²/gm)	f_1	f_2	λ(A)	LINE	E(eV)	μ(cm²/gm)	f_1	f_2	λ(A)
Na $L_{2,3}M$	30.5	7.44 04		7.77	407.1	Co Lα	776.2	3.14 03	28.55	8.37	16.0
Mg $L_{2,3}M$	49.3	4.09 04		6.92	251.5	Ni Lα	851.5	2.68 03	26.16	7.82	14.56
Al $L_{2,3}M$	72.4	2.44 04		6.06	171.4	Cu Lα	929.7	2.29 03	19.73	7.31	13.33
Si $L_{2,3}M$	91.5	1.68 04		5.27	135.5	Zn Lα	1011.7	8.68 03	20.38	30.12	12.25
Be K	108.5	1.15 04	12.00	4.27	114.	Na Kα	1041.0	8.28 03	25.12	29.57	11.91
Sr Mζ	114.0	1.10 04	8.77	4.28	108.7	Ge Lα	1188.0	6.65 03	34.76	27.07	10.44
Y Mζ	132.8	8.10 04	7.26	36.89	93.4	Mg Kα	1253.6	6.08 03	36.33	26.12	9.89
S Lℓ	148.7	4.99 04	30.92	25.44	83.4	Al Kα	1486.7	5.47 03	43.01	27.87	8.34
Zr Mζ	151.1	4.58 04	31.87	23.75	82.1	Si Kα	1740.0	4.06 03	50.30	24.23	7.13
Nb Mζ	171.7	2.18 04	33.75	12.84	72.2	Zr Lα	2042.4	2.78 03	53.75	19.47	6.07
B Kα	183.3	1.51 04	32.75	9.52	67.6	Nb Lα	2165.9	2.42 03		17.94	5.73
Mo Mζ	192.6	1.15 04	31.51	7.57	64.4	Mo Lα	2293.2	2.11 03		16.56	5.41
W N_5N_7	212.2	8.57 03	29.22	6.23	58.4	Cl Kα	2622.4	1.52 03		13.68	4.73
C Kα	277.0	6.47 03	23.98	6.15	44.7	Ag Lα	2984.3	1.11 03		11.35	4.16
Ag Mζ	311.7	8.35 03	23.80	8.92	39.8	Ca Kα	3691.7	6.56 02		8.31	3.36
N Kα	392.4	8.03 03	27.27	10.81	31.6	Ba Lα	4466.3	4.08 02		6.25	2.78
Ti Lℓ	395.3	7.97 03	27.33	10.81	31.4	Ti Kα	4510.8	3.98 02		6.16	2.75
Ti Lα	452.2	6.84 03	28.58	10.61	27.4	V Kα	4952.2	3.15 02		5.35	2.50
V Lα	511.3	5.88 03	29.38	10.31	24.3	Cr Kα	5414.7	2.51 02		4.67	2.29
O Kα	524.9	5.69 03	29.53	10.24	23.6	Mn Kα	5898.8	2.02 02		4.09	2.10
Mn Lℓ	556.3	5.26 03	29.81	10.02	22.3	Co Kα	6930.3	5.24 02		12.46	1.79
Cr Lα	572.8	5.04 03	29.90	9.90	21.6	Ni Kα	7478.2	4.93 02		12.65	1.66
Mn Lα	637.4	4.31 03	30.01	9.42	19.5	Cu Kα	8047.8	4.11 02		11.35	1.54
F Kα	676.8	3.91 03	29.83	9.07	18.3	Zn Kα	8638.9	3.44 02		10.19	1.44
Fe Lα	705.0	3.69 03	29.60	8.91	17.6	Ge Kα	9886.4	2.43 02		8.24	1.25

ABSORPTION EDGE

L_1	7129.4 eV	1.7390 A	M_4	995.1 eV	12.459 A
L_2	6723.4 eV	1.8440 A	M_5	973.4 eV	12.737 A
L_3	6209.2 eV	1.9967 A			





For 80 eV < E < 400 eV ———— (139)
For E < 80 eV ------- (1)
———— (48)

References: 29, 31, 32, 48, 58, 139

XI. Low-Energy X-Ray Interaction Coefficient Tables

See page 19 for Explanation of Tables

TABLE I. PHOTOABSORPTION CROSS SECTION, μ
ATOMIC SCATTERING FACTOR, $f_1 + if_2$

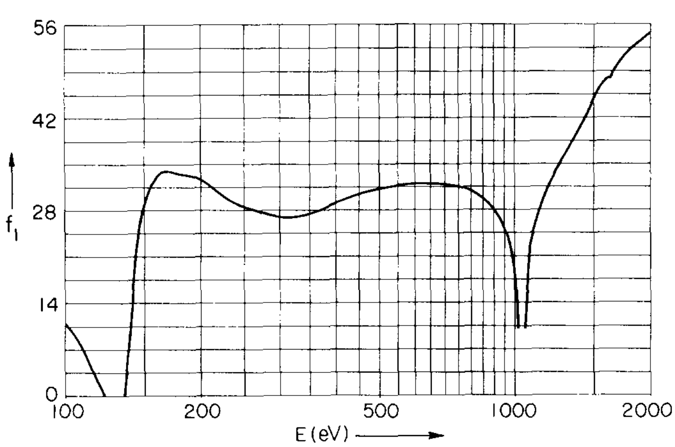
Atomic Weight = 145 Z = 6

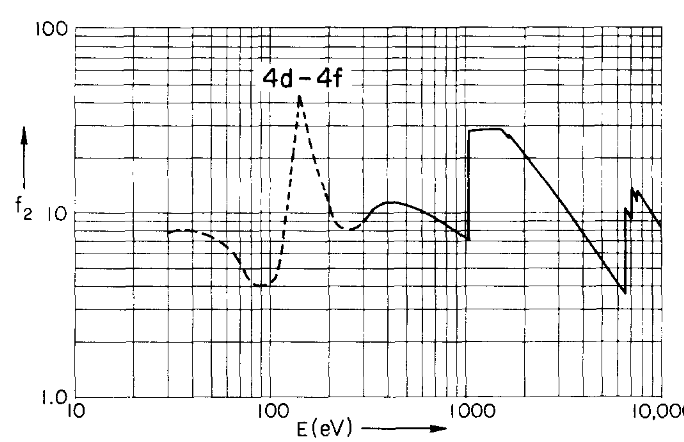
μ(barns/atom) = μ(cm^2/gm) x 240.7 PROMETHIUM (Pm)
Eμ(E) = 290.0 f_2 keVcm^2/gm

LINE	E(eV)	μ(cm^2/gm)	f_1	f_2	λ(A)
Na $L_{2,3}M$	30.5	7.49 04		7.86	407.1
Mg $L_{2,3}M$	49.3	4.41 04		7.50	251.5
Al $L_{2,3}M$	72.4	2.05 04		5.13	171.4
Si $L_{2,3}M$	91.5	1.29 04		4.07	135.5
Be K	108.5	1.23 04	7.83	4.61	114.
Sr Mζ	114.0	1.59 04	4.64	6.26	108.7
Y Mζ	132.8	5.79 04	-2.87	26.51	93.4
S Lℓ	148.7	6.70 04	27.62	34.35	83.4
Zr Mζ	151.1	6.17 04	29.53	32.16	82.1
Nb Mζ	171.7	3.10 04	34.12	18.33	72.2
B Kα	183.3	2.35 04	33.50	14.82	67.6
Mo Mζ	192.6	1.91 04	33.30	12.68	64.4
W N_5N_7	212.2	1.27 04	31.53	9.26	58.4
C Kα	277.0	8.78 03	27.56	8.38	44.7
Ag Mζ	311.7	8.73 03	26.81	9.38	39.8
N Kα	392.4	8.49 03	28.80	11.48	31.6
Ti Lℓ	395.3	8.44 03	28.89	11.50	31.4
Ti Lα	452.2	7.22 03	30.28	11.25	27.4
V Lα	511.3	6.17 03	31.14	10.87	24.3
O Kα	524.9	5.96 03	31.30	10.79	23.6
Mn Lℓ	556.3	5.50 03	31.62	10.54	22.3
Cr Lα	572.8	5.27 03	31.73	10.39	21.6
Mn Lα	637.4	4.50 03	31.95	9.89	19.5
F Kα	676.8	4.08 03	31.90	9.52	18.3
Fe Lα	705.0	3.85 03	31.77	9.35	17.6
Co Lα	776.2	3.28 03	31.11	8.78	16.0
Ni Lα	851.5	2.80 03	29.62	8.21	14.56
Cu Lα	929.7	2.39 03	26.40	7.67	13.33
Zn Lα	1011.7	2.05 03	14.53	7.14	12.25
Na Kα	1041.0	7.92 03	13.67	28.41	11.91
Ge Lα	1188.0	7.02 03	31.70	28.73	10.44
Mg Kα	1253.6	6.68 03	34.82	28.86	9.89
Al Kα	1486.7	5.71 03	44.23	29.28	8.34
Si Kα	1740.0	4.17 03	51.00	25.03	7.13
Zr Lα	2042.4	2.87 03	54.78	20.23	6.07
Nb Lα	2165.9	2.50 03		18.66	5.73
Mo Lα	2293.2	2.18 03		17.23	5.41
Cl Kα	2622.4	1.58 03		14.25	4.73
Ag Lα	2984.3	1.15 03		11.82	4.16
Ca Kα	3691.7	6.79 02		8.64	3.36
Ba Lα	4466.3	4.22 02		6.49	2.78
Ti Kα	4510.8	4.11 02		6.40	2.75
V Kα	4952.2	3.25 02		5.55	2.50
Cr Kα	5414.7	2.60 02		4.85	2.29
Mn Kα	5898.8	2.09 02		4.25	2.10
Co Kα	6930.3	3.93 02		9.40	1.79
Ni Kα	7478.2	5.14 02		13.25	1.66
Cu Kα	8047.8	4.25 02		11.79	1.54
Zn Kα	8638.9	3.53 02		10.51	1.44
Ge Kα	9886.4	2.47 02		8.42	1.25

ABSORPTION EDGE

L_1	7436 eV	1.6674 A
L_2	7014 eV	1.7676 A
L_3	6460.5 eV	1.9191 A
M_5**	1027 eV	12.07 A





For E < 400 eV ------- (1)

References:

XI. Low-Energy X-Ray Interaction Coefficient Tables

See page 19 for Explanation of Tables

TABLE I. PHOTOABSORPTION CROSS SECTION, μ
ATOMIC SCATTERING FACTOR, $f_1 + if_2$

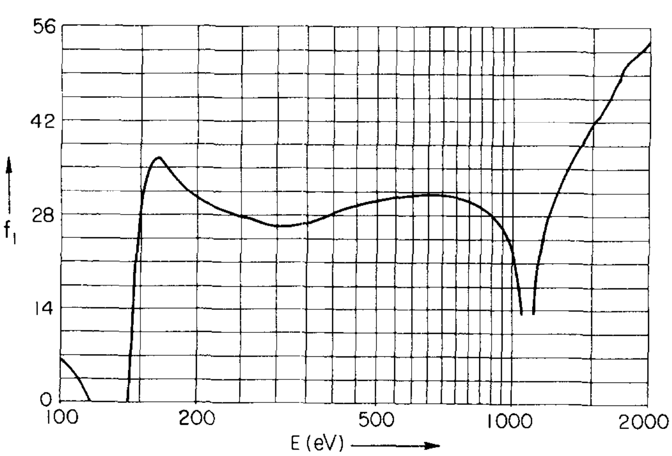
Atomic Weight = 150.4 Z = 62

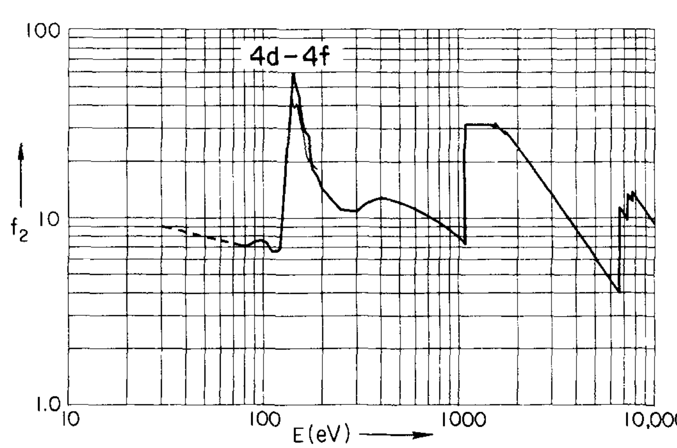
μ(barns/atom) = μ(cm²/gm) x 249.6 SAMARIUM (Sm)
Eμ(E) = 279.7 f_2 keVcm²/gm

LINE	E(eV)	μ(cm²/gm)	f_1	f_2	λ(A)	LINE	E(eV)	μ(cm²/gm)	f_1	f_2	λ(A)
Na $L_{2,3}M$	30.5	5.74 04		6.24	407.1	Co Lα	776.2	3.45 03	30.45	9.56	16.0
Mg $L_{2,3}M$	49.3	4.53 04		7.98	251.5	Ni Lα	851.5	2.93 03	29.21	8.93	14.56
Al $L_{2,3}M$	72.4	3.27 04		8.45	171.4	Cu Lα	929.7	2.51 03	26.78	8.33	13.33
Si $L_{2,3}M$	91.5	2.43 04		7.95	135.5	Zn Lα	1011.7	2.15 03	21.09	7.76	12.25
Be K	108.5	1.81 04	4.32	7.02	114.	Na Kα	1041.0	2.03 03	16.39	7.56	11.91
Sr Mζ	114.0	1.70 04	1.88	6.93	108.7	Ge Lα	1188.0	7.43 03	27.28	31.56	10.44
Y Mζ	132.8	4.79 04	-25.49	22.75	93.4	Mg Kα	1253.6	7.03 03	31.52	31.50	9.89
S Lℓ	148.7	9.84 04	27.10	52.32	83.4	Al Kα	1486.7	5.90 03	41.59	31.33	8.34
Zr Mζ	151.1	8.81 04	30.60	47.57	82.1	Si Kα	1740.0	4.58 03	49.26	28.51	7.13
Nb Mζ	171.7	3.68 04	35.25	22.58	72.2	Zr Lα	2042.4	3.16 03	54.60	23.07	6.07
B Kα	183.3	2.74 04	32.99	17.92	67.6	Nb Lα	2165.9	2.75 03		21.29	5.73
Mo Mζ	192.6	2.33 04	31.55	16.01	64.4	Mo Lα	2293.2	2.40 03		19.67	5.41
W N_5N_7	212.2	1.81 04	29.77	13.71	58.4	Cl Kα	2622.4	1.74 03		16.27	4.73
C Kα	277.0	1.11 04	27.05	11.03	44.7	Ag Lα	2984.3	1.27 03		13.50	4.16
Ag Mζ	311.7	1..05 04	26.40	11.71	39.8	Ca Kα	3691.7	7.48 02		9.87	3.36
N Kα	392.4	9.41 03	28.16	13.19	31.6	Ba Lα	4466.3	4.65 02		7.42	2.78
Ti Lℓ	395.3	9.35 03	28.27	13.20	31.4	Ti Kα	4510.8	4.53 02		7.31	2.75
Ti Lα	452.2	7.67 03	29.66	12.40	27.4	V Kα	4952.2	3.58 02		6.34	2.50
V Lα	511.3	6.53 03	30.35	11.94	24.3	Cr Kα	5414.7	2.86 02		5.53	2.29
O Kα	524.9	6.31 03	30.51	11.84	23.6	Mn Kα	5898.8	2.30 02		4.85	2.10
Mn Lℓ	556.3	5.80 03	30.81	11.54	22.3	Co Kα	6930.3	4.37 02		10.82	1.79
Cr Lα	572.8	5.55 03	30.93	11.37	21.6	Ni Kα	7478.2	4.85 02		12.97	1.66
Mn Lα	637.4	4.73 03	31.16	10.78	19.5	Cu Kα	8047.8	4.58 02		13.16	1.54
F Kα	676.8	4.28 03	31.09	10.36	18.3	Zn Kα	8638.9	3.84 02		11.86	1.44
Fe Lα	705.0	4.04 03	30.99	10.17	17.6	Ge Kα	9886.4	2.73 02		9.65	1.25

ABSORPTION EDGE

L_1	7747.8 eV	1.6002 A	M_4	1098.3 eV	11.288 A
L_2	7313.2 eV	1.6953 A	M_5	1073.2 eV	11.552 A
L_3	6717.2 eV	1.8457 A			





For 80 eV < E < 500 eV ———— (139) x 1.11
For E < 80 eV - - - - - - (1)
———— (48)

References: 31, 32, 48, 58, 104, 139

XI. Low-Energy X-Ray Interaction Coefficient Tables

See page 19 for Explanation of Tables

TABLE I. PHOTOABSORPTION CROSS SECTION, μ
ATOMIC SCATTERING FACTOR, $f_1 + if_2$

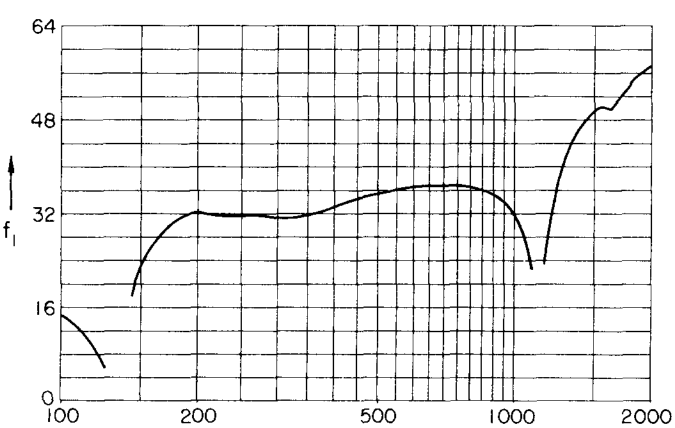
Atomic Weight = 152.0 Z = 63

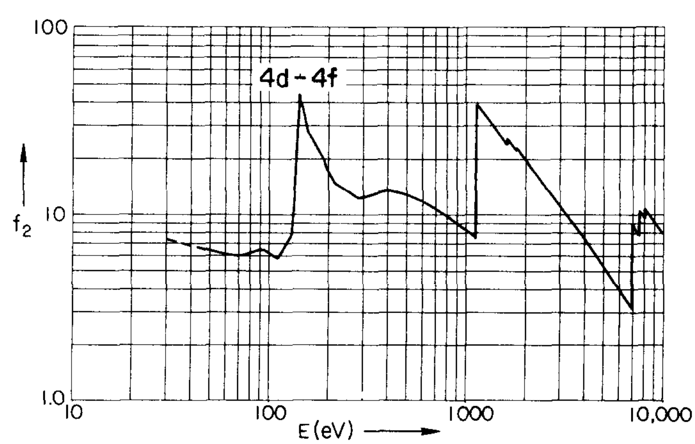
μ(barns/atom) = μ(cm^2/gm) x 252.3 EUROPIUM (Eu)
$E\mu(E)$ = 276.8 f_2 keVcm^2/gm

LINE	E(eV)	μ(cm^2/gm)	f_1	f_2	λ(A)	LINE	E(eV)	μ(cm^2/gm)	f_1	f_2	λ(A)
Na $L_{2,3}M$	30.5	6.71 04		7.38	407.1	Co Lα	776.2	3.62 03	36.62	10.14	16.0
Mg $L_{2,3}M$	49.3	3.65 04		6.51	251.5	Ni Lα	851.5	3.08 03	35.85	9.47	14.56
Al $L_{2,3}M$	72.4	2.36 04		6.18	171.4	Cu Lα	929.7	2.63 03	34.19	8.84	13.33
Si $L_{2,3}M$	91.5	2.00 04		6.62	135.5	Zn Lα	1011.7	2.25 03	30.68	8.23	12.25
Be K	108.5	1.50 04	12.86	5.90	114.	Na Kα	1041.0	2.13 03	28.45	8.02	11.91
Sr Mζ	114.0	1.52 04	11.01	6.26	108.7	Ge Lα	1188.0	8.44 03	31.11	36.22	10.44
Y Mζ	132.8	2.76 04	-5.18	13.24	93.4	Mg Kα	1253.6	7.42 03	39.21	33.60	9.89
S Lℓ	148.7	6.06 04	23.35	32.57	83.4	Al Kα	1486.7	4.93 03	49.60	26.49	8.34
Zr Mζ	151.1	5.49 04	24.64	29.96	82.1	Si Kα	1740.0	3.67 03	53.92	23.09	7.13
Nb Mζ	171.7	3.74 04	29.28	23.21	72.2	Zr Lα	2042.4	2.63 03	57.60	19.39	6.07
B Kα	183.3	3.13 04	31.21	20.70	67.6	Nb Lα	2165.9	2.29 03		17.89	5.73
Mo Mζ	192.6	2.59 04	32.38	18.01	64.4	Mo Lα	2293.2	2.00 03		16.53	5.41
W N_5N_7	212.2	1.97 04	32.04	15.12	58.4	Cl Kα	2622.4	1.44 03		13.67	4.73
C Kα	277.0	1.24 04	31.61	12.43	44.7	Ag Lα	2984.3	1.05 03		11.35	4.16
Ag Mζ	311.7	1.11 04	31.14	12.48	39.8	Ca Kα	3691.7	6.24 02		8.32	3.36
N Kα	392.4	9.58 03	32.82	13.58	31.6	Ba Lα	4466.3	3.88 02		6.27	2.78
Ti Lℓ	395.3	9.51 03	32.94	13.57	31.4	Ti Kα	4510.8	3.79 02		6.17	2.75
Ti Lα	452.2	8.06 03	34.43	13.17	27.4	V Kα	4952.2	3.00 02		5.37	2.50
V Lα	511.3	6.86 03	35.47	12.67	24.3	Cr Kα	5414.7	2.40 02		4.69	2.29
O Kα	524.9	6.63 03	35.69	12.57	23.6	Mn Kα	5898.8	1.93 02		4.11	2.10
Mn Lℓ	556.3	6.10 03	36.11	12.25	22.3	Co Kα	6930.3	1.28 02		3.20	1.79
Cr Lα	572.8	5.84 03	36.29	12.07	21.6	Ni Kα	7478.2	2.95 02		7.98	1.66
Mn Lα	637.4	4.97 03	36.76	11.44	19.5	Cu Kα	8047.8	3.32 02		9.66	1.54
F Kα	676.8	4.50 03	36.85	10.99	18.3	Zn Kα	8638.9	3.19 02		9.96	1.44
Fe Lα	705.0	4.24 03	36.85	10.79	17.6	Ge Kα	9886.4	2.27 02		8.10	1.25

ABSORPTION EDGE

L_1	8060.7 eV	1.5381 A	M_3*	1473 eV	8.418 A
L_2	7619.9 eV	1.6271 A	M_4	1157.5 eV	10.711 A
L_3	6980.6 eV	1.7761 A	M_5	1125.8 eV	11.013 A





For 76 eV < E < 289.5 eV ——— (32-N)
For E < 76 eV - - - - - - (1)

References: 29, 31, 32, 100

XI. Low-Energy X-Ray Interaction Coefficient Tables

See page 19 for Explanation of Tables

TABLE I. PHOTOABSORPTION CROSS SECTION, μ
ATOMIC SCATTERING FACTOR, $f_1 + if_2$

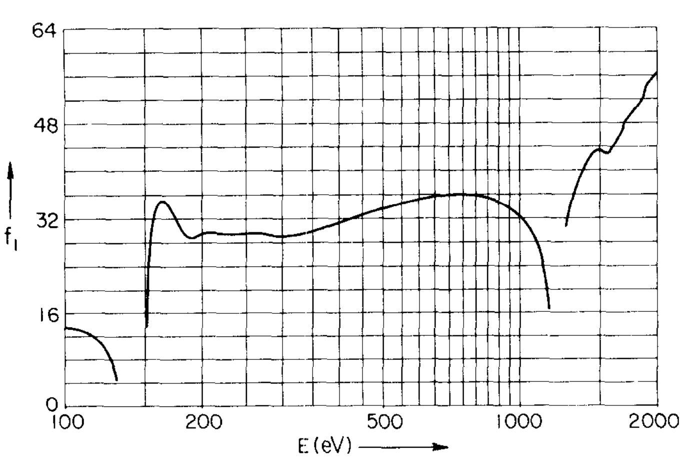
Atomic Weight = 157.3 Z = 64

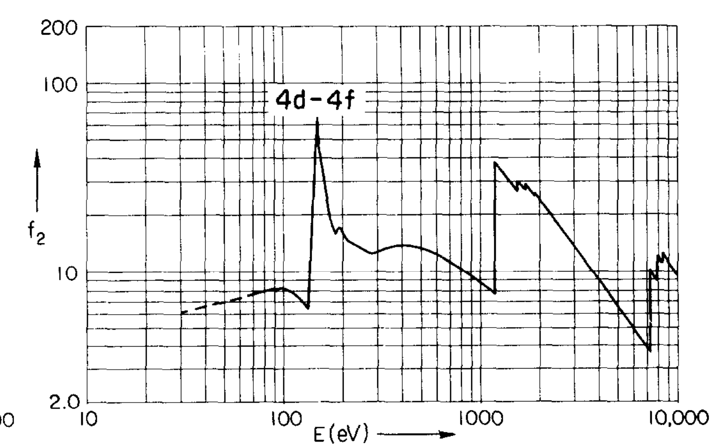
μ(barns/atom) = μ(cm^2/gm) x 261.1 GADOLINIUM (Gd)
$E\mu(E)$ = 267.5 f_2 keVcm^2/gm

LINE	E(eV)	μ(cm^2/gm)	f_1	f_2	λ(A)	LINE	E(eV)	μ(cm^2/gm)	f_1	f_2	λ(A)
Na $L_{2,3}M$	30.5	5.31 04		6.04	407.1	Co Lα	776.2	3.66 03	35.75	10.62	16.0
Mg $L_{2,3}M$	49.3	3.75 04		6.90	251.5	Ni Lα	851.5	3.12 03	35.25	9.93	14.56
Al $L_{2,3}M$	72.4	2.84 04		7.68	171.4	Cu Lα	929.7	2.67 03	34.15	9.29	13.33
Si $L_{2,3}M$	91.5	2.39 04		8.16	135.5	Zn Lα	1011.7	2.29 03	32.02	8.66	12.25
Be K	108.5	1.94 04	12.84	7.85	114.	Na Kα	1041.0	2.17 03	30.84	8.45	11.91
Sr Mζ	114.0	1.80 04	12.11	7.67	108.7	Ge Lα	1188.0	8.50 03	-2.60	37.73	10.44
Y Mζ	132.8	1.34 04	0.45	6.64	93.4	Mg Kα	1253.6	7.48 03	29.73	35.05	9.89
S Lℓ	148.7	1.19 05	5.21	66.21	83.4	Al Kα	1486.7	5.01 03	43.61	27.82	8.34
Zr Mζ	151.1	8.54 04	27.96	48.24	82.1	Si Kα	1740.0	4.29 03	50.53	27.90	7.13
Nb Mζ	171.7	2.91 04	33.46	18.68	72.2	Zr Lα	2042.4	3.07 03	56.37	23.43	6.07
B Kα	183.3	2.30 04	29.63	15.75	67.6	Nb Lα	2165.9	2.67 03		21.61	5.73
Mo Mζ	192.6	2.37 04	28.88	17.10	64.4	Mo Lα	2293.2	2.33 03		19.97	5.41
W N_5N_7	212.2	1.84 04	29.65	14.58	58.4	Cl Kα	2622.4	1.69 03		16.53	4.73
C Kα	277.0	1.20 04	29.26	12.39	44.7	Ag Lα	2984.3	1.23 03		13.75	4.16
Ag Mζ	311.7	1.11 04	29.19	12.92	39.8	Ca Kα	3691.7	7.32 02		10.10	3.36
N Kα	392.4	9.55 03	31.15	14.01	31.6	Ba Lα	4466.3	4.57 02		7.62	2.78
Ti Lℓ	395.3	9.47 03	31.27	13.99	31.4	Ti Kα	4510.8	4.46 02		7.51	2.75
Ti Lα	452.2	8.04 03	32.85	13.59	27.4	V Kα	4952.2	3.53 02		6.53	2.50
V Lα	511.3	6.87 03	33.95	13.13	24.3	Cr Kα	5414.7	2.82 02		5.71	2.29
O Kα	524.9	6.64 03	34.18	13.03	23.6	Mn Kα	5898.8	2.27 02		5.00	2.10
Mn Lℓ	556.3	6.13 03	34.65	12.74	22.3	Co Kα	6930.3	1.50 02		3.88	1.79
Cr Lα	572.8	5.88 03	34.87	12.58	21.6	Ni Kα	7478.2	3.46 02		9.67	1.66
Mn Lα	637.4	5.02 03	35.49	11.96	19.5	Cu Kα	8047.8	3.91 02		11.78	1.54
F Kα	676.8	4.55 03	35.68	11.50	18.3	Zn Kα	8638.9	3.69 02		11.93	1.44
Fe Lα	705.0	4.29 03	35.75	11.29	17.6	Ge Kα	9886.4	2.63 02		9.72	1.25

ABSORPTION EDGE

L_1	8386.4 eV	1.4784 A	M_3*	1543 eV	8.036 A
L_2	7931.0 eV	1.5632 A	M_5**	1185 eV	10.46 A
L_3	7243.0 eV	1.7117 A			





For 76 eV < E < 212 eV ———— (58)
For E < 76 eV - - - - - - - (1)

References: 29, 31, 32, 58

XI. Low-Energy X-Ray Interaction Coefficient Tables

See page 19 for Explanation of Tables

TABLE I. PHOTOABSORPTION CROSS SECTION, μ
ATOMIC SCATTERING FACTOR, $f_1 + if_2$

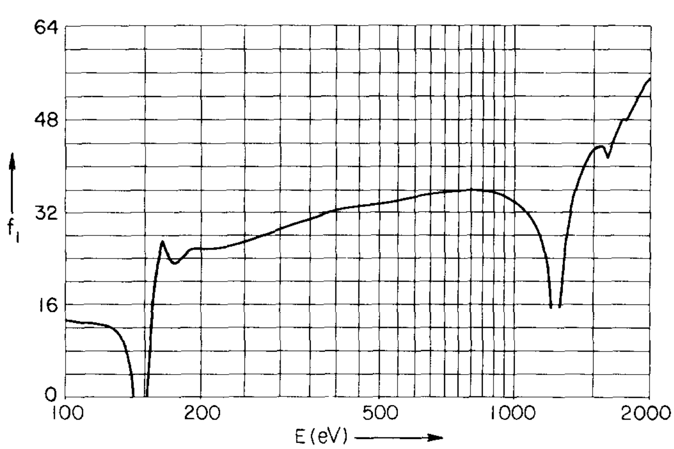
Atomic Weight = 158.9 Z = 65

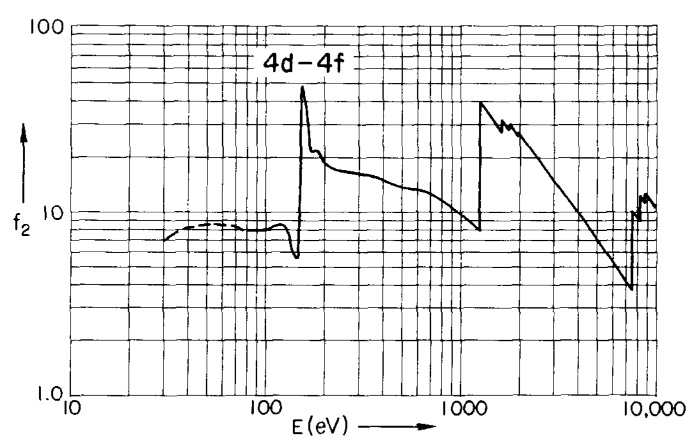
μ(barns/atom) = μ(cm^2/gm) x 263.9 TERBIUM (Tb)
$E\mu(E)$ = 264.6 f_2 keVcm^2/gm

LINE	E(eV)	μ(cm^2/gm)	f_1	f_2	λ(A)	LINE	E(eV)	μ(cm^2/gm)	f_1	f_2	λ(A)
Na $L_{2,3}M$	30.5	6.16 04		7.08	407.1	Co Lα	776.2	4.00 03	36.19	11.72	16.0
Mg $L_{2,3}M$	49.3	4.65 04		8.66	251.5	Ni Lα	851.5	3.39 03	35.98	10.91	14.56
Al $L_{2,3}M$	72.4	3.03 04		8.28	171.4	Cu Lα	929.7	2.90 03	35.24	10.17	13.33
Si $L_{2,3}M$	91.5	2.34 04		8.08	135.5	Zn Lα	1011.7	2.47 03	33.71	9.46	12.25
Be K	108.5	2.05 04	12.96	8.42	114.	Na Kα	1041.0	2.34 03	32.90	9.21	11.91
Sr Mζ	114.0	2.00 04	12.84	8.59	108.7	Ge Lα	1188.0	1.81 03	22.71	8.14	10.44
Y Mζ	132.8	1.44 04	10.87	7.23	93.4	Mg Kα	1253.6	8.24 03	10.90	39.04	9.89
S Lℓ	148.7	1.47 04	-18.27	8.24	83.4	Al Kα	1486.7	5.44 03	42.84	30.53	8.34
Zr Mζ	151.1	8.11 04	-22.01	46.31	82.1	Si Kα	1740.0	4.35 03	48.79	28.62	7.13
Nb Mζ	171.7	3.34 04	23.30	21.67	72.2	Zr Lα	2042.4	3.33 03	55.73	25.67	6.07
B Kα	183.3	3.11 04	24.18	21.54	67.6	Nb Lα	2165.9	2.90 03		23.71	5.73
Mo Mζ	192.6	2.69 04	25.74	19.57	64.4	Mo Lα	2293.2	2.53 03		21.93	5.41
W N_5N_7	212.2	2.21 04	25.59	17.68	58.4	Cl Kα	2622.4	1.83 03		18.17	4.73
C Kα	277.0	1.60 04	27.98	16.74	44.7	Ag Lα	2984.3	1.34 03		15.10	4.16
Ag Mζ	311.7	1.40 04	29.45	16.45	39.8	Ca Kα	3691.7	7.93 02		11.06	3.36
N Kα	392.4	1.02 04	32.33	15.12	31.6	Ba Lα	4466.3	4.93 02		8.33	2.78
Ti Lℓ	395.3	1.01 04	32.40	15.06	31.4	Ti Kα	4510.8	4.81 02		8.20	2.75
Ti Lα	452.2	8.23 03	33.29	14.05	27.4	V Kα	4952.2	3.81 02		7.13	2.50
V Lα	511.3	7.01 03	33.80	13.54	24.3	Cr Kα	5414.7	3.04 02		6.22	2.29
O Kα	524.9	6.82 03	33.96	13.53	23.6	Mn Kα	5898.8	2.45 02		5.46	2.10
Mn Lℓ	556.3	6.35 03	34.37	13.35	22.3	Co Kα	6930.3	1.63 02		4.26	1.79
Cr Lα	572.8	6.13 03	34.55	13.27	21.6	Ni Kα	7478.2	1.34 02		3.78	1.66
Mn Lα	637.4	5.38 03	35.18	12.95	19.5	Cu Kα	8047.8	3.03 02		9.21	1.54
F Kα	676.8	5.00 03	35.61	12.77	18.3	Zn Kα	8638.9	3.48 02		11.37	1.44
Fe Lα	705.0	4.70 03	35.91	12.51	17.6	Ge Kα	9886.4	2.82 02		10.55	1.25

ABSORPTION EDGE

L_1	8716.7 eV	1.4223 A	M_5**	1240 eV	10.0 A
L_2	8252.7 eV	1.5023 A			
L_3	7515.3 eV	1.6497 A			





For 80 eV < E < 500 eV ———— (139) x 1.20
For E < 80 eV - - - - - - - (1)

References: 74 , 139

XI. Low-Energy X-Ray Interaction Coefficient Tables

See page 19 for Explanation of Tables

TABLE I. PHOTOABSORPTION CROSS SECTION, μ
ATOMIC SCATTERING FACTOR, $f_1 + if_2$

Atomic Weight = 162.5 Z = 66

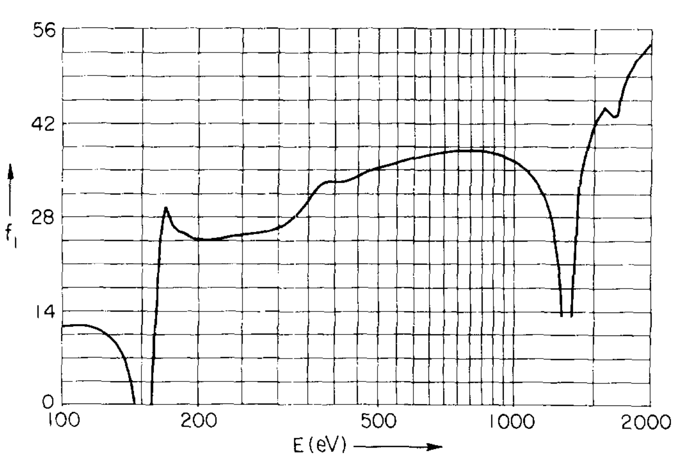
μ(barns/atom) = μ(cm^2/gm) x 269.8 DYSPROSIUM (Dy)
Eμ(E) = 258.8 f_2 keVcm^2/gm

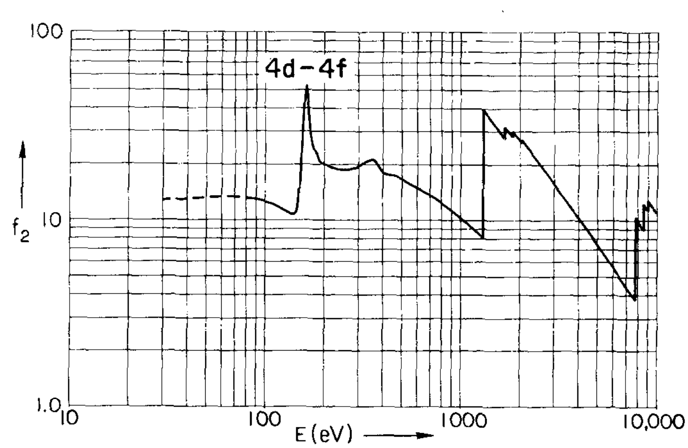
LINE	E(eV)	μ(cm^2/gm)	f_1	f_2	λ(A)
Na $L_{2,3}M$	30.5	1.08 05		12.71	407.1
Mg $L_{2,3}M$	49.3	6.91 04		13.16	251.5
Al $L_{2,3}M$	72.4	4.75 04		13.29	171.4
Si $L_{2,3}M$	91.5	3.65 04		12.92	135.5
Be K	108.5	2.92 04	11.88	12.23	114.
Sr Mζ	114.0	2.72 04	11.83	11.98	108.7
Y Mζ	132.8	2.12 04	8.99	10.85	93.4
S Lℓ	148.7	2.26 04	-5.28	12.96	83.4
Zr Mζ	151.1	3.76 04	-9.69	21.95	82.1
Nb Mζ	171.7	4.16 04	28.66	27.57	72.2
B Kα	183.3	3.21 04	25.66	22.71	67.6
Mo Mζ	192.6	2.75 04	24.81	20.48	64.4
W N_5N_7	212.2	2.36 04	24.60	19.34	58.4
C Kα	277.0	1.74 04	25.80	18.61	44.7
Ag Mζ	311.7	1.65 04	27.03	19.86	39.8
N Kα	392.4	1.19 04	33.34	18.05	31.6
Ti Lℓ	395.3	1.18 04	33.27	17.97	31.4
Ti Lα	452.2	9.99 03	34.23	17.45	27.4
V Lα	511.3	8.18 03	35.55	16.15	24.3
O Kα	524.9	7.88 03	35.77	15.97	23.6
Mn Lℓ	556.3	7.24 03	36.26	15.55	22.3
Cr Lα	572.8	6.92 03	36.51	15.31	21.6
Mn Lα	637.4	5.86 03	37.31	14.44	19.5
F Kα	676.8	5.28 03	37.59	13.81	18.3
Fe Lα	705.0	4.97 03	37.75	13.53	17.6

LINE	E(eV)	μ(cm^2/gm)	f_1	f_2	λ(A)
Co Lα	776.2	4.22 03	38.00	12.65	16.0
Ni Lα	851.5	3.57 03	37.89	11.75	14.56
Cu Lα	929.7	3.04 03	37.32	10.92	13.33
Zn Lα	1011.7	2.59 03	36.18	10.13	12.25
Na Kα	1041.0	2.45 03	35.61	9.86	11.91
Ge Lα	1188.0	1.89 03	29.61	8.67	10.44
Mg Kα	1253.6	1.70 03	21.59	8.23	9.89
Al Kα	1486.7	5.67 03	41.49	32.53	8.34
Si Kα	1740.0	4.52 03	48.36	30.41	7.13
Zr Lα	2042.4	3.30 03	54.57	26.04	6.07
Nb Lα	2165.9	3.01 03		25.15	5.73
Mo Lα	2293.2	2.63 03		23.30	5.41
Cl Kα	2622.4	1.91 03		19.36	4.73
Ag Lα	2984.3	1.40 03		16.09	4.16
Ca Kα	3691.7	8.25 02		11.77	3.36
Ba Lα	4466.3	5.12 02		8.84	2.78
Ti Kα	4510.8	5.00 02		8.71	2.75
V Kα	4952.2	3.95 02		7.56	2.50
Cr Kα	5414.7	3.15 02		6.60	2.29
Mn Kα	5898.8	2.54 02		5.79	2.10
Co Kα	6930.3	1.69 02		4.52	1.79
Ni Kα	7478.2	1.39 02		4.02	1.66
Cu Kα	8047.8	3.19 02		9.93	1.54
Zn Kα	8638.9	3.64 02		12.14	1.44
Ge Kα	9886.4	2.93 02		11.20	1.25

ABSORPTION EDGE

L_1	9054.8 eV	1.3692 A	M_3*	1672 eV	7.414 A
L_2	8583.0 eV	1.4445 A	M_5**	1295 eV	9.57 A
L_3	7789.7 eV	1.5916 A			





For 80 eV < E < 400 eV ——— (139) x 1.41
For E < 80 eV - - - - - - - (1)

References: 31, 32, 58, 139

XI. Low-Energy X-Ray Interaction Coefficient Tables

See page 19 for Explanation of Tables

TABLE I. PHOTOABSORPTION CROSS SECTION, μ
ATOMIC SCATTERING FACTOR, $f_1 + if_2$

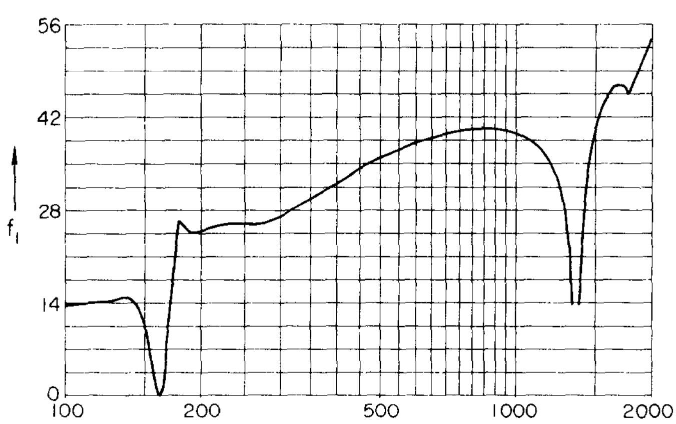
Atomic Weight = 164.9 Z = 67

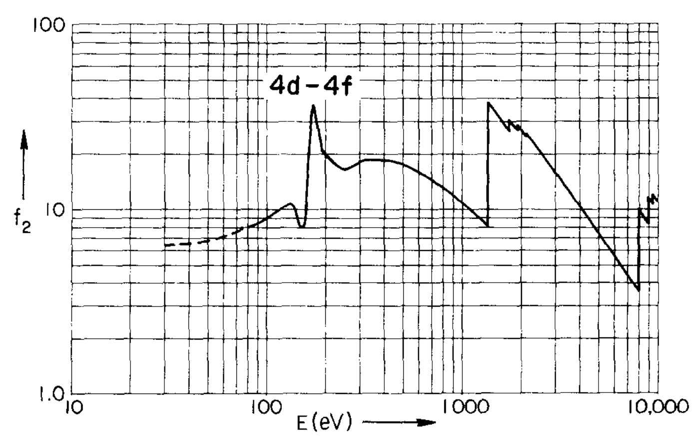
μ(barns/atom) = μ(cm^2/gm) x 273.8 HOLMIUM (Ho)
$E\mu(E)$ = 255.0 f_2 keVcm^2/gm

LINE	E(eV)	μ(cm^2/gm)	f_1	f_2	λ(A)	LINE	E(eV)	μ(cm^2/gm)	f_1	f_2	λ(A)
Na $L_{2,3}M$	30.5	5.40 04		6.44	407.1	Co Lα	776.2	4.44 03	40.23	13.52	16.0
Mg $L_{2,3}M$	49.3	3.50 04		6.77	251.5	Ni Lα	851.5	3.76 03	40.37	12.55	14.56
Al $L_{2,3}M$	72.4	2.74 04		7.78	171.4	Cu Lα	929.7	3.20 03	40.12	11.67	13.33
Si $L_{2,3}M$	91.5	2.38 04		8.53	135.5	Zn Lα	1011.7	2.73 03	39.46	10.82	12.25
Be K	108.5	2.27 04	13.86	9.66	114.	Na Kα	1041.0	2.58 03	39.08	10.53	11.91
Sr Mζ	114.0	2.23 04	14.06	9.95	108.7	Ge Lα	1188.0	1.98 03	35.37	9.23	10.44
Y Mζ	132.8	2.06 04	14.87	10.72	93.4	Mg Kα	1253.6	1.78 03	31.70	8.75	9.89
S Lℓ	148.7	1.39 04	11.51	8.08	83.4	Al Kα	1486.7	5.72 03	40.14	33.34	8.34
Zr Mζ	151.1	1.34 04	10.14	7.93	82.1	Si Kα	1740.0	3.90 03	46.96	26.60	7.13
Nb Mζ	171.7	5.42 04	15.79	36.47	72.2	Zr Lα	2042.4	3.30 03	55.81	26.39	6.07
B Kα	183.3	3.06 04	25.51	21.97	67.6	Nb Lα	2165.9	2.98 03		25.34	5.73
Mo Mζ	192.6	2.68 04	24.65	20.23	64.4	Mo Lα	2293.2	2.62 03		23.52	5.41
W N_5N_7	212.2	2.20 04	25.48	18.28	58.4	Cl Kα	2622.4	1.91 03		19.60	4.73
C Kα	277.0	1.60 04	26.17	17.35	44.7	Ag Lα	2984.3	1.40 03		16.33	4.16
Ag Mζ	311.7	1.51 04	27.83	18.44	39.8	Ca Kα	3691.7	8.27 02		11.96	3.36
N Kα	392.4	1.20 04	31.78	18.50	31.6	Ba Lα	4466.3	5.13 02		8.99	2.78
Ti Lℓ	395.3	1.19 04	31.91	18.50	31.4	Ti Kα	4510.8	5.01 02		8.86	2.75
Ti Lα	452.2	1.03 04	34.47	18.18	27.4	V Kα	4952.2	3.96 02		7.68	2.50
V Lα	511.3	8.66 03	36.30	17.35	24.3	Cr Kα	5414.7	3.16 02		6.70	2.29
O Kα	524.9	8.34 03	36.67	17.16	23.6	Mn Kα	5898.8	2.54 02		5.87	2.10
Mn Lℓ	556.3	7.65 03	37.44	16.68	22.3	Co Kα	6930.3	1.68 02		4.57	1.79
Cr Lα	572.8	7.31 03	37.80	16.41	21.6	Ni Kα	7478.2	1.38 02		4.06	1.66
Mn Lα	637.4	6.19 03	38.92	15.48	19.5	Cu Kα	8047.8	1.15 02		3.62	1.54
F Kα	676.8	5.59 03	39.40	14.84	18.3	Zn Kα	8638.9	2.62 02		8.89	1.44
Fe Lα	705.0	5.26 03	39.71	14.54	17.6	Ge Kα	9886.4	2.90 02		11.24	1.25

ABSORPTION EDGE

L_1	9399.4 eV	1.3190 A
L_2	8916.4 eV	1.3905 A
L_3	8067.6 eV	1.5368 A
M_5**	1351 eV	9.18 A





For 80 eV < E < 500 eV ———— (139) x 1.12
For E < 80 eV - - - - - (1)

References: 31, 32, 58, 139

XI. Low-Energy X-Ray Interaction Coefficient Tables

See page 19 for Explanation of Tables

TABLE I. PHOTOABSORPTION CROSS SECTION, μ
ATOMIC SCATTERING FACTOR, $f_1 + if_2$

Atomic Weight = 167.3   Z = 68

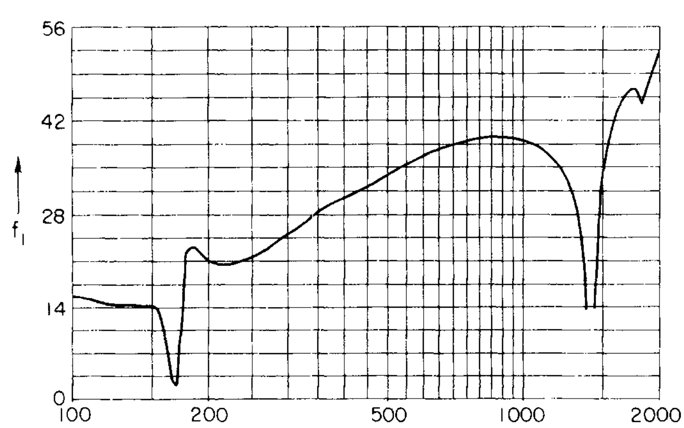
μ(barns/atom) = μ(cm^2/gm) x 277.7   ERBIUM (Er)

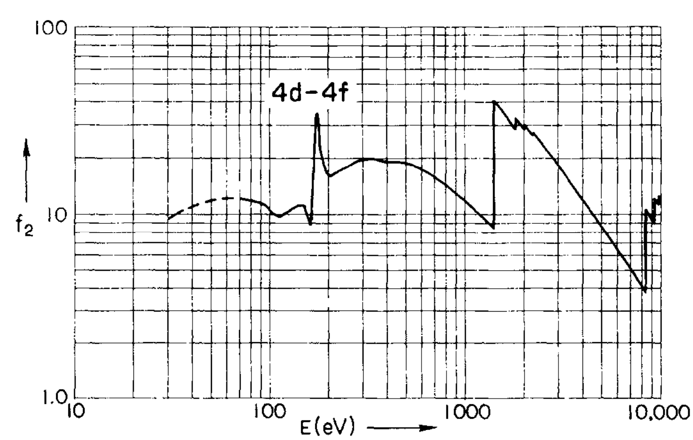
$E\mu(E)$ = 251.4 f_2 keVcm^2/gm

LINE	E(eV)	μ(cm^2/gm)	f_1	f_2	λ(A)	LINE	E(eV)	μ(cm^2/gm)	f_1	f_2	λ(A)
Na $L_{2,3}M$	30.5	7.93 04		9.60	407.1	Co Lα	776.2	4.73 03	39.35	14.59	16.0
Mg $L_{2,3}M$	49.3	6.03 04		11.81	251.5	Ni Lα	851.5	4.00 03	39.62	13.54	14.56
Al $L_{2,3}M$	72.4	4.21 04		12.11	171.4	Cu Lα	929.7	3.40 03	39.52	12.58	13.33
Si $L_{2,3}M$	91.5	3.14 04		11.41	135.5	Zn Lα	1011.7	2.90 03	39.00	11.66	12.25
Be K	108.5	2.29 04	15.39	9.88	114.	Na Kα	1041.0	2.74 03	38.70	11.33	11.91
Sr Mζ	114.0	2.18 04	14.92	9.88	108.7	Ge Lα	1188.0	2.10 03	35.70	9.91	10.44
Y Mζ	132.8	2.06 04	14.45	10.89	93.4	Mg Kα	1253.6	1.88 03	33.06	9.39	9.89
S Lℓ	148.7	1.91 04	14.34	11.29	83.4	Al Kα	1486.7	6.36 03	33.46	37.61	8.34
Zr Mζ	151.1	1.81 04	14.44	10.89	82.1	Si Kα	1740.0	4.34 03	47.12	30.03	7.13
Nb Mζ	171.7	4.97 04	3.41	33.92	72.2	Zr Lα	2042.4	3.66 03	54.43	29.72	6.07
B Kα	183.3	2.80 04	23.51	20.41	67.6	Nb Lα	2165.9	3.17 03		27.33	5.73
Mo Mζ	192.6	2.19 04	22.28	16.75	64.4	Mo Lα	2293.2	2.90 03		26.42	5.41
W N_5N_7	212.2	1.93 04	20.57	16.24	58.4	Cl Kα	2622.4	2.11 03		22.01	4.73
C Kα	277.0	1.75 04	23.39	19.30	44.7	Ag Lα	2984.3	1.55 03		18.36	4.16
Ag Mζ	311.7	1.59 04	25.78	19.73	39.8	Ca Kα	3691.7	9.19 02		13.50	3.36
N Kα	392.4	1.22 04	30.27	19.09	31.6	Ba Lα	4466.3	5.73 02		10.18	2.78
Ti Lℓ	395.3	1.21 04	30.34	19.06	31.4	Ti Kα	4510.8	5.59 02		10.03	2.75
Ti Lα	452.2	1.05 04	32.25	18.94	27.4	V Kα	4952.2	4.43 02		8.71	2.50
V Lα	511.3	9.21 03	34.41	18.73	24.3	Cr Kα	5414.7	3.54 02		7.61	2.29
O Kα	524.9	8.92 03	34.93	18.61	23.6	Mn Kα	5898.8	2.85 02		6.68	2.10
Mn Lℓ	556.3	8.19 03	35.93	18.11	22.3	Co Kα	6930.3	1.89 02		5.20	1.79
Cr Lα	572.8	7.83 03	36.40	17.83	21.6	Ni Kα	7478.2	1.55 02		4.61	1.66
Mn Lα	637.4	6.62 03	37.80	16.77	19.5	Cu Kα	8047.8	1.28 02		4.10	1.54
F Kα	676.8	5.95 03	38.39	16.01	18.3	Zn Kα	8638.9	2.94 02		10.11	1.44
Fe Lα	705.0	5.59 03	38.70	15.66	17.6	Ge Kα	9886.4	3.17 02		12.48	1.25

ABSORPTION EDGE

L_1	9757.4 eV	1.2706 A	M_4	1441.5 eV	8.601 A
L_2	9262.2 eV	1.3386 A	M_5	1401.3 eV	8.847 A
L_3	8357.5 eV	1.4835 A			





For 80 eV < E < 400 eV ———— (139) x 1.19

For E < 80 eV - - - - - - - (1)

References: 31, 32, 58, 139

XI. Low-Energy X-Ray Interaction Coefficient Tables

See page 19 for Explanation of Tables

TABLE I. PHOTOABSORPTION CROSS SECTION, μ
ATOMIC SCATTERING FACTOR, $f_1 + if_2$

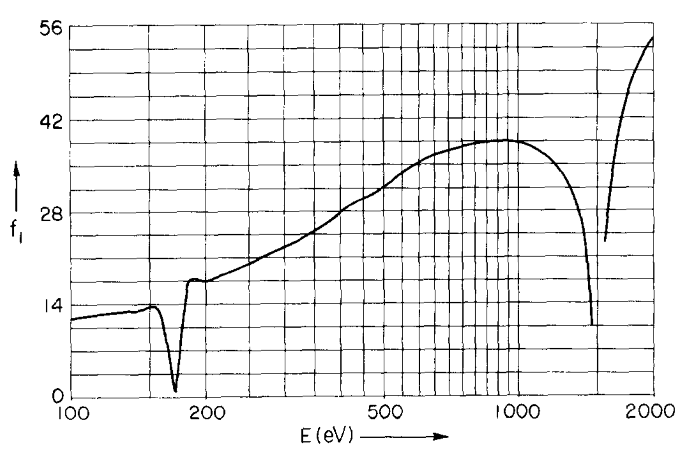
Atomic Weight = 168.9 Z = 69

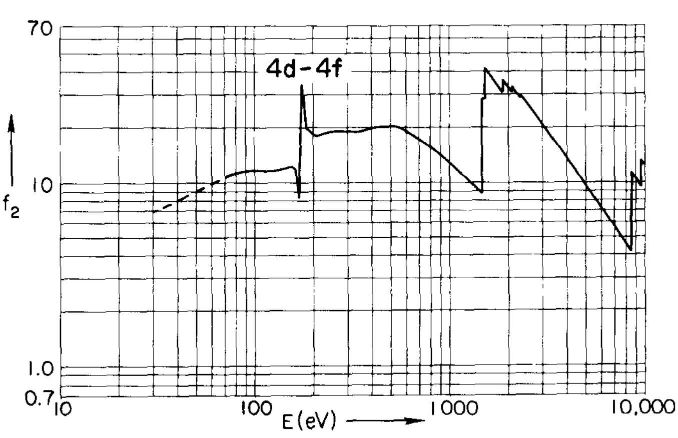
μ(barns/atom) = μ(cm²/gm) x 280.5 THULIUM (Tm)
Eμ(E) = 249.0 f_2 keVcm²/gm

LINE	E(eV)	μ(cm²/gm)	f_1	f_2	λ(A)
Na $L_{2,3}M$	30.5	5.67 04		6.93	407.1
Mg $L_{2,3}M$	49.3	4.51 04		8.94	251.5
Al $L_{2,3}M$	72.4	3.74 04		10.86	171.4
Si $L_{2,3}M$	91.5	3.14 04		11.53	135.5
Be K	108.5	2.64 04	13.04	11.50	114.0
Sr M_ζ	114.0	2.50 04	13.22	11.45	108.7
Y M_ζ	132.8	2.19 04	13.34	11.69	93.4
S $L\ell$	148.7	2.03 04	13.13	12.11	83.4
Zr M_ζ	151.1	2.00 04	13.03	12.16	82.1
Nb M_ζ	171.7	2.48 04	-6.88	17.10	72.2
B Kα	183.3	2.95 04	19.64	21.74	67.6
Mo M_ζ	192.6	2.42 04	18.71	18.74	64.4
W N_5N_7	212.2	2.14 04	19.13	18.21	58.4
C Kα	277.0	1.71 04	23.27	19.02	44.7
Ag M_ζ	311.7	1.50 04	24.94	18.84	39.8
N Kα	392.4	1.25 04	27.62	19.71	31.6
Ti $L\ell$	395.3	1.24 04	27.76	19.75	31.4
Ti Lα	452.2	1.12 04	30.35	20.30	27.4
V Lα	511.3	9.85 03	33.02	20.23	24.3
O Kα	524.9	9.56 03	33.66	20.15	23.6
Mn $L\ell$	556.3	8.77 03	34.93	19.59	22.3
Cr Lα	572.8	8.38 03	35.49	19.28	21.6
Mn Lα	637.4	7.09 03	37.15	18.14	19.5
F Kα	676.8	6.38 03	37.83	17.35	18.3
Fe Lα	705.0	6.00 03	38.29	16.98	17.6
Co Lα	776.2	5.06 03	39.17	15.78	16.0
Ni Lα	851.5	4.27 03	39.61	14.60	14.56
Cu Lα	929.7	3.63 03	39.66	13.54	13.33
Zn Lα	1011.7	3.09 03	39.38	12.56	12.25
Na Kα	1041.0	2.92 03	39.18	12.21	11.91
Ge Lα	1188.0	2.23 03	37.06	10.66	10.44
Mg Kα	1253.6	2.00 03	35.33	10.09	9.89
Al Kα	1486.7	4.73 03	16.85	28.23	8.34
Si Kα	1740.0	4.87 03	44.45	34.05	7.13
Zr Lα	2042.4	3.85 03	52.80	31.60	6.07
Nb Lα	2165.9	3.57 03		31.08	5.73
Mo Lα	2293.2	3.11 03		28.60	5.41
Cl Kα	2622.4	2.37 03		24.94	4.73
Ag Lα	2984.3	1.74 03		20.82	4.16
Ca Kα	3691.7	1.03 03		15.34	3.36
Ba Lα	4466.3	6.46 02		11.58	2.78
Ti Kα	4510.8	6.30 02		11.41	2.75
V Kα	4952.2	4.99 02		9.93	2.50
Cr Kα	5414.7	3.99 02		8.67	2.29
Mn Kα	5898.8	3.21 02		7.61	2.10
Co Kα	6930.3	2.13 02		5.93	1.79
Ni Kα	7478.2	1.75 02		5.25	1.66
Cu Kα	8047.8	1.45 02		4.67	1.54
Zn Kα	8638.9	1.20 02		4.16	1.44
Ge Kα	9886.4	3.16 02		12.56	1.25

ABSORPTION EDGE

L_2	9617.1 eV	1.2892 A
L_3	8649.6 eV	1.4334 A
M_5	1460.9 eV	8.487 A





For 80 eV < E < 500 eV ———— (139) x 1.12
For E < 80 eV - - - - - - (1)

References: 31, 32, 137, 139

XI. Low-Energy X-Ray Interaction Coefficient Tables

See page 19 for Explanation of Tables

TABLE I. PHOTOABSORPTION CROSS SECTION, μ
ATOMIC SCATTERING FACTOR, $f_1 + if_2$

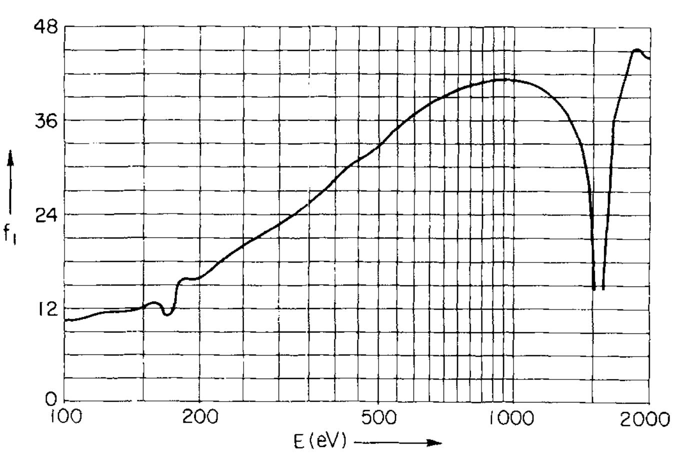
Atomic Weight = 173.0 Z = 70

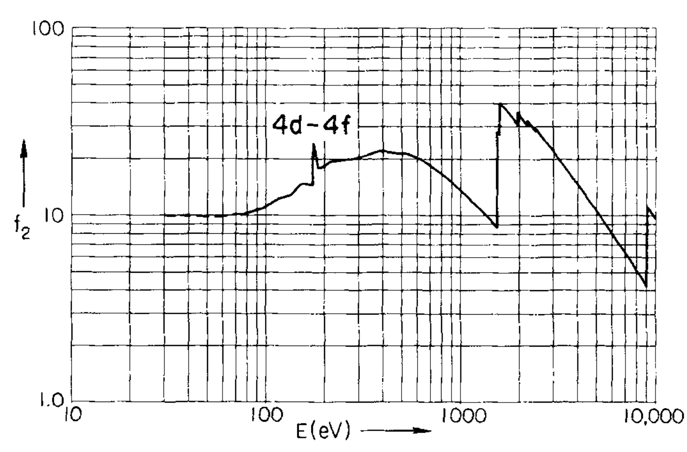
μ(barns/atom) = μ(cm^2/gm) x 287.3 YTTERBIUM (Yb)
Eμ(E) = 243.0 f_2 keVcm^2/gm

LINE	E(eV)	μ(cm^2/gm)	f_1	f_2	λ(A)
Na $L_{2,3}M$	30.5	7.96 04		9.97	407.1
Mg $L_{2,3}M$	49.3	4.86 04		9.85	251.5
Al $L_{2,3}M$	72.4	3.37 04		10.03	171.4
Si $L_{2,3}M$	91.5	2.88 04		10.84	135.5
Be K	108.5	2.69 04	10.48	11.98	114.
Sr Mζ	114.0	2.64 04	10.86	12.40	108.7
Y Mζ	132.8	2.37 04	11.47	12.93	93.4
S Lℓ	148.7	2.40 04	12.04	14.66	83.4
Zr Mζ	151.1	2.40 04	12.31	14.92	82.1
Nb Mζ	171.7	2.02 04	7.45	14.26	72.2
B Kα	183.3	2.37 04	15.75	17.84	67.6
Mo Mζ	192.6	2.26 04	15.43	17.92	64.4
W N_5N_7	212.2	2.23 04	16.83	19.44	58.4
C Kα	277.0	1.77 04	21.52	20.18	44.7
Ag Mζ	311.7	1.63 04	23.30	20.85	39.8
N Kα	392.4	1.38 04	27.95	22.23	31.6
Ti Lℓ	395.3	1.37 04	28.17	22.19	31.4
Ti Lα	452.2	1.16 04	30.92	21.48	27.4
V Lα	511.3	1.03 04	33.24	21.57	24.3
O Kα	524.9	1.00 04	33.95	21.59	23.6
Mn Lℓ	556.3	9.18 03	35.33	21.02	22.3
Cr Lα	572.8	8.78 03	36.00	20.69	21.6
Mn Lα	637.4	7.43 03	37.87	19.47	19.5
F Kα	676.8	6.68 03	38.65	18.60	18.3
Fe Lα	705.0	6.28 03	39.13	18.20	17.6
Co Lα	776.2	5.31 03	40.17	16.97	16.0
Ni Lα	851.5	4.48 03	40.82	15.70	14.56
Cu Lα	929.7	3.80 03	41.10	14.53	13.33
Zn Lα	1011.7	3.23 03	41.01	13.42	12.25
Na Kα	1041.0	3.04 03	40.90	13.03	11.91
Ge Lα	1188.0	2.32 03	39.41	11.34	10.44
Mg Kα	1253.6	2.08 03	38.20	10.72	9.89
Al Kα	1486.7	1.47 03	24.77	8.97	8.34
Si Kα	1740.0	4.95 03	41.59	35.45	7.13
Zr Lα	2042.4	3.98 03	51.45	33.41	6.07
Nb Lα	2165.9	3.44 03		30.62	5.73
Mo Lα	2293.2	3.20 03		30.14	5.41
Cl Kα	2622.4	2.43 03		26.19	4.73
Ag Lα	2984.3	1.78 03		21.91	4.16
Ca Kα	3691.7	1.06 03		16.17	3.36
Ba Lα	4466.3	6.66 02		12.23	2.78
Ti Kα	4510.8	6.49 02		12.05	2.75
V Kα	4952.2	5.15 02		10.48	2.50
Cr Kα	5414.7	4.11 02		9.17	2.29
Mn Kα	5898.8	3.32 02		8.05	2.10
Co Kα	6930.3	2.20 02		6.28	1.79
Ni Kα	7478.2	1.81 02		5.58	1.66
Cu Kα	8047.8	1.50 02		4.97	1.54
Zn Kα	8638.9	1.25 02		4.43	1.44
Ge Kα	9886.4	2.34 02		9.54	1.25

ABSORPTION EDGE

L_2	9976.1 eV	1.2428 A	M_3*	1943 eV	6.382 A
L_3	8944.1 eV	1.3862 A	M_5**	1528 eV	8.11 A





For 76 eV < E < 277 eV ———— (58)
For E < 76 eV - - - - - - - (1)

References: 31, 32, 58, 139

XI. Low-Energy X-Ray Interaction Coefficient Tables

See page 19 for Explanation of Tables

TABLE I. PHOTOABSORPTION CROSS SECTION, μ
ATOMIC SCATTERING FACTOR, $f_1 + if_2$

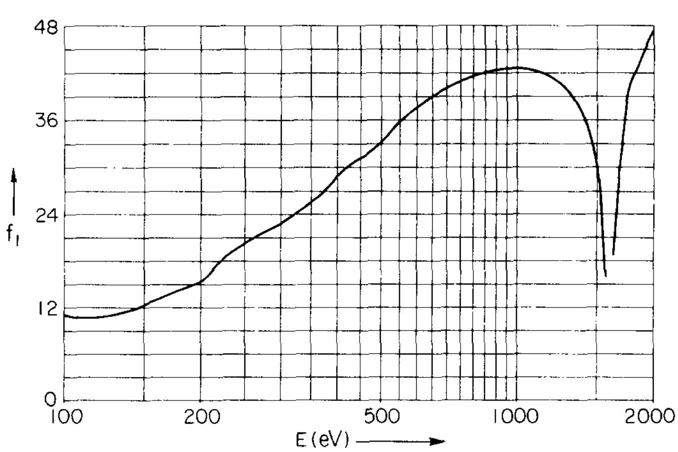
Atomic Weight = 175.0 $Z = 71$

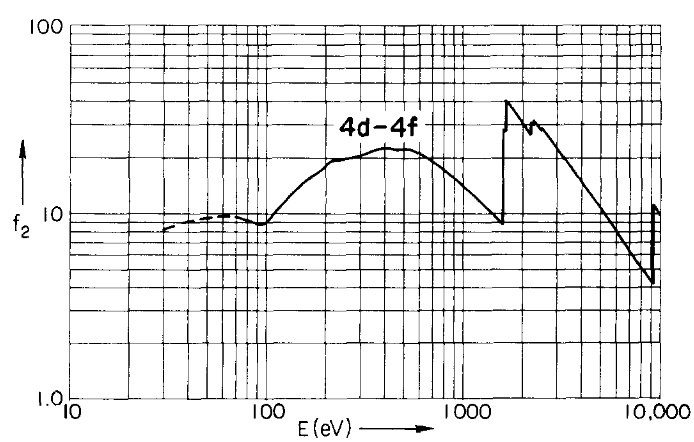
μ(barns/atom) = μ(cm^2/gm) x 290.5 LUTETIUM (Lu)
$E\mu(E)$ = 240.4 f_2 keVcm^2/gm

LINE	E(eV)	μ(cm^2/gm)	f_1	f_2	λ(A)	LINE	E(eV)	μ(cm^2/gm)	f_1	f_2	λ(A)
Na $L_{2,3}M$	30.5	6.50 04		8.24	407.1	Co $L\alpha$	776.2	5.48 03	41.29	17.69	16.0
Mg $L_{2,3}M$	49.3	4.60 04		9.42	251.5	Ni $L\alpha$	851.5	4.62 03	42.06	16.38	14.56
Al $L_{2,3}M$	72.4	3.19 04		9.62	171.4	Cu $L\alpha$	929.7	3.93 03	42.45	15.19	13.33
Si $L_{2,3}M$	91.5	2.32 04		8.82	135.5	Zn $L\alpha$	1011.7	3.35 03	42.56	14.09	12.25
Be K	108.5	2.21 04	10.65	9.96	114.0	Na $K\alpha$	1041.0	3.16 03	42.52	13.69	11.91
Sr $M\zeta$	114.0	2.22 04	10.73	10.54	108.7	Ge $L\alpha$	1188.0	2.41 03	41.49	11.93	10.44
Y $M\zeta$	132.8	2.28 04	11.22	12.58	93.4	Mg $K\alpha$	1253.6	2.16 03	40.59	11.28	9.89
S $L\ell$	148.7	2.32 04	12.15	14.34	83.4	Al $K\alpha$	1486.7	1.53 03	32.68	9.46	8.34
Zr $M\zeta$	151.1	2.32 04	12.39	14.56	82.1	Si $K\alpha$	1740.0	5.20 03	38.61	37.66	7.13
Nb $M\zeta$	171.7	2.23 04	13.64	15.92	72.2	Zr $L\alpha$	2042.4	4.12 03	48.74	34.98	6.07
B $K\alpha$	183.3	2.19 04	14.42	16.69	67.6	Nb $L\alpha$	2165.9	3.55 03		31.99	5.73
Mo $M\zeta$	192.6	2.16 04	14.83	17.26	64.4	Mo $L\alpha$	2293.2	3.29 03		31.37	5.41
W N_5N_7	212.2	2.19 04	16.62	19.34	58.4	Cl $K\alpha$	2622.4	2.49 03		27.18	4.73
C $K\alpha$	277.0	1.74 04	21.56	20.06	44.7	Ag $L\alpha$	2984.3	1.84 03		22.84	4.16
Ag $M\zeta$	311.7	1.61 04	23.30	20.90	39.8	Ca $K\alpha$	3691.7	1.10 03		16.91	3.36
N $K\alpha$	392.4	1.39 04	28.02	22.65	31.6	Ba $L\alpha$	4466.3	6.88 02		12.79	2.78
Ti $L\ell$	395.3	1.38 04	28.26	22.66	31.4	Ti $K\alpha$	4510.8	6.72 02		12.60	2.75
Ti $L\alpha$	452.2	1.17 04	31.14	22.04	27.4	V $K\alpha$	4952.2	5.32 02		10.96	2.50
V $L\alpha$	511.3	1.05 04	33.60	22.35	24.3	Cr $K\alpha$	5414.7	4.25 02		9.58	2.29
O $K\alpha$	524.9	1.03 04	34.40	22.42	23.6	Mn $K\alpha$	5898.8	3.43 02		8.40	2.10
Mn $L\ell$	556.3	9.43 03	36.00	21.82	22.3	Co $K\alpha$	6930.3	2.27 02		6.56	1.79
Cr $L\alpha$	572.8	9.02 03	36.64	21.49	21.6	Ni $K\alpha$	7478.2	1.87 02		5.82	1.66
Mn $L\alpha$	637.4	7.65 03	38.64	20.28	19.5	Cu $K\alpha$	8047.8	1.55 02		5.19	1.54
F $K\alpha$	676.8	6.90 03	39.59	19.41	18.3	Zn $K\alpha$	8638.9	1.29 02		4.63	1.44
Fe $L\alpha$	705.0	6.48 03	40.09	19.01	17.6	Ge $K\alpha$	9886.4	2.43 02		10.01	1.25

ABSORPTION EDGE

L_3 9249.0 eV 1.3405 A M_5** 1591 eV 7.79 A





For 76 eV < E < 100 eV ———— (32-N)
For E < 76 eV ------ (1)

References: 32

XI. Low-Energy X-Ray Interaction Coefficient Tables

See page 19 for Explanation of Tables

TABLE I. PHOTOABSORPTION CROSS SECTION, μ
ATOMIC SCATTERING FACTOR, $f_1 + if_2$

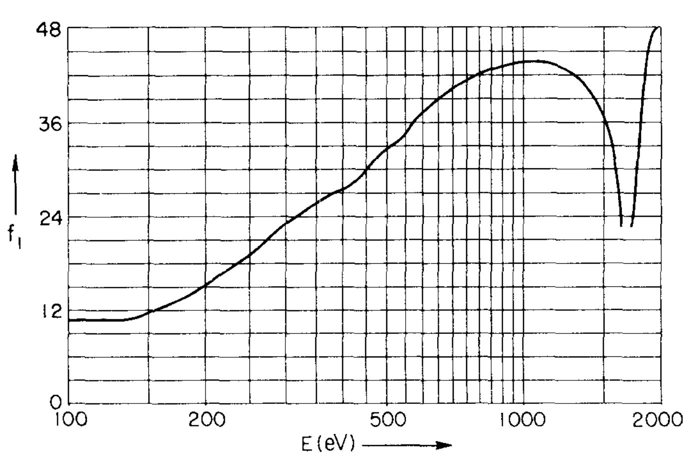
Atomic Weight = 178.5 Z = 72

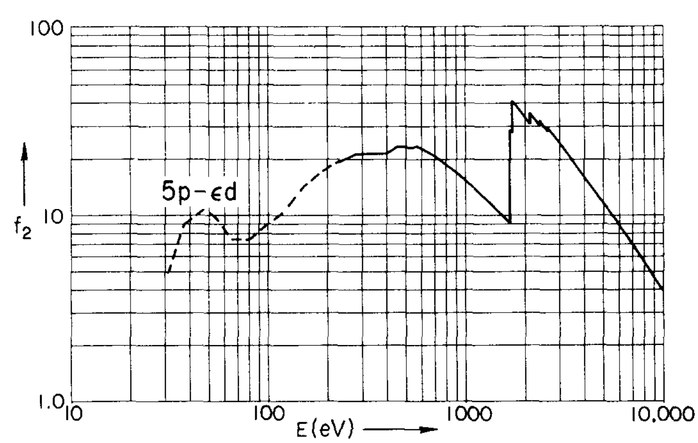
μ(barns/atom) = μ(cm²/gm) x 296.3 HAFNIUM (Hf)
Eμ(E) = 235.6 f_2 keVcm²/gm

LINE	E(eV)	μ(cm²/gm)	f_1	f_2	λ(A)	LINE	E(eV)	μ(cm²/gm)	f_1	f_2	λ(A)
Na $L_{2,3}M$	30.5	3.89 04		5.02	407.1	Co Lα	776.2	5.74 03	41.82	18.90	16.0
Mg $L_{2,3}M$	49.3	4.94 04		10.32	251.5	Ni Lα	851.5	4.86 03	42.74	17.55	14.56
Al $L_{2,3}M$	72.4	2.41 04		7.41	171.4	Cu Lα	929.7	4.14 03	43.36	16.34	13.33
Si $L_{2,3}M$	91.5	2.13 04		8.26	135.5	Zn Lα	1011.7	3.53 03	43.68	15.14	12.25
Be K	108.5	2.08 04	10.65	9.58	114.	Na Kα	1041.0	3.33 03	43.72	14.71	11.91
Sr Mζ	114.0	2.07 04	10.66	10.00	108.7	Ge Lα	1188.0	2.55 03	43.13	12.84	10.44
Y Mζ	132.8	2.12 04	10.65	11.95	93.4	Mg Kα	1253.6	2.29 03	42.49	12.15	9.89
S Lℓ	148.7	2.22 04	11.43	14.01	83.4	Al Kα	1486.7	1.62 03	37.37	10.21	8.34
Zr Mζ	151.1	2.23 04	11.66	14.26	82.1	Si Kα	1740.0	5.44 03	28.47	40.17	7.13
Nb Mζ	171.7	2.18 04	13.07	15.91	72.2	Zr Lα	2042.4	3.70 03	49.28	32.03	6.07
B Kα	183.3	2.16 04	13.87	16.83	67.6	Nb Lα	2165.9	3.72 03		34.16	5.73
Mo Mζ	192.6	2.15 04	14.59	17.55	64.4	Mo Lα	2293.2	3.23 03		31.43	5.41
W N_5N_7	212.2	2.08 04	16.24	18.73	58.4	Cl Kα	2622.4	2.62 03		29.18	4.73
C Kα	277.0	1.80 04	21.29	21.19	44.7	Ag Lα	2984.3	1.91 03		24.21	4.16
Ag Mζ	311.7	1.61 04	23.78	21.29	39.8	Ca Kα	3691.7	1.14 03		17.82	3.36
N Kα	392.4	1.29 04	27.34	21.49	31.6	Ba Lα	4466.3	7.14 02		13.53	2.78
Ti Lℓ	395.3	1.28 04	27.36	21.49	31.4	Ti Kα	4510.8	6.97 02		13.34	2.75
Ti Lα	452.2	1.22 04	30.05	23.31	27.4	V Kα	4952.2	5.54 02		11.64	2.50
V Lα	511.3	1.05 04	33.15	22.69	24.3	Cr Kα	5414.7	4.44 02		10.21	2.29
O Kα	524.9	1.01 04	33.49	22.56	23.6	Mn Kα	5898.8	3.59 02		8.99	2.10
Mn Lℓ	556.3	9.90 03	35.02	23.38	22.3	Co Kα	6930.3	2.39 02		7.04	1.79
Cr Lα	572.8	9.46 03	36.10	22.98	21.6	Ni Kα	7478.2	1.97 02		6.25	1.66
Mn Lα	637.4	8.01 03	38.69	21.65	19.5	Cu Kα	8047.8	1.63 02		5.56	1.54
F Kα	676.8	7.23 03	39.74	20.75	18.3	Zn Kα	8638.9	1.35 02		4.95	1.44
Fe Lα	705.0	6.80 03	40.41	20.33	17.6	Ge Kα	9886.4	2.55 02		10.70	1.25

ABSORPTION EDGE

L_3 9557.7 eV 1.2972 A M_5** 1662 eV 7.46 A





For E < 420 eV ------- (1)

References:

XI. Low-Energy X-Ray Interaction Coefficient Tables

See page 19 for Explanation of Tables

TABLE I. PHOTOABSORPTION CROSS SECTION, μ
ATOMIC SCATTERING FACTOR, $f_1 + if_2$

Atomic Weight = 180.9 Z = 73

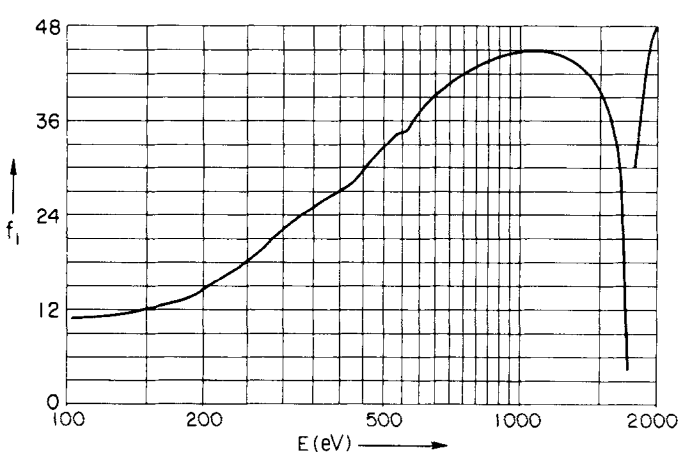
μ(barns/atom) = μ(cm^2/gm) x 300.4 TANTALUM (Ta)
Eμ(E) = 232.4 f_2 keVcm^2/gm

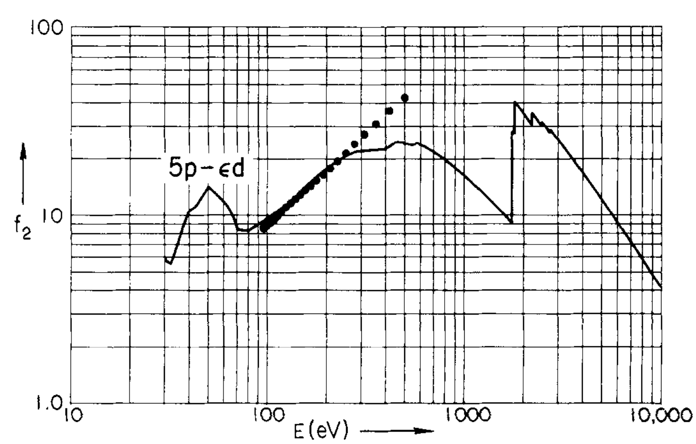
LINE	E(eV)	μ(cm^2/gm)	f_1	f_2	λ(A)
Na $L_{2,3}M$	30.5	4.46 04		5.85	407.1
Mg $L_{2,3}M$	49.3	6.57 04		13.94	251.5
Al $L_{2,3}M$	72.4	2.71 04		8.44	171.4
Si $L_{2,3}M$	91.5	2.34 04		9.22	135.5
Be K	108.5	2.23 04	10.80	10.41	114.
Sr Mζ	114.0	2.21 04	10.92	10.83	108.7
Y Mζ	132.8	2.15 04	11.31	12.31	93.4
S Lℓ	148.7	2.13 04	11.87	13.62	83.4
Zr Mζ	151.1	2.13 04	11.97	13.82	82.1
Nb Mζ	171.7	2.08 04	12.76	15.32	72.2
B Kα	183.3	2.08 04	13.25	16.42	67.6
Mo Mζ	192.6	2.09 04	13.87	17.29	64.4
W N_5N_7	212.2	2.04 04	15.30	18.66	58.4
C Kα	277.0	1.84 04	20.33	21.91	44.7
Ag Mζ	311.7	1.65 04	23.01	22.16	39.8
N Kα	392.4	1.34 04	26.86	22.65	31.6
Ti Lℓ	395.3	1.33 04	26.92	22.67	31.4
Ti Lα	452.2	1.26 04	29.91	24.53	27.4
V Lα	511.3	1.09 04	33.31	23.96	24.3
O Kα	524.9	1.06 04	33.91	23.84	23.6
Mn Lℓ	556.3	9.75 03	34.63	23.33	22.3
Cr Lα	572.8	9.93 03	35.47	24.46	21.6
Mn Lα	637.4	8.40 03	38.87	23.02	19.5
F Kα	676.8	7.59 03	40.09	22.09	18.3
Fe Lα	705.0	7.14 03	40.86	21.66	17.6

LINE	E(eV)	μ(cm^2/gm)	f_1	f_2	λ(A)
Co Lα	776.2	6.05 03	42.44	20.19	16.0
Ni Lα	851.5	5.13 03	43.59	18.78	14.56
Cu Lα	929.7	4.37 03	44.37	17.47	13.33
Zn Lα	1011.7	3.71 03	44.83	16.15	12.25
Na Kα	1041.0	3.51 03	44.91	15.71	11.91
Ge Lα	1188.0	2.69 03	44.60	13.75	10.44
Mg Kα	1253.6	2.42 03	44.17	13.02	9.89
Al Kα	1486.7	1.69 03	40.20	10.79	8.34
Si Kα	1740.0	3.76 03	1.19	28.11	7.13
Zr Lα	2042.4	3.84 03	49.50	33.75	6.07
Nb Lα	2165.9	3.34 03		31.09	5.73
Mo Lα	2293.2	3.38 03		33.34	5.41
Cl Kα	2622.4	2.58 03		29.12	4.73
Ag Lα	2984.3	1.98 03		25.42	4.16
Ca Kα	3691.7	1.19 03		18.88	3.36
Ba Lα	4466.3	7.43 02		14.27	2.78
Ti Kα	4510.8	7.25 02		14.06	2.75
V Kα	4952.2	5.73 02		12.21	2.50
Cr Kα	5414.7	4.58 02		10.66	2.29
Mn Kα	5898.8	3.68 02		9.35	2.10
Co Kα	6930.3	2.44 02		7.28	1.79
Ni Kα	7478.2	2.01 02		6.47	1.66
Cu Kα	8047.8	1.67 02		5.77	1.54
Zn Kα	8638.9	1.39 02		5.16	1.44
Ge Kα	9886.4	2.65 02		11.26	1.25

ABSORPTION EDGE

L_3	9876.6 eV	1.2553 A
M_1	2704 eV	4.585 A
M_2	2470 eV	5.020 A
M_3	2194 eV	5.650 A
M_4	1804 eV	6.87 A
M_5	1743 eV	7.11 A





For E < 220 eV ——— (40) x .76
• (45)

References: 35, 40, 45, 114

XI. Low-Energy X-Ray Interaction Coefficient Tables

See page 19 for Explanation of Tables

TABLE I. PHOTOABSORPTION CROSS SECTION, μ
ATOMIC SCATTERING FACTOR, $f_1 + if_2$

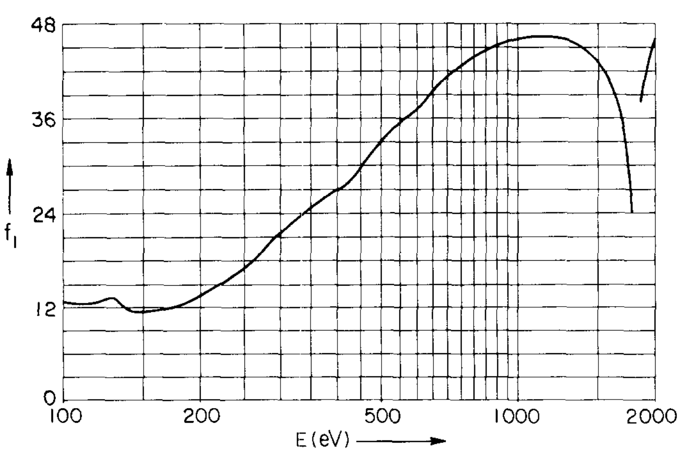
Atomic Weight = 183.9 Z = 74

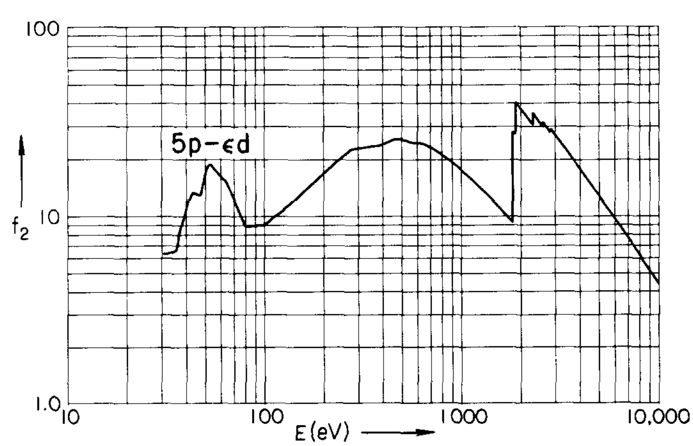
μ(barns/atom) = μ(cm^2/gm) x 305.2 TUNGSTEN (W)
Eμ(E) = 228.8 f_2 keVcm^2/gm

LINE	E(eV)	μ(cm^2/gm)	f_1	f_2	λ(A)	LINE	E(eV)	μ(cm^2/gm)	f_1	f_2	λ(A)
Na $L_{2,3}M$	30.5	4.74 04		6.30	407.1	Co Lα	776.2	6.34 03	43.35	21.49	16.0
Mg $L_{2,3}M$	49.3	7.64 04		16.46	251.5	Ni Lα	851.5	5.36 03	44.67	19.94	14.56
Al $L_{2,3}M$	72.4	3.48 04		11.00	171.4	Cu Lα	929.7	4.56 03	45.58	18.51	13.33
Si $L_{2,3}M$	91.5	2.24 04		8.96	135.5	Zn Lα	1011.7	3.88 03	46.17	17.17	12.25
Be K	108.5	2.04 04	12.28	9.65	114.	Na Kα	1041.0	3.67 03	46.30	16.71	11.91
Sr Mζ	114.0	2.01 04	12.30	10.03	108.7	Ge Lα	1188.0	2.82 03	46.31	14.66	10.44
Y Mζ	132.8	1.93 04	12.63	11.17	93.4	Mg Kα	1253.6	2.54 03	46.05	13.90	9.89
S Lℓ	148.7	1.83 04	11.23	11.92	83.4	Al Kα	1486.7	1.78 03	43.25	11.54	8.34
Zr Mζ	151.1	1.85 04	11.29	12.23	82.1	Si Kα	1740.0	1.27 03	30.73	9.66	7.13
Nb Mζ	171.7	1.93 04	11.80	14.47	72.2	Zr Lα	2042.4	3.99 03	48.06	35.64	6.07
B Kα	183.3	1.97 04	12.19	15.75	67.6	Nb Lα	2165.9	3.47 03		32.86	5.73
Mo Mζ	192.6	2.00 04	12.83	16.83	64.4	Mo Lα	2293.2	3.53 03		35.36	5.41
W N_5N_7	212.2	1.99 04	14.25	18.44	58.4	Cl Kα	2622.4	2.69 03		30.79	4.73
C Kα	277.0	1.88 04	19.36	22.70	44.7	Ag Lα	2984.3	2.06 03		26.82	4.16
Ag Mζ	311.7	1.69 04	22.33	23.07	39.8	Ca Kα	3691.7	1.23 03		19.90	3.36
N Kα	392.4	1.39 04	26.60	23.80	31.6	Ba Lα	4466.3	7.71 02		15.05	2.78
Ti Lℓ	395.3	1.38 04	26.67	23.82	31.4	Ti Kα	4510.8	7.52 02		14.83	2.75
Ti Lα	452.2	1.30 04	29.88	25.73	27.4	V Kα	4952.2	5.95 02		12.89	2.50
V Lα	511.3	1.13 04	33.60	25.30	24.3	Cr Kα	5414.7	4.75 02		11.25	2.29
O Kα	524.9	1.10 04	34.36	25.21	23.6	Mn Kα	5898.8	3.83 02		9.87	2.10
Mn Lℓ	556.3	1.02 04	35.80	24.68	22.3	Co Kα	6930.3	2.54 02		7.69	1.79
Cr Lα	572.8	9.74 03	36.31	24.37	21.6	Ni Kα	7478.2	2.09 02		6.82	1.66
Mn Lα	637.4	8.78 03	38.93	24.45	19.5	Cu Kα	8047.8	1.73 02		6.07	1.54
F Kα	676.8	7.93 03	40.59	23.45	18.3	Zn Kα	8638.9	1.44 02		5.43	1.44
Fe Lα	705.0	7.46 03	41.47	22.99	17.6	Ge Kα	9886.4	1.01 02		4.37	1.25

ABSORPTION EDGE

M_1	2813	eV	4.407	A
M_2	2575	eV	4.815	A
M_3	2281.1	eV	5.435	A
M_4	1880	eV	6.59	A
M_5	1814	eV	6.83	A





For E < 126 eV ———— (40)

References: 40, 114

XI. Low-Energy X-Ray Interaction Coefficient Tables

See page 19 for Explanation of Tables

TABLE I. PHOTOABSORPTION CROSS SECTION, μ
ATOMIC SCATTERING FACTOR, $f_1 + if_2$

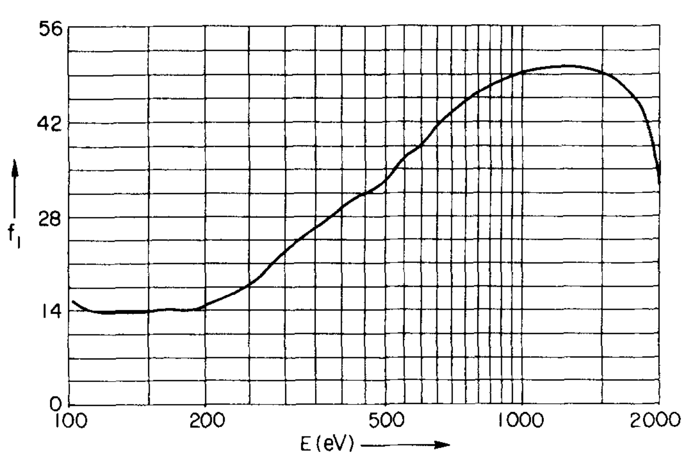
Atomic Weight = 186.2 Z = 75

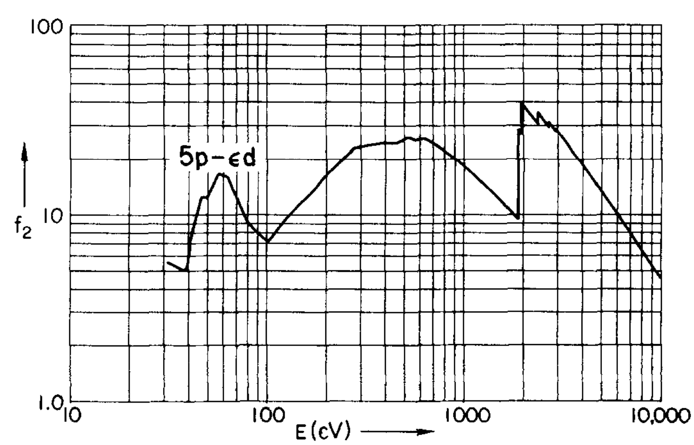
μ(barns/atom) = μ(cm²/gm) x 309.1 RHENIUM (Re)
Eμ(E) = 225.9 f_2 keVcm²/gm

LINE	E(eV)	μ(cm²/gm)	f_1	f_2	λ(A)	LINE	E(eV)	μ(cm²/gm)	f_1	f_2	λ(A)
Na $L_{2,3}M$	30.5	4.28 04		5.77	407.1	Co Lα	776.2	6.57 03	45.72	22.55	16.0
Mg $L_{2,3}M$	49.3	5.79 04		12.64	251.5	Ni Lα	851.5	5.57 03	47.28	20.99	14.56
Al $L_{2,3}M$	72.4	3.68 04		11.79	171.4	Cu Lα	929.7	4.75 03	48.43	19.55	13.33
Si $L_{2,3}M$	91.5	1.96 04		7.94	135.5	Zn Lα	1011.7	4.06 03	49.32	18.18	12.25
Be K	108.5	1.60 04	14.11	7.67	114.	Na Kα	1041.0	3.84 03	49.57	17.68	11.91
Sr Mζ	114.0	1.63 04	13.73	8.25	108.7	Ge Lα	1188.0	2.95 03	50.18	15.53	10.44
Y Mζ	132.8	1.72 04	13.43	10.13	93.4	Mg Kα	1253.6	2.65 03	50.25	14.73	9.89
S Lℓ	148.7	1.75 04	13.53	11.50	83.4	Al Kα	1486.7	1.86 03	49.34	12.24	8.34
Zr Mζ	151.1	1.75 04	13.55	11.70	82.1	Si Kα	1740.0	1.34 03	46.13	10.30	7.13
Nb Mζ	171.7	1.73 04	13.72	13.17	72.2	Zr Lα	2042.4	4.11 03	28.57	37.15	6.07
B Kα	183.3	1.80 04	13.64	14.59	67.6	Nb Lα	2165.9	3.58 03		34.35	5.73
Mo Mζ	192.6	1.86 04	14.07	15.83	64.4	Mo Lα	2293.2	3.14 03		31.82	5.41
W N_5N_7	212.2	1.88 04	15.30	17.64	58.4	Cl Kα	2622.4	2.63 03		30.47	4.73
C Kα	277.0	1.87 04	20.29	22.94	44.7	Ag Lα	2984.3	2.14 03		28.20	4.16
Ag Mζ	311.7	1.70 04	23.53	23.46	39.8	Ca Kα	3691.7	1.28 03		20.96	3.36
N Kα	392.4	1.41 04	28.73	24.52	31.6	Ba Lα	4466.3	8.02 02		15.85	2.78
Ti Lℓ	395.3	1.40 04	28.94	24.55	31.4	Ti Kα	4510.8	7.82 02		15.62	2.75
Ti Lα	452.2	1.21 04	31.40	24.30	27.4	V Kα	4952.2	6.19 02		13.57	2.50
V Lα	511.3	1.14 04	33.97	25.88	24.3	Cr Kα	5414.7	4.94 02		11.85	2.29
O Kα	524.9	1.13 04	35.02	26.23	23.6	Mn Kα	5898.8	3.98 02		10.39	2.10
Mn Lℓ	556.3	1.04 04	36.97	25.71	22.3	Co Kα	6930.3	2.64 02		8.10	1.79
Cr Lα	572.8	1.00 04	37.59	25.38	21.6	Ni Kα	7478.2	2.17 02		7.19	1.66
Mn Lα	637.4	9.16 03	40.68	25.83	19.5	Cu Kα	8047.8	1.80 02		6.40	1.54
F Kα	676.8	8.23 03	42.65	24.65	18.3	Zn Kα	8638.9	1.50 02		5.73	1.44
Fe Lα	705.0	7.72 03	43.65	24.10	17.6	Ge Kα	9886.4	1.06 02		4.62	1.25

ABSORPTION EDGE

M_1	2927 eV	4.236 A
M_2	2684 eV	4.620 A
M_3	2369 eV	5.234 A
M_4	1958 eV	6.33 A
M_5	1890 eV	6.560 A





For E < 160 eV ———— (40)

References: 40

XI. Low-Energy X-Ray Interaction Coefficient Tables

See page 19 for Explanation of Tables

TABLE I. PHOTOABSORPTION CROSS SECTION, μ
ATOMIC SCATTERING FACTOR, $f_1 + if_2$

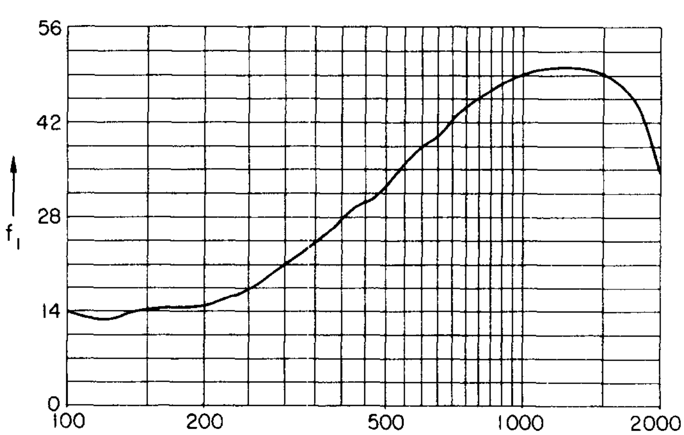
Atomic Weight = 190.2 Z = 76

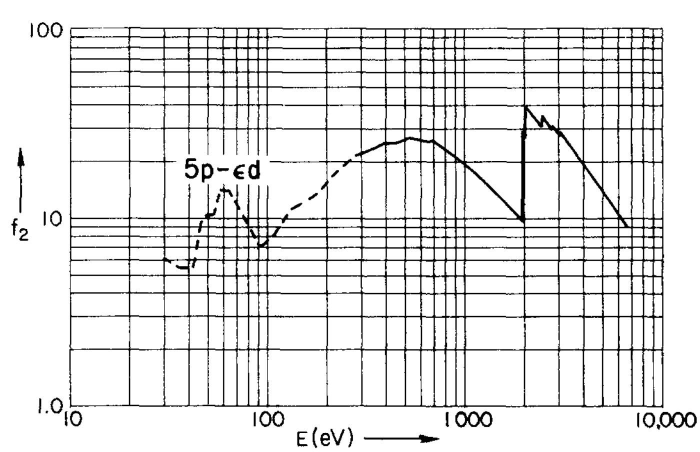
μ(barns/atom) = μ(cm^2/gm) x 315.8 OSMIUM (Os)
$E\mu(E)$ = 221.1 f_2 keVcm^2/gm

LINE	E(eV)	μ(cm^2/gm)	f_1	f_2	λ(A)
Na $L_{2,3}M$	30.5	4.43 04		6.10	407.1
Mg $L_{2,3}M$	49.3	4.63 04		10.32	251.5
Al $L_{2,3}M$	72.4	3.36 04		11.01	171.4
Si $L_{2,3}M$	91.5	1.69 04		6.97	135.5
Be K	108.5	1.67 04	13.20	8.20	114.
Sr Mζ	114.0	1.71 04	12.74	8.82	108.7
Y Mζ	132.8	1.87 04	13.42	11.21	93.4
S Lℓ	148.7	1.78 04	14.10	11.97	83.4
Zr Mζ	151.1	1.77 04	14.19	12.08	82.1
Nb Mζ	171.7	1.67 04	14.52	13.00	72.2
B Kα	183.3	1.68 04	14.46	13.91	67.6
Mo Mζ	192.6	1.69 04	14.57	14.71	64.4
W N_5N_7	212.2	1.73 04	15.21	16.62	58.4
C Kα	277.0	1.71 04	19.26	21.37	44.7
Ag Mζ	311.7	1.60 04	21.81	22.55	39.8
N Kα	392.4	1.41 04	27.07	25.07	31.6
Ti Lℓ	395.3	1.41 04	27.35	25.11	31.4
Ti Lα	452.2	1.22 04	30.24	24.88	27.4
V Lα	511.3	1.15 04	32.99	26.52	24.3
O Kα	524.9	1.13 04	34.04	26.89	23.6
Mn Lℓ	556.3	1.06 04	36.19	26.54	22.3
Cr Lα	572.8	1.02 04	37.02	26.31	21.6
Mn Lα	637.4	8.79 03	39.43	25.32	19.5
F Kα	676.8	8.44 03	41.10	25.82	18.3
Fe Lα	705.0	7.92 03	42.59	25.23	17.6
Co Lα	776.2	6.76 03	45.01	23.71	16.0
Ni Lα	851.5	5.76 03	46.82	22.16	14.56
Cu Lα	929.7	4.92 03	48.18	20.68	13.33
Zn Lα	1011.7	4.19 03	49.20	19.18	12.25
Na Kα	1041.0	3.97 03	49.48	18.67	11.91
Ge Lα	1188.0	3.05 03	50.15	16.38	10.44
Mg Kα	1253.6	2.74 03	50.22	15.54	9.89
Al Kα	1486.7	1.94 03	49.27	13.01	8.34
Si Kα	1740.0	1.40 03	45.67	11.00	7.13
Zr Lα	2042.4	4.22 03	24.87	38.98	6.07
Nb Lα	2165.9	3.68 03		36.05	5.73
Mo Lα	2293.2	3.22 03		33.41	5.41
Cl Kα	2622.4	2.71 03		32.18	4.73
Ag Lα	2984.3	2.10 03		28.40	4.16
Ca Kα	3691.7	1.32 03		22.03	3.36
Ba Lα	4466.3	8.26 02		16.69	2.78
Ti Kα	4510.8	8.06 02		16.44	2.75
V Kα	4952.2	6.39 02		14.30	2.50
Cr Kα	5414.7	5.10 02		12.50	2.29
Mn Kα	5898.8	4.11 02		10.96	2.10
Co Kα	6930.3	2.73 02		8.55	1.79
Ni Kα	7478.2	2.25 02		7.59	1.66
Cu Kα	8047.8	1.86 02		6.77	1.54
Zn Kα	8638.9	1.55 02		6.05	1.44
Ge Kα	9886.4	1.09 02		4.88	1.25

ABSORPTION EDGE

M_1	3045 eV	4.071 A
M_2	2797 eV	4.433 A
M_3	2458 eV	5.043 A
M_4	2042 eV	6.073 A
M_5	1967 eV	6.30 A





For E < 300 eV - - - - - - - (1)

References:

XI. Low-Energy X-Ray Interaction Coefficient Tables

See page 19 for Explanation of Tables

TABLE I. PHOTOABSORPTION CROSS SECTION, μ
ATOMIC SCATTERING FACTOR, $f_1 + if_2$

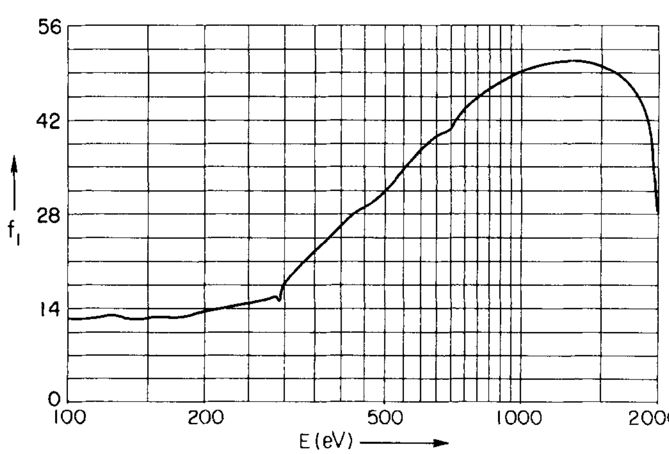
Atomic Weight = 192.2 Z = 77

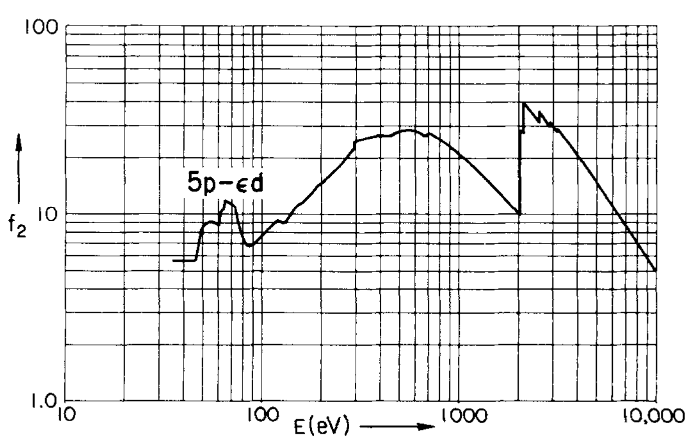
μ(barns/atom) = μ(cm²/gm) x 319.1 IRIDIUM (Ir)
Eμ(E) = 218.8 f_2 keVcm²/gm

LINE	E(eV)	μ(cm²/gm)	f_1	f_2	λ(A)	LINE	E(eV)	μ(cm²/gm)	f_1	f_2	λ(A)
Na $L_{2,3}M$	30.5	4.09 04		5.69	407.1	Co Lα	776.2	7.16 03	44.67	25.40	16.0
Mg $L_{2,3}M$	49.3	3.69 04		8.30	251.5	Ni Lα	851.5	6.11 03	46.73	23.77	14.56
Al $L_{2,3}M$	72.4	3.27 04		10.83	171.4	Cu Lα	929.7	5.23 03	48.30	22.22	13.33
Si $L_{2,3}M$	91.5	1.67 04		7.00	135.5	Zn Lα	1011.7	4.46 03	49.49	20.63	12.25
Be K	108.5	1.71 04	12.49	8.48	114.	Na Kα	1041.0	4.22 03	49.85	20.07	11.91
Sr Mζ	114.0	1.70 04	12.63	8.87	108.7	Ge Lα	1188.0	3.24 03	50.71	17.61	10.44
Y Mζ	132.8	1.53 04	12.52	9.26	93.4	Mg Kα	1253.6	2.92 03	50.84	16.70	9.89
S Lℓ	148.7	1.62 04	12.56	10.98	83.4	Al Kα	1486.7	2.06 03	50.17	13.97	8.34
Zr Mζ	151.1	1.62 04	12.65	11.16	82.1	Si Kα	1740.0	1.48 03	47.09	11.79	7.13
Nb Mζ	171.7	1.58 04	12.77	12.39	72.2	Zr Lα	2042.4	3.00 03	16.32	28.04	6.07
B Kα	183.3	1.61 04	12.88	13.52	67.6	Nb Lα	2165.9	3.87 03		38.34	5.73
Mo Mζ	192.6	1.63 04	13.51	14.36	64.4	Mo Lα	2293.2	3.38 03		35.46	5.41
W N_5N_7	212.2	1.60 04	13.88	15.50	58.4	Cl Kα	2622.4	2.85 03		34.20	4.73
C Kα	277.0	1.64 04	15.61	20.81	44.7	Ag Lα	2984.3	2.21 03		30.17	4.16
Ag Mζ	311.7	1.73 04	19.26	24.64	39.8	Ca Kα	3691.7	1.39 03		23.40	3.36
N Kα	392.4	1.47 04	25.82	26.32	31.6	Ba Lα	4466.3	8.71 02		17.78	2.78
Ti Lℓ	395.3	1.46 04	26.07	26.37	31.4	Ti Kα	4510.8	8.50 02		17.52	2.75
Ti Lα	452.2	1.27 04	29.20	26.32	27.4	V Kα	4952.2	6.73 02		15.23	2.50
V Lα	511.3	1.19 04	32.07	27.74	24.3	Cr Kα	5414.7	5.38 02		13.30	2.29
O Kα	524.9	1.17 04	33.03	28.06	23.6	Mn Kα	5898.8	4.32 02		11.65	2.10
Mn Lℓ	556.3	1.10 04	35.13	27.96	22.3	Co Kα	6930.3	2.86 02		9.07	1.79
Cr Lα	572.8	1.07 04	36.13	27.87	21.6	Ni Kα	7478.2	2.35 02		8.05	1.66
Mn Lα	637.4	9.27 03	39.31	27.00	19.5	Cu Kα	8047.8	1.95 02		7.17	1.54
F Kα	676.8	8.43 03	40.25	26.08	18.3	Zn Kα	8638.9	1.62 02		6.41	1.44
Fe Lα	705.0	8.40 03	41.37	27.06	17.6	Ge Kα	9886.4	1.15 02		5.18	1.25

ABSORPTION EDGE

M_1	3167	eV	3.915	A
M_2	2910	eV	4.260	A
M_3	2550.5	eV	4.861	A
M_4	2126	eV	5.83	A
M_5	2048	eV	6.05	A





For E < 260 eV ———— (91) x 0.729

References: 91

XI. Low-Energy X-Ray Interaction Coefficient Tables

See page 19 for Explanation of Tables

TABLE I. PHOTOABSORPTION CROSS SECTION, μ
ATOMIC SCATTERING FACTOR, $f_1 + if_2$

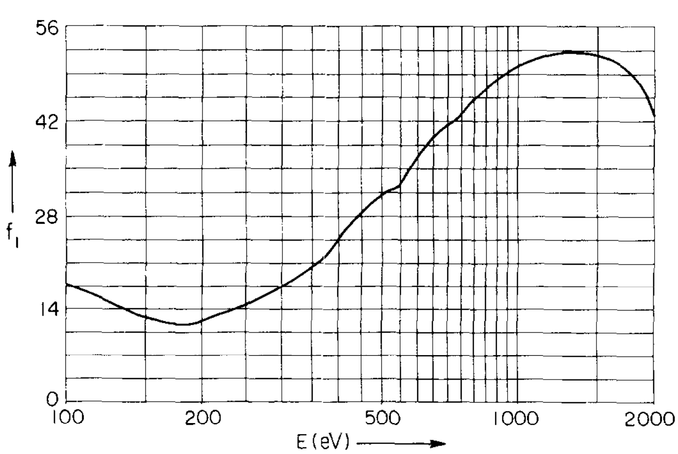
Atomic Weight = 195.1 Z = 78

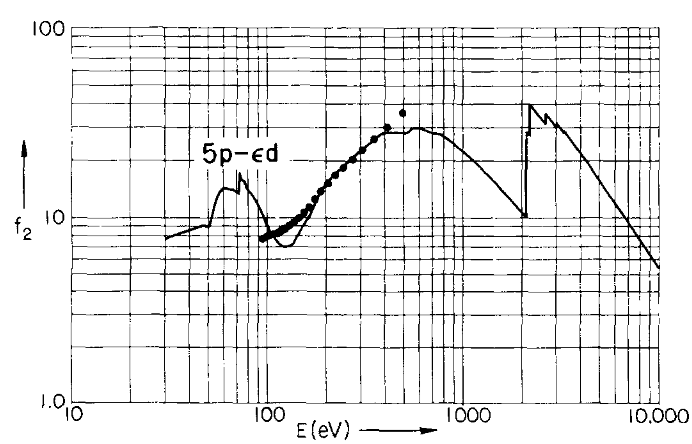
μ(barns/atom) = μ(cm^2/gm) x 323.9 PLATINUM (Pt)
Eμ(E) = 215.6 f_2 keVcm^2/gm

LINE	E(eV)	μ(cm^2/gm)	f_1	f_2	λ(A)	LINE	E(eV)	μ(cm^2/gm)	f_1	f_2	λ(A)
Na $L_{2,3}M$	30.5	5.49 04		7.75	407.1	Co Lα	776.2	7.59 03	44.27	27.33	16.0
Mg $L_{2,3}M$	49.3	3.94 04		9.00	251.5	Ni Lα	851.5	6.45 03	47.03	25.48	14.56
Al $L_{2,3}M$	72.4	5.17 04		17.37	171.4	Cu Lα	929.7	5.51 03	48.84	23.76	13.33
Si $L_{2,3}M$	91.5	2.68 04		11.37	135.5	Zn Lα	1011.7	4.71 03	50.21	22.07	12.25
Be K	108.5	1.54 04	16.86	7.75	114.	Na Kα	1041.0	4.45 03	50.61	21.48	11.91
Sr Mζ	114.0	1.38 04	16.28	7.29	108.7	Ge Lα	1188.0	3.42 03	51.74	18.86	10.44
Y Mζ	132.8	1.17 04	14.09	7.21	93.4	Mg Kα	1253.6	3.08 03	51.97	17.89	9.89
S Lℓ	148.7	1.23 04	12.67	8.46	83.4	Al Kα	1486.7	2.17 03	51.72	14.99	8.34
Zr Mζ	151.1	1.24 04	12.53	8.68	82.1	Si Kα	1740.0	1.57 03	49.50	12.64	7.13
Nb Mζ	171.7	1.38 04	11.59	10.98	72.2	Zr Lα	2042.4	1.11 03	39.35	10.51	6.07
B Kα	183.3	1.47 04	11.52	12.48	67.6	Nb Lα	2165.9	2.74 03		27.50	5.73
Mo Mζ	192.6	1.54 04	11.65	13.76	64.4	Mo Lα	2293.2	3.54 03		37.60	5.41
W N_5N_7	212.2	1.60 04	12.73	15.79	58.4	Cl Kα	2622.4	2.57 03		31.24	4.73
C Kα	277.0	1.61 04	16.11	20.62	44.7	Ag Lα	2984.3	2.17 03		30.08	4.16
Ag Mζ	311.7	1.58 04	17.92	22.78	39.8	Ca Kα	3691.7	1.45 03		24.75	3.36
N Kα	392.4	1.52 04	23.90	27.68	31.6	Ba Lα	4466.3	9.07 02		18.78	2.78
Ti Lℓ	395.3	1.51 04	24.22	27.75	31.4	Ti Kα	4510.8	8.85 02		18.50	2.75
Ti Lα	452.2	1.33 04	28.68	27.93	27.4	V Kα	4952.2	7.01 02		16.10	2.50
V Lα	511.3	1.17 04	31.58	27.66	24.3	Cr Kα	5414.7	5.60 02		14.06	2.29
O Kα	524.9	1.13 04	31.68	27.60	23.6	Mn Kα	5898.8	4.51 02		12.34	2.10
Mn Lℓ	556.3	1.15 04	33.30	29.59	22.3	Co Kα	6930.3	2.99 02		9.62	1.79
Cr Lα	572.8	1.12 04	34.89	29.62	21.6	Ni Kα	7478.2	2.46 02		8.55	1.66
Mn Lα	637.4	9.77 03	38.91	28.89	19.5	Cu Kα	8047.8	2.04 02		7.62	1.54
F Kα	676.8	8.89 03	40.68	27.91	18.3	Zn Kα	8638.9	1.70 02		6.82	1.44
Fe Lα	705.0	8.40 03	41.53	27.47	17.6	Ge Kα	9886.4	1.20 02		5.51	1.25

ABSORPTION EDGE

M_1	3296	eV	3.762	A
M_2	3029	eV	4.093	A
M_3	2645.9	eV	4.686	A
M_4	2217	eV	5.59	A
M_5	2133	eV	5.81	A





For E < 100 eV ——— (40)
• (45)

References: 35, 40, 45

XI. Low-Energy X-Ray Interaction Coefficient Tables

See page 19 for Explanation of Tables

TABLE I. PHOTOABSORPTION CROSS SECTION, μ
ATOMIC SCATTERING FACTOR, $f_1 + if_2$

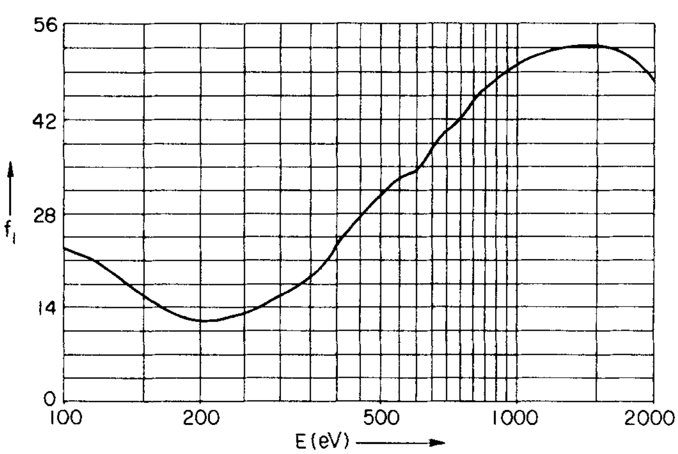
Atomic Weight = 197.0 Z = 79

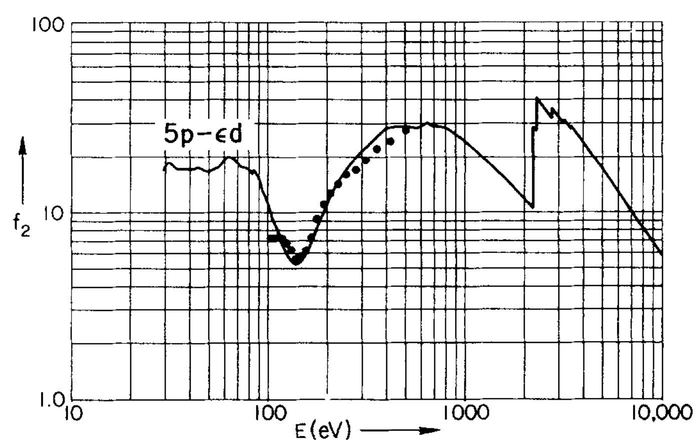
μ(barns/atom) = μ(cm^2/gm) x 327.0 GOLD (Au)
$E\mu(E)$ = 213.5 f_2 keVcm^2/gm

LINE	E(eV)	μ(cm^2/gm)	f_1	f_2	λ(A)
Na $L_{2,3}M$	30.5	1.28 05		18.23	407.1
Mg $L_{2,3}M$	49.3	7.25 04		16.74	251.5
Al $L_{2,3}M$	72.4	5.24 04		17.77	171.4
Si $L_{2,3}M$	91.5	3.34 04		14.31	135.5
Be K	108.5	1.71 04	21.77	8.66	114.
Sr Mζ	114.0	1.40 04	21.33	7.48	108.7
Y Mζ	132.8	8.67 03	18.23	5.39	93.4
S Lℓ	148.7	7.98 03	15.74	5.55	83.4
Zr Mζ	151.1	8.02 03	15.38	5.68	82.1
Nb Mζ	171.7	9.37 03	13.07	7.53	72.2
B Kα	183.3	1.04 04	12.26	8.97	67.6
Mo Mζ	192.6	1.13 04	11.84	10.22	64.4
W N_5N_7	212.2	1.30 04	11.67	12.92	58.4
C Kα	277.0	1.52 04	14.20	19.73	44.7
Ag Mζ	311.7	1.53 04	16.21	22.31	39.8
N Kα	392.4	1.54 04	22.36	28.37	31.6
Ti Lℓ	395.3	1.54 04	22.75	28.47	31.4
Ti Lα	452.2	1.37 04	27.75	28.99	27.4
V Lα	511.3	1.21 04	31.50	28.92	24.3
O Kα	524.9	1.18 04	32.32	28.90	23.6
Mn Lℓ	556.3	1.09 04	33.76	28.47	22.3
Cr Lα	572.8	1.05 04	34.05	28.21	21.6
Mn Lα	637.4	1.02 04	37.23	30.41	19.5
F Kα	676.8	9.29 03	39.80	29.44	18.3
Fe Lα	705.0	8.79 03	40.87	29.01	17.6
Co Lα	776.2	7.95 03	44.05	28.91	16.0
Ni Lα	851.5	6.76 03	47.10	26.96	14.56
Cu Lα	929.7	5.79 03	49.12	25.22	13.33
Zn Lα	1011.7	4.97 03	50.71	23.53	12.25
Na Kα	1041.0	4.70 03	51.22	22.90	11.91
Ge Lα	1188.0	3.62 03	52.65	20.13	10.44
Mg Kα	1253.6	3.25 03	52.98	19.09	9.89
Al Kα	1486.7	2.31 03	53.14	16.04	8.34
Si Kα	1740.0	1.66 03	51.60	13.55	7.13
Zr Lα	2042.4	1.18 03	45.33	11.29	6.07
Nb Lα	2165.9	1.04 03		10.52	5.73
Mo Lα	2293.2	3.68 03		39.50	5.41
Cl Kα	2622.4	2.68 03		32.93	4.73
Ag Lα	2984.3	2.27 03		31.78	4.16
Ca Kα	3691.7	1.51 03		26.16	3.36
Ba Lα	4466.3	9.53 02		19.93	2.78
Ti Kα	4510.8	9.30 02		19.64	2.75
V Kα	4952.2	7.37 02		17.09	2.50
Cr Kα	5414.7	5.89 02		14.93	2.29
Mn Kα	5898.8	4.74 02		13.09	2.10
Co Kα	6930.3	3.14 02		10.19	1.79
Ni Kα	7478.2	2.58 02		9.05	1.66
Cu Kα	8047.8	2.14 02		8.07	1.54
Zn Kα	8638.9	1.78 02		7.22	1.44
Ge Kα	9886.4	1.26 02		5.84	1.25

ABSORPTION EDGE

M_1	3428	eV	3.616	A
M_2	3150	eV	3.936	A
M_3	2743.9	eV	4.518	A
M_4	2307	eV	5.374	A
M_5	2220	eV	5.584	A





For E < 277 eV ——— (82)
• (45)

References: 9, 14, 25, 30, 34, 40, 45, 82, 92, 114

XI. Low-Energy X-Ray Interaction Coefficient Tables

See page 19 for Explanation of Tables

TABLE I. PHOTOABSORPTION CROSS SECTION, μ
ATOMIC SCATTERING FACTOR, $f_1 + if_2$

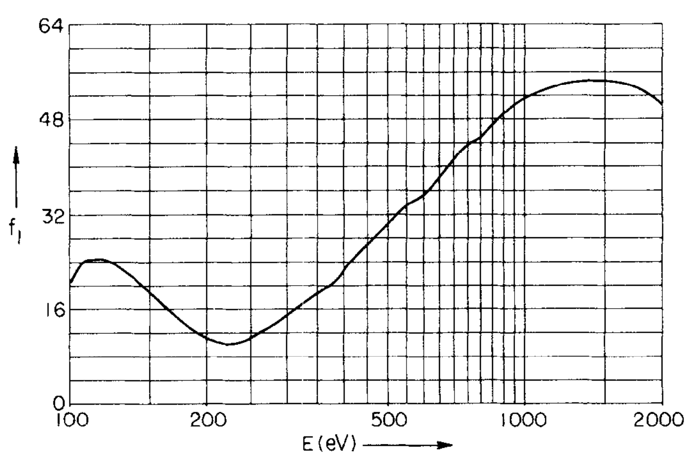
Atomic Weight = 200.6 Z = 80

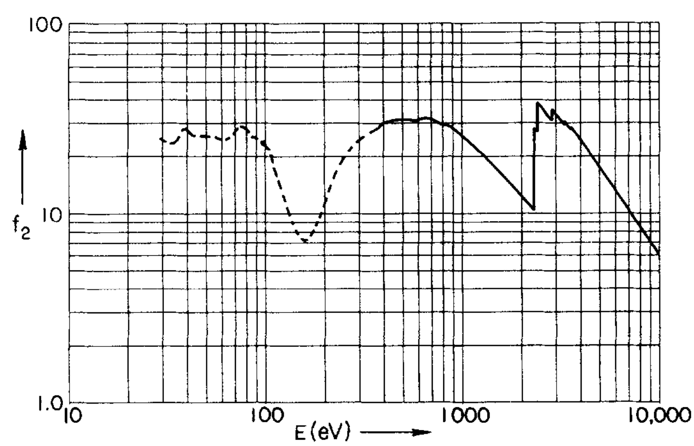
μ(barns/atom) = μ(cm^2/gm) x 333.0 MERCURY (Hg)
Eμ(E) = 209.7 f_2 keVcm^2/gm

LINE	E(eV)	μ(cm^2/gm)	f_1	f_2	λ(A)	LINE	E(eV)	μ(cm^2/gm)	f_1	f_2	λ(A)
Na $L_{2,3}M$	30.5	1.65 05		23.93	407.1	Co Lα	776.2	7.94 03	44.42	29.39	16.0
Mg $L_{2,3}M$	49.3	1.07 05		25.21	251.5	Ni Lα	851.5	7.19 03	47.15	29.19	14.56
Al $L_{2,3}M$	72.4	8.06 04		27.83	171.4	Cu Lα	929.7	6.12 03	49.93	27.11	13.33
Si $L_{2,3}M$	91.5	5.68 04		24.77	135.5	Zn Lα	1011.7	5.23 03	51.79	25.24	12.25
Be K	108.5	3.63 04	24.45	18.78	114.	Na Kα	1041.0	4.94 03	52.38	24.54	11.91
Sr Mζ	114.0	3.03 04	24.41	16.49	108.7	Ge Lα	1188.0	3.79 03	54.05	21.48	10.44
Y Mζ	132.8	1.58 04	22.65	10.02	93.4	Mg Kα	1253.6	3.40 03	54.39	20.33	9.89
S Lℓ	148.7	1.06 04	19.15	7.52	83.4	Al Kα	1486.7	2.42 03	54.82	17.12	8.34
Zr Mζ	151.1	1.03 04	18.65	7.42	82.1	Si Kα	1740.0	1.74 03	53.82	14.44	7.13
Nb Mζ	171.7	9.40 03	14.55	7.70	72.2	Zr Lα	2042.4	1.23 03	49.51	11.99	6.07
B Kα	183.3	1.01 04	12.75	8.81	67.6	Nb Lα	2165.9	1.08 03		11.17	5.73
Mo Mζ	192.6	1.09 04	11.64	10.01	64.4	Mo Lα	2293.2	9.51 02		10.40	5.41
W N_5N_7	212.2	1.30 04	10.24	13.12	58.4	Cl Kα	2622.4	2.75 03		34.35	4.73
C Kα	277.0	1.68 04	13.13	22.21	44.7	Ag Lα	2984.3	2.35 03		33.45	4.16
Ag Mζ	311.7	1.67 04	15.98	24.81	39.8	Ca Kα	3691.7	1.56 03		27.45	3.36
N Kα	392.4	1.59 04	21.65	29.77	31.6	Ba Lα	4466.3	9.85 02		20.98	2.78
Ti Lℓ	395.3	1.59 04	22.08	29.88	31.4	Ti Kα	4510.8	9.61 02		20.68	2.75
Ti Lα	452.2	1.43 04	27.09	30.86	27.4	V Kα	4952.2	7.62 02		18.00	2.50
V Lα	511.3	1.28 04	31.18	31.09	24.3	Cr Kα	5414.7	6.09 02		15.73	2.29
O Kα	524.9	1.24 04	32.13	31.14	23.6	Mn Kα	5898.8	4.90 02		13.80	2.10
Mn Lℓ	556.3	1.16 04	33.83	30.67	22.3	Co Kα	6930.3	3.25 02		10.74	1.79
Cr Lα	572.8	1.11 04	34.34	30.40	21.6	Ni Kα	7478.2	2.67 02		9.53	1.66
Mn Lα	637.4	1.05 04	37.45	31.77	19.5	Cu Kα	8047.8	2.21 02		8.49	1.54
F Kα	676.8	9.77 03	39.91	31.52	18.3	Zn Kα	8638.9	1.84 02		7.59	1.44
Fe Lα	705.0	9.29 03	41.60	31.24	17.6	Ge Kα	9886.4	1.30 02		6.14	1.25

ABSORPTION EDGE

M_1	3565	eV	3.478	A
M_2	3277	eV	3.783	A
M_3	2846.9	eV	4.355	A
M_4	2404	eV	5.157	A
M_5	2313	eV	5.36	A





For E < 350 eV ------- (1)

References: 68, 73, 138

XI. Low-Energy X-Ray Interaction Coefficient Tables

See page 19 for Explanation of Tables

TABLE I. PHOTOABSORPTION CROSS SECTION, μ
ATOMIC SCATTERING FACTOR, $f_1 + if_2$

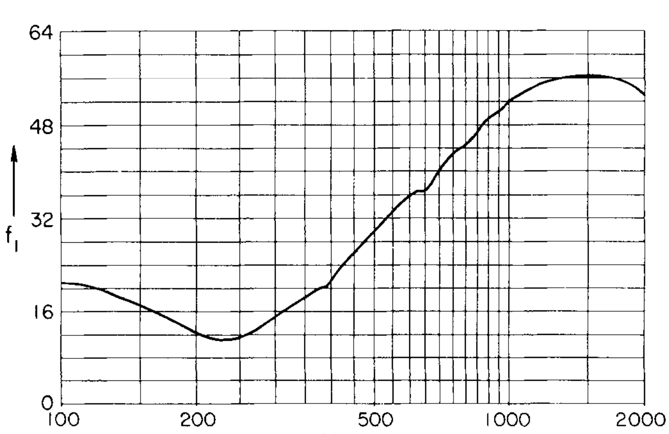
Atomic Weight = 204.4 Z = 8

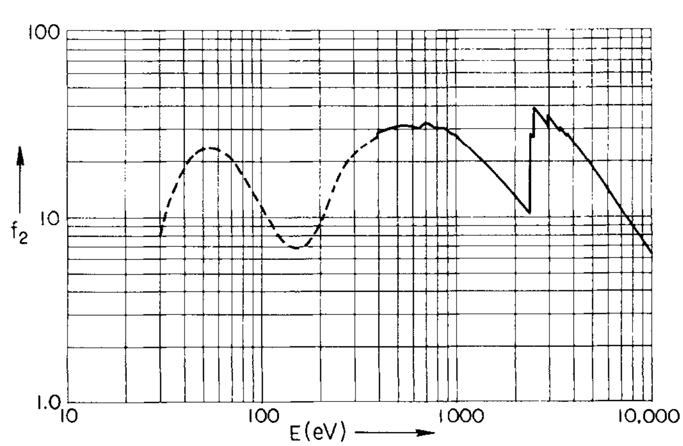
μ(barns/atom) = μ(cm²/gm) x 339.3 THALLIUM (Tl)
$E\mu(E)$ = 205.8 f_2 keVcm²/gm

LINE	E(eV)	μ(cm²/gm)	f_1	f_2	λ(A)
Na $L_{2,3}M$	30.5	5.73 04		8.48	407.1
Mg $L_{2,3}M$	49.3	9.70 04		23.24	251.5
Al $L_{2,3}M$	72.4	5.56 04		19.55	171.4
Si $L_{2,3}M$	91.5	2.95 04		13.12	135.5
Be K	108.5	1.84 04	20.96	9.69	114.
Sr $M\zeta$	114.0	1.60 04	20.66	8.87	108.7
Y $M\zeta$	132.8	1.11 04	18.83	7.14	93.4
S $L\ell$	148.7	9.42 03	17.39	6.81	83.4
Zr $M\zeta$	151.1	9.26 03	17.18	6.80	82.1
Nb $M\zeta$	171.7	8.61 03	15.15	7.18	72.2
B $K\alpha$	183.3	8.82 03	14.04	7.86	67.6
Mo $M\zeta$	192.6	9.28 03	13.25	8.68	64.4
W N_5N_7	212.2	1.05 04	11.78	10.88	58.4
C $K\alpha$	277.0	1.47 04	13.22	19.78	44.7
Ag $M\zeta$	311.7	1.50 04	15.76	22.68	39.8
N $K\alpha$	392.4	1.43 04	20.05	27.35	31.6
Ti $L\ell$	395.3	1.49 04	20.12	28.68	31.4
Ti $L\alpha$	452.2	1.37 04	26.10	30.11	27.4
V $L\alpha$	511.3	1.25 04	30.36	30.96	24.3
O $K\alpha$	524.9	1.22 04	31.43	31.14	23.6
Mn $L\ell$	556.3	1.14 04	33.55	30.87	22.3
Cr $L\alpha$	572.8	1.10 04	34.49	30.69	21.6
Mn $L\alpha$	637.4	9.62 03	36.48	29.79	19.5
F $K\alpha$	676.8	9.69 03	38.01	31.85	18.3
Fe $L\alpha$	705.0	9.33 03	40.44	31.97	17.6
Co $L\alpha$	776.2	8.01 03	43.81	30.21	16.0
Ni $L\alpha$	851.5	7.31 03	46.79	30.23	14.56
Cu $L\alpha$	929.7	6.28 03	49.81	28.35	13.33
Zn $L\alpha$	1011.7	5.46 03	52.11	26.82	12.25
Na $K\alpha$	1041.0	5.15 03	52.88	26.06	11.91
Ge $L\alpha$	1188.0	3.94 03	55.04	22.74	10.44
Mg $K\alpha$	1253.6	3.53 03	55.58	21.50	9.89
Al $K\alpha$	1486.7	2.50 03	56.39	18.03	8.34
Si $K\alpha$	1740.0	1.80 03	55.84	15.23	7.13
Zr $L\alpha$	2042.4	1.27 03	52.85	12.65	6.07
Nb $L\alpha$	2165.9	1.12 03		11.77	5.73
Mo $L\alpha$	2293.2	9.83 02		10.95	5.41
Cl $K\alpha$	2622.4	2.83 03		36.06	4.73
Ag $L\alpha$	2984.3	2.40 03		34.83	4.16
Ca $K\alpha$	3691.7	1.52 03		27.34	3.36
Ba $L\alpha$	4466.3	1.01 03		21.81	2.78
Ti $K\alpha$	4510.8	9.81 02		21.51	2.75
V $K\alpha$	4952.2	7.80 02		18.77	2.50
Cr $K\alpha$	5414.7	6.24 02		16.43	2.29
Mn $K\alpha$	5898.8	5.03 02		14.42	2.10
Co $K\alpha$	6930.3	3.34 02		11.24	1.79
Ni $K\alpha$	7478.2	2.75 02		9.98	1.66
Cu $K\alpha$	8047.8	2.27 02		8.89	1.54
Zn $K\alpha$	8638.9	1.90 02		7.96	1.44
Ge $K\alpha$	9886.4	1.34 02		6.44	1.25

ABSORPTION EDGE

M_1	3705	eV	3.346 A
M_2	3412	eV	3.634 A
M_3	2953.5	eV	4.198 A
M_4	2504	eV	4.952 A
M_5	2406	eV	5.153 A





For E < 390 eV ------ (1)

References:

XI. Low-Energy X-Ray Interaction Coefficient Tables

See page 19 for Explanation of Tables

TABLE I. PHOTOABSORPTION CROSS SECTION, μ
ATOMIC SCATTERING FACTOR, $f_1 + if_2$

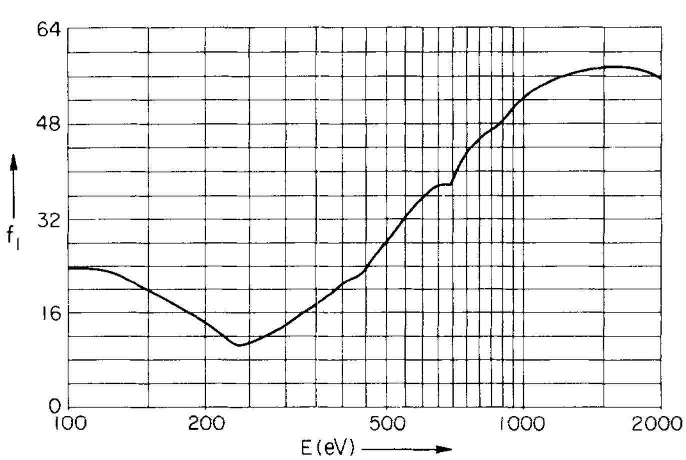
Atomic Weight = 207.2 Z = 82

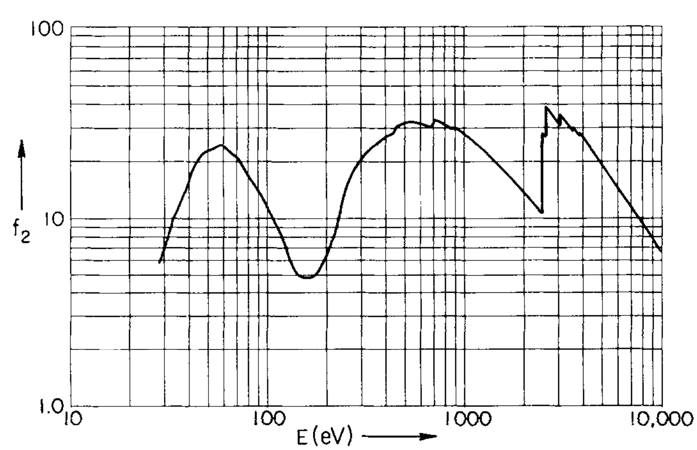
μ(barns/atom) = μ(cm^2/gm) x 344.0 LEAD (Pb)
$E\mu(E)$ = 203.0 f_2 keVcm^2/gm

LINE	E(eV)	μ(cm^2/gm)	f_1	f_2	λ(A)
Na $L_{2,3}M$	30.5	5.13 04		7.69	407.1
Mg $L_{2,3}M$	49.3	9.28 04		22.53	251.5
Al $L_{2,3}M$	72.4	5.47 04		19.51	171.4
Si $L_{2,3}M$	91.5	2.98 04		13.42	135.5
Be K	108.5	1.77 04	23.35	9.45	114.
Sr $M\zeta$	114.0	1.52 04	23.21	8.56	108.7
Y $M\zeta$	132.8	8.67 03	21.71	5.67	93.4
S $L\ell$	148.7	6.71 03	19.58	4.91	83.4
Zr $M\zeta$	151.1	6.57 03	19.30	4.89	82.1
Nb $M\zeta$	171.7	5.90 03	17.03	4.99	72.2
B $K\alpha$	183.3	6.03 03	15.75	5.45	67.6
Mo $M\zeta$	192.6	6.29 03	14.78	5.97	64.4
W N_5N_7	212.2	7.16 03	12.70	7.49	58.4
C $K\alpha$	277.0	1.32 04	12.20	17.98	44.7
Ag $M\zeta$	311.7	1.40 04	14.65	21.56	39.8
N $K\alpha$	392.4	1.37 04	20.24	26.57	31.6
Ti $L\ell$	395.3	1.37 04	20.42	26.69	31.4
Ti $L\alpha$	452.2	1.37 04	23.56	30.59	27.4
V $L\alpha$	511.3	1.27 04	29.10	31.94	24.3
O $K\alpha$	524.9	1.25 04	30.37	32.24	23.6
Mn $L\ell$	556.3	1.17 04	32.86	32.01	22.3
Cr $L\alpha$	572.8	1.13 04	33.98	31.88	21.6
Mn $L\alpha$	637.4	9.87 03	37.25	30.98	19.5
F $K\alpha$	676.8	9.08 03	37.66	30.27	18.3
Fe $L\alpha$	705.0	9.59 03	38.77	33.31	17.6
Co $L\alpha$	776.2	8.29 03	44.18	31.69	16.0
Ni $L\alpha$	851.5	7.13 03	46.83	29.90	14.56
Cu $L\alpha$	929.7	6.47 03	49.50	29.61	13.33
Zn $L\alpha$	1011.7	5.56 03	52.36	27.71	12.25
Na $K\alpha$	1041.0	5.26 03	53.14	26.97	11.91
Ge $L\alpha$	1188.0	4.05 03	55.54	23.71	10.44
Mg $K\alpha$	1253.6	3.64 03	56.09	22.50	9.89
Al $K\alpha$	1486.7	2.61 03	57.33	19.10	8.34
Si $K\alpha$	1740.0	1.88 03	57.27	16.14	7.13
Zr $L\alpha$	2042.4	1.34 03	55.15	13.44	6.07
Nb $L\alpha$	2165.9	1.18 03		12.53	5.73
Mo $L\alpha$	2293.2	1.03 03		11.69	5.41
Cl $K\alpha$	2622.4	2.95 03		38.11	4.73
Ag $L\alpha$	2984.3	2.16 03		31.75	4.16
Ca $K\alpha$	3691.7	1.58 03		28.80	3.36
Ba $L\alpha$	4466.3	1.04 03		22.92	2.78
Ti $K\alpha$	4510.8	1.02 03		22.59	2.75
V $K\alpha$	4952.2	8.07 02		19.69	2.50
Cr $K\alpha$	5414.7	6.46 02		17.24	2.29
Mn $K\alpha$	5898.8	5.22 02		15.15	2.10
Co $K\alpha$	6930.3	3.47 02		11.85	1.79
Ni $K\alpha$	7478.2	2.86 02		10.54	1.66
Cu $K\alpha$	8047.8	2.37 02		9.41	1.54
Zn $K\alpha$	8638.9	1.98 02		8.43	1.44
Ge $K\alpha$	9886.4	1.40 02		6.83	1.25

ABSORPTION EDGE

M_1	3854 eV	3.217 A		N_5**	413 eV	30.0 A
M_2	3550 eV	3.492 A				
M_3	3063.2 eV	4.047 A				
M_4	2606 eV	4.757 A				
M_5	2502 eV	4.955 A				





For 50 eV < E < 500 eV ——— (22) x 0.643

References: 22, 103

XI. Low-Energy X-Ray Interaction Coefficient Tables

See page 19 for Explanation of Tables

TABLE I. PHOTOABSORPTION CROSS SECTION, μ
ATOMIC SCATTERING FACTOR, $f_1 + if_2$

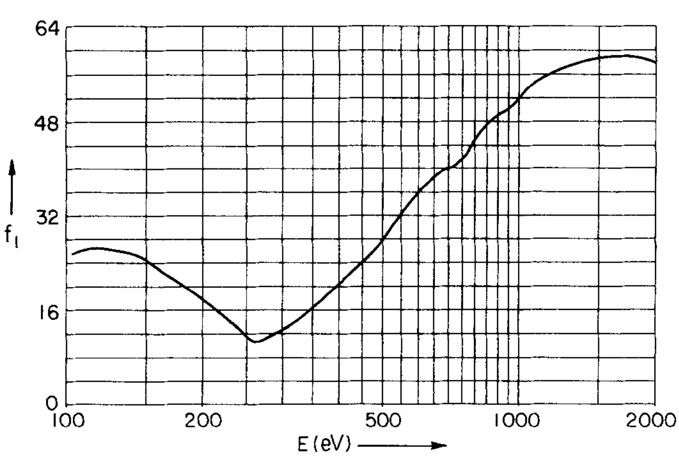
Atomic Weight = 209.0 Z = 83

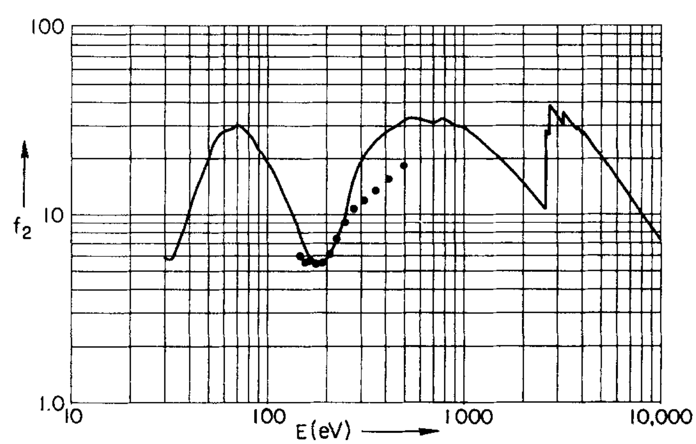
μ(barns/atom) = μ(cm^2/gm) x 347.0 BISMUTH (Bi)
$E\mu(E)$ = 201.2 f_2 keVcm^2/gm

LINE	E(eV)	μ(cm^2/gm)	f_1	f_2	λ(A)	LINE	E(eV)	μ(cm^2/gm)	f_1	f_2	λ(A)
Na $L_{2,3}M$	30.5	3.84 04		5.81	407.1	Co $L\alpha$	776.2	8.53 03	43.34	32.89	16.0
Mg $L_{2,3}M$	49.3	8.07 04		19.76	251.5	Ni $L\alpha$	851.5	7.39 03	47.53	31.25	14.56
Al $L_{2,3}M$	72.4	8.18 04		29.43	171.4	Cu $L\alpha$	929.7	6.38 03	49.88	29.44	13.33
Si $L_{2,3}M$	91.5	4.79 04		21.78	135.5	Zn $L\alpha$	1011.7	5.77 03	52.36	29.01	12.25
Be K	108.5	2.99 04	26.19	16.09	114.	Na $K\alpha$	1041.0	5.46 03	53.44	28.26	11.91
Sr $M\zeta$	114.0	2.53 04	26.59	14.33	108.7	Ge $L\alpha$	1188.0	4.22 03	56.31	24.93	10.44
Y $M\zeta$	132.8	1.54 04	25.92	10.15	93.4	Mg $K\alpha$	1253.6	3.80 03	57.12	23.67	9.89
S $L\ell$	148.7	9.79 03	24.69	7.23	83.4	Al $K\alpha$	1486.7	2.73 03	58.73	20.14	8.34
Zr $M\zeta$	151.1	9.16 03	24.32	6.88	82.1	Si $K\alpha$	1740.0	1.97 03	59.08	17.04	7.13
Nb $M\zeta$	171.7	6.64 03	21.24	5.66	72.2	Zr $L\alpha$	2042.4	1.40 03	57.68	14.17	6.07
B $K\alpha$	183.3	6.11 03	19.80	5.56	67.6	Nb $L\alpha$	2165.9	1.23 03		13.19	5.73
Mo $M\zeta$	192.6	5.90 03	18.64	5.65	64.4	Mo $L\alpha$	2293.2	1.08 03		12.28	5.41
W N_5N_7	212.2	6.16 03	16.29	6.49	58.4	Cl $K\alpha$	2622.4	2.10 03		27.41	4.73
C $K\alpha$	277.0	1.18 04	11.41	16.22	44.7	Ag $L\alpha$	2984.3	2.22 03		32.96	4.16
Ag $M\zeta$	311.7	1.35 04	13.61	20.87	39.8	Ca $K\alpha$	3691.7	1.54 03		28.16	3.36
N $K\alpha$	392.4	1.40 04	19.80	27.20	31.6	Ba $L\alpha$	4466.3	1.07 03		23.76	2.78
Ti $L\ell$	395.3	1.40 04	20.00	27.40	31.4	Ti $K\alpha$	4510.8	1.05 03		23.43	2.75
Ti $L\alpha$	452.2	1.34 04	24.12	30.16	27.4	V $K\alpha$	4952.2	8.33 02		20.50	2.50
V $L\alpha$	511.3	1.28 04	28.77	32.56	24.3	Cr $K\alpha$	5414.7	6.68 02		17.98	2.29
O $K\alpha$	524.9	1.27 04	30.15	33.09	23.6	Mn $K\alpha$	5898.8	5.40 02		15.81	2.10
Mn $L\ell$	556.3	1.19 04	32.93	32.95	22.3	Co $K\alpha$	6930.3	3.59 02		12.36	1.79
Cr $L\alpha$	572.8	1.16 04	34.20	32.87	21.6	Ni $K\alpha$	7478.2	2.96 02		10.98	1.66
Mn $L\alpha$	637.4	1.01 04	38.04	32.05	19.5	Cu $K\alpha$	8047.8	2.45 02		9.79	1.54
F $K\alpha$	676.8	9.33 03	39.69	31.36	18.3	Zn $K\alpha$	8638.9	2.04 02		8.76	1.44
Fe $L\alpha$	705.0	8.81 03	40.23	30.85	17.6	Ge $K\alpha$	9886.4	1.44 02		7.09	1.25

ABSORPTION EDGE

M_1	4007 eV	3.094 A	N_5**	440 eV	28.2 A
M_2	3691 eV	3.359 A			
M_3	3176 eV	3.904 A			
M_4	2711 eV	4.572 A			
M_5	2603 eV	4.764 A			





For E < 500 eV ——— (82)
• (45)

References: 15, 16, 21, 25, 30, 34, 45, 56, 82, 92

XI. Low-Energy X-Ray Interaction Coefficient Tables

See page 19 for Explanation of Tables

TABLE I. PHOTOABSORPTION CROSS SECTION, μ
ATOMIC SCATTERING FACTOR, $f_1 + if_2$

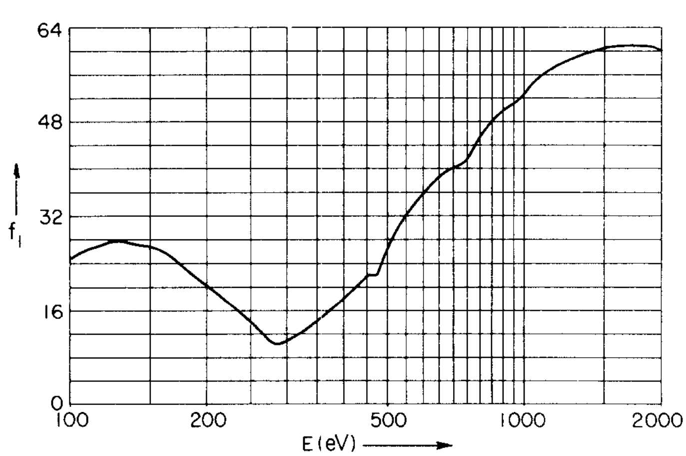
Atomic Weight = 210 Z = 84

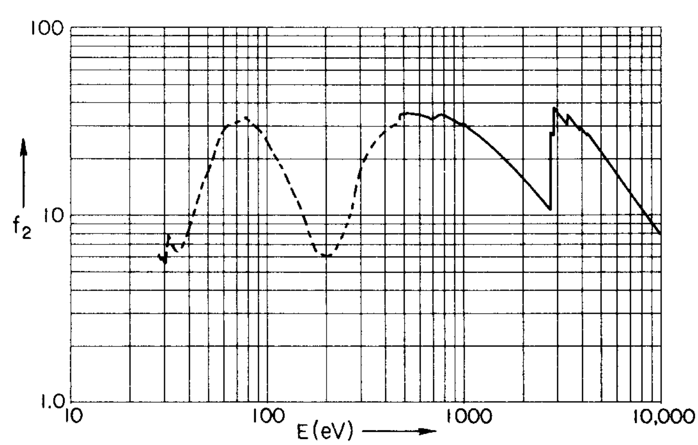
μ(barns/atom) = μ(cm^2/gm) x 348.7 POLONIUM (Po)
Eμ(E) = 200.3 f_2 keVcm^2/gm

LINE	E(eV)	μ(cm^2/gm)	f_1	f_2	λ(A)	LINE	E(eV)	μ(cm^2/gm)	f_1	f_2	λ(A)
Na $L_{2,3}M$	30.5	3.60 04		5.47	407.1	Co Lα	776.2	8.95 03	43.73	34.70	16.0
Mg $L_{2,3}M$	49.3	6.61 04		16.26	251.5	Ni Lα	851.5	7.75 03	48.11	32.92	14.56
Al $L_{2,3}M$	72.4	8.88 04		32.11	171.4	Cu Lα	929.7	6.68 03	50.62	31.02	13.33
Si $L_{2,3}M$	91.5	6.31 04		28.82	135.5	Zn Lα	1011.7	6.06 03	53.29	30.61	12.25
Be K	108.5	3.94 04	26.27	21.36	114.	Na Kα	1041.0	5.74 03	54.44	29.82	11.91
Sr Mζ	114.0	3.43 04	26.85	19.53	108.7	Ge Lα	1188.0	4.43 03	57.59	26.25	10.44
Y Mζ	132.8	2.09 04	27.63	13.88	93.4	Mg Kα	1253.6	3.98 03	58.47	24.93	9.89
S Lℓ	148.7	1.45 04	26.95	10.73	83.4	Al Kα	1486.7	2.85 03	60.31	21.14	8.34
Zr Mζ	151.1	1.36 04	26.83	10.22	82.1	Si Kα	1740.0	2.06 03	60.87	17.89	7.13
Nb Mζ	171.7	8.05 03	24.31	6.90	72.2	Zr Lα	2042.4	1.46 03	59.94	14.89	6.07
B Kα	183.3	6.91 03	22.41	6.32	67.6	Nb Lα	2165.9	1.28 03		13.88	5.73
Mo Mζ	192.6	6.40 03	21.21	6.16	64.4	Mo Lα	2293.2	1.13 03		12.93	5.41
W N_5N_7	212.2	5.90 03	18.70	6.25	58.4	Cl Kα	2622.4	8.30 02		10.86	4.73
C Kα	277.0	8.99 03	10.48	12.43	44.7	Ag Lα	2984.3	2.32 03		34.53	4.16
Ag Mζ	311.7	1.25 04	11.63	19.41	39.8	Ca Kα	3691.7	1.60 03		29.41	3.36
N Kα	392.4	1.41 04	17.70	27.53	31.6	Ba Lα	4466.3	1.11 03		24.69	2.78
Ti Lℓ	395.3	1.41 04	17.92	27.74	31.4	Ti Kα	4510.8	1.08 03		24.35	2.75
Ti Lα	452.2	1.37 04	21.99	31.02	27.4	V Kα	4952.2	8.61 02		21.30	2.50
V Lα	511.3	1.38 04	28.48	35.25	24.3	Cr Kα	5414.7	6.91 02		18.68	2.29
O Kα	524.9	1.35 04	29.95	35.24	23.6	Mn Kα	5898.8	5.58 02		16.44	2.10
Mn Lℓ	556.3	1.26 04	32.78	34.89	22.3	Co Kα	6930.3	3.72 02		12.87	1.79
Cr Lα	572.8	1.21 04	34.05	34.71	21.6	Ni Kα	7478.2	3.07 02		11.44	1.66
Mn Lα	637.4	1.06 04	38.04	33.76	19.5	Cu Kα	8047.8	2.54 02		10.22	1.54
F Kα	676.8	9.75 03	39.72	32.94	18.3	Zn Kα	8638.9	2.12 02		9.15	1.44
Fe Lα	705.0	9.26 03	40.26	32.59	17.6	Ge Kα	9886.4	1.50 02		7.42	1.25

ABSORPTION EDGE

M_5** 2683 eV 4.62 A N_7** 178 eV 69.7 A





For E < 500 eV ------- (1)

References:

XI. Low-Energy X-Ray Interaction Coefficient Tables

See page 19 for Explanation of Tables

TABLE I. PHOTOABSORPTION CROSS SECTION, μ
ATOMIC SCATTERING FACTOR, $f_1 + if_2$

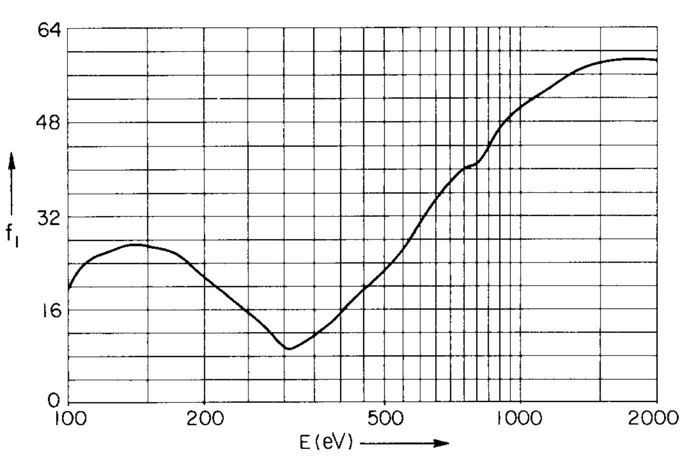
Atomic Weight = 210 Z = 85

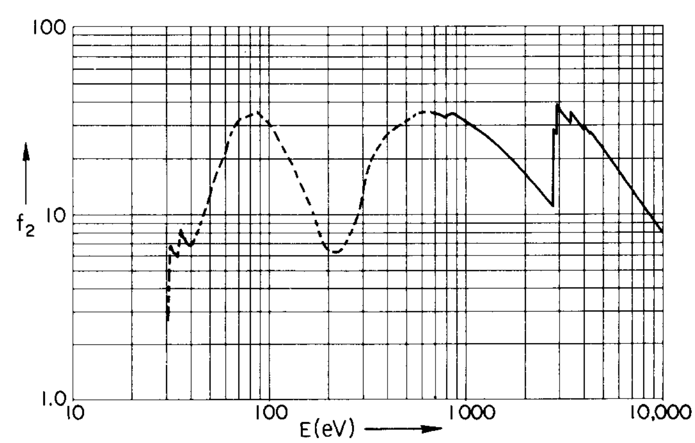
μ(barns/atom) = μ(cm^2/gm) x 348.7 ASTATINE (At)
Eμ(E) = 200.3 f_2 keVcm^2/gm

LINE	E(eV)	μ(cm^2/gm)	f_1	f_2	λ(A)
Na $L_{2,3}M$	30.5	1.76 04		2.67	407.1
Mg $L_{2,3}M$	49.3	4.95 04		12.19	251.5
Al $L_{2,3}M$	72.4	9.05 04		32.71	171.4
Si $L_{2,3}M$	91.5	7.30 04		33.35	135.5
Be K	108.5	4.91 04	23.82	26.60	114.
Sr Mζ	114.0	4.25 04	24.94	24.21	108.7
Y Mζ	132.8	2.73 04	27.03	18.12	93.4
S Lℓ	148.7	1.84 04	26.85	13.67	83.4
Zr Mζ	151.1	1.75 04	26.74	13.18	82.1
Nb Mζ	171.7	1.09 04	25.59	9.34	72.2
B Kα	183.3	8.23 03	24.05	7.53	67.6
Mo Mζ	192.6	6.98 03	22.48	6.71	64.4
W N_5N_7	212.2	5.97 03	19.90	6.32	58.4
C Kα	277.0	6.75 03	12.22	9.33	44.7
Ag Mζ	311.7	1.02 04	8.97	15.88	39.8
N Kα	392.4	1.33 04	14.52	26.12	31.6
Ti Lℓ	395.3	1.35 04	14.80	26.66	31.4
Ti Lα	452.2	1.31 04	19.44	29.63	27.4
V Lα	511.3	1.26 04	23.44	32.25	24.3
O Kα	524.9	1.25 04	24.34	32.83	23.6
Mn Lℓ	556.3	1.23 04	26.66	34.26	22.3
Cr Lα	572.8	1.22 04	28.19	35.00	21.6
Mn Lα	637.4	1.12 04	33.69	35.54	19.5
F Kα	676.8	1.03 04	36.51	34.91	18.3
Fe Lα	705.0	9.78 03	38.15	34.42	17.6
Co Lα	776.2	8.44 03	40.43	32.72	16.0
Ni Lα	851.5	8.19 03	43.65	34.81	14.56
Cu Lα	929.7	7.07 03	48.00	32.82	13.33
Zn Lα	1011.7	6.10 03	50.67	30.80	12.25
Na Kα	1041.0	5.80 03	51.39	30.11	11.91
Ge Lα	1188.0	4.65 03	54.24	27.57	10.44
Mg Kα	1253.6	4.25 03	55.33	26.59	9.89
Al Kα	1486.7	3.06 03	57.82	22.74	8.34
Si Kα	1740.0	2.23 03	58.64	19.33	7.13
Zr Lα	2042.4	1.58 03	57.77	16.16	6.07
Nb Lα	2165.9	1.39 03		15.07	5.73
Mo Lα	2293.2	1.23 03		14.05	5.41
Cl Kα	2622.4	9.02 02		11.81	4.73
Ag Lα	2984.3	2.50 03		37.20	4.16
Ca Kα	3691.7	1.72 03		31.62	3.36
Ba Lα	4466.3	1.18 03		26.41	2.78
Ti Kα	4510.8	1.16 03		26.06	2.75
V Kα	4952.2	9.25 02		22.87	2.50
Cr Kα	5414.7	7.43 02		20.09	2.29
Mn Kα	5898.8	6.01 02		17.69	2.10
Co Kα	6930.3	4.00 02		13.82	1.79
Ni Kα	7478.2	3.29 02		12.28	1.66
Cu Kα	8047.8	2.73 02		10.95	1.54
Zn Kα	8638.9	2.27 02		9.80	1.44
Ge Kα	9886.4	1.61 02		7.94	1.25

ABSORPTION EDGE

M_5** 2787 eV 4.45 A N_7** 204 eV 60.8 A





For E < 700 eV ------ (1)

References:

XI. Low-Energy X-Ray Interaction Coefficient Tables

See page 19 for Explanation of Tables

TABLE I. PHOTOABSORPTION CROSS SECTION, μ
ATOMIC SCATTERING FACTOR, $f_1 + if_2$

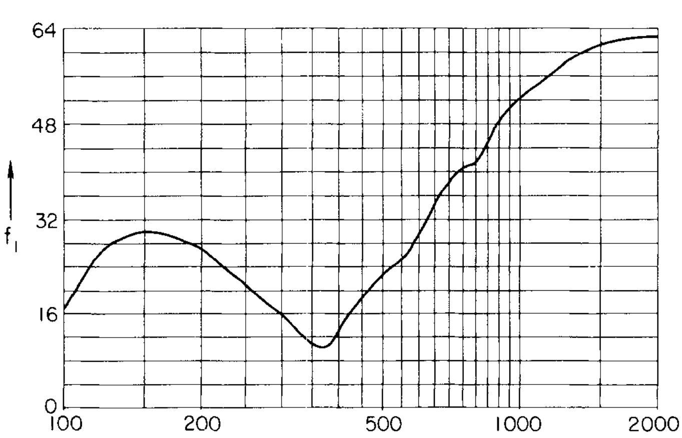
Atomic Weight = 222 Z = 86

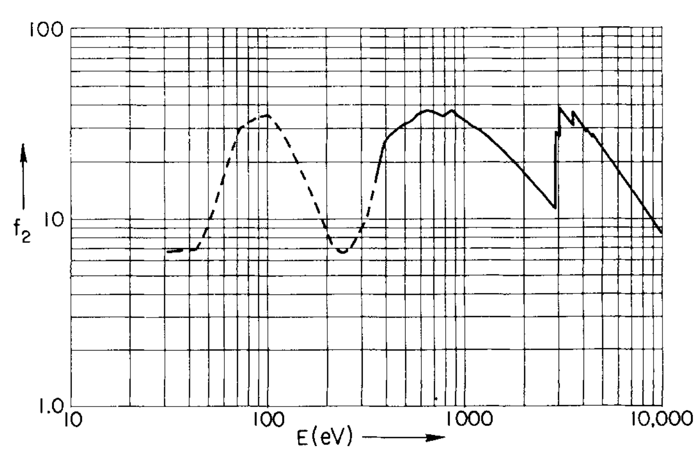
μ(barns/atom) = μ(cm^2/gm) x 368.6 RADON (Rn)
Eμ(E) = 189.4 f_2 keVcm^2/gm

LINE	E(eV)	μ(cm^2/gm)	f_1	f_2	λ(A)	LINE	E(eV)	μ(cm^2/gm)	f_1	f_2	λ(A)
Na $L_{2,3}M$	30.5	4.21 04		6.77	407.1	Co Lα	776.2	8.45 03	41.24	34.63	16.0
Mg $L_{2,3}M$	49.3	3.52 04		9.16	251.5	Ni Lα	851.5	8.32 03	45.26	37.37	14.56
Al $L_{2,3}M$	72.4	7.85 04		29.98	171.4	Cu Lα	929.7	7.06 03	50.14	34.63	13.33
Si $L_{2,3}M$	91.5	7.16 04		34.57	135.5	Zn Lα	1011.7	6.09 03	52.90	32.52	12.25
Be K	108.5	5.61 04	21.58	32.13	114.	Na Kα	1041.0	5.78 03	53.66	31.77	11.91
Sr Mζ	114.0	5.03 04	24.22	30.26	108.7	Ge Lα	1188.0	4.65 03	56.83	29.18	10.44
Y Mζ	132.8	3.22 04	28.88	22.57	93.4	Mg Kα	1253.6	4.26 03	58.10	28.18	9.89
S Lℓ	148.7	2.25 04	30.06	17.67	83.4	Al Kα	1486.7	3.07 03	61.10	24.06	8.34
Zr Mζ	151.1	2.13 04	30.07	17.00	82.1	Si Kα	1740.0	2.23 03	62.42	20.45	7.13
Nb Mζ	171.7	1.38 04	29.27	12.50	72.2	Zr Lα	2042.4	1.59 03	62.36	17.13	6.07
B Kα	183.3	1.10 04	28.48	10.68	67.6	Nb Lα	2165.9	1.40 03		16.01	5.73
Mo Mζ	192.6	9.24 03	27.79	9.39	64.4	Mo Lα	2293.2	1.24 03		14.95	5.41
W N_5N_7	212.2	6.38 03	25.50	7.15	58.4	Cl Kα	2622.4	9.14 02		12.65	4.73
C Kα	277.0	5.29 03	17.99	7.74	44.7	Ag Lα	2984.3	1.73 03		27.27	4.16
Ag Mζ	311.7	5.91 03	14.60	9.72	39.8	Ca Kα	3691.7	1.76 03		34.31	3.36
N Kα	392.4	1.23 04	11.87	25.39	31.6	Ba Lα	4466.3	1.14 03		26.76	2.78
Ti Lℓ	395.3	1.24 04	12.53	25.93	31.4	Ti Kα	4510.8	1.16 03		27.56	2.75
Ti Lα	452.2	1.25 04	18.88	29.76	27.4	V Kα	4952.2	9.22 02		24.11	2.50
V Lα	511.3	1.19 04	23.27	32.06	24.3	Cr Kα	5414.7	7.40 02		21.15	2.29
O Kα	524.9	1.18 04	24.03	32.58	23.6	Mn Kα	5898.8	5.98 02		18.62	2.10
Mn Lℓ	556.3	1.17 04	25.82	34.23	22.3	Co Kα	6930.3	3.99 02		14.59	1.79
Cr Lα	572.8	1.18 04	27.21	35.64	21.6	Ni Kα	7478.2	3.29 02		12.98	1.66
Mn Lα	637.4	1.11 04	33.49	37.40	19.5	Cu Kα	8047.8	2.73 02		11.59	1.54
F Kα	676.8	1.02 04	36.82	36.57	18.3	Zn Kα	8638.9	2.28 02		10.39	1.44
Fe Lα	705.0	9.75 03	38.60	36.27	17.6	Ge Kα	9886.4	1.61 02		8.42	1.25

ABSORPTION EDGE

M_5** 2892 eV 4.287 A N_7** 234 eV 53.0 A





For E < 350 eV ------- (1)

References:

XI. Low-Energy X-Ray Interaction Coefficient Tables

See page 19 for Explanation of Tables

TABLE I. PHOTOABSORPTION CROSS SECTION, μ
ATOMIC SCATTERING FACTOR, $f_1 + if_2$

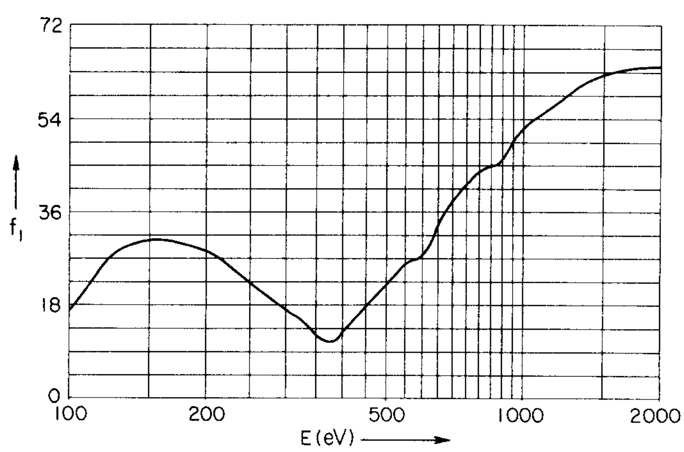
Atomic Weight = 223 Z = 87

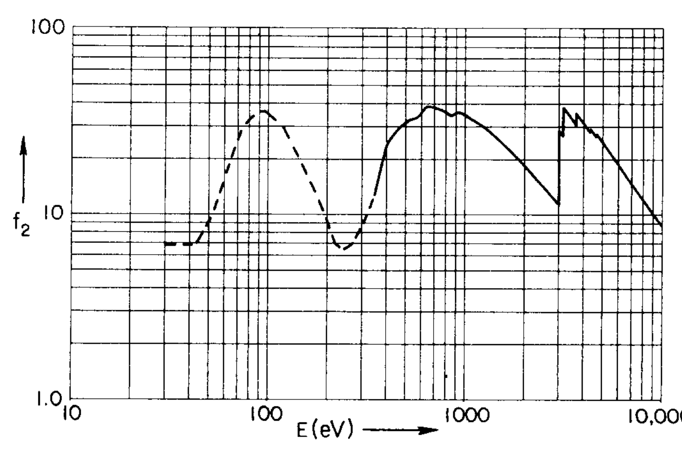
μ(barns/atom) = μ(cm²/gm) x 370.2 FRANCIUM (Fr)
Eμ(E) = 188.6 f_2 keVcm²/gm

LINE	E(eV)	μ(cm²/gm)	f_1	f_2	λ(A)	LINE	E(eV)	μ(cm²/gm)	f_1	f_2	λ(A)
Na $L_{2,3}M$	30.5	4.22 04		6.81	407.1	Co Lα	776.2	8.79 03	42.86	36.15	16.0
Mg $L_{2,3}M$	49.3	3.39 04		8.86	251.5	Ni Lα	851.5	7.58 03	45.00	34.22	14.56
Al $L_{2,3}M$	72.4	7.29 04		27.99	171.4	Cu Lα	929.7	7.35 03	48.26	36.22	13.33
Si $L_{2,3}M$	91.5	7.36 04		35.69	135.5	Zn Lα	1011.7	6.36 03	52.51	34.11	12.25
Be K	108.5	5.61 04	20.90	32.28	114.	Na Kα	1041.0	6.04 03	53.50	33.33	11.91
Sr Mζ	114.0	5.10 04	23.38	30.84	108.7	Ge Lα	1188.0	4.87 03	57.32	30.70	10.44
Y Mζ	132.8	3.35 04	29.16	23.61	93.4	Mg Kα	1253.6	4.47 03	58.78	29.68	9.89
S Lℓ	148.7	2.38 04	30.55	18.73	83.4	Al Kα	1486.7	3.20 03	62.24	25.18	8.34
Zr Mζ	151.1	2.25 04	30.60	18.05	82.1	Si Kα	1740.0	2.32 03	63.77	21.37	7.13
Nb Mζ	171.7	1.47 04	30.13	13.42	72.2	Zr Lα	2042.4	1.65 03	64.00	17.91	6.07
B Kα	183.3	1.19 04	29.49	11.54	67.6	Nb Lα	2165.9	1.46 03		16.75	5.73
Mo Mζ	192.6	1.01 04	28.91	10.29	64.4	Mo Lα	2293.2	1.29 03		15.67	5.41
W N_5N_7	212.2	6.84 03	27.16	7.69	58.4	Cl Kα	2622.4	9.58 02		13.32	4.73
C Kα	277.0	5.04 03	19.26	7.40	44.7	Ag Lα	2984.3	7.14 02		11.29	4.16
Ag Mζ	311.7	5.83 03	16.06	9.63	39.8	Ca Kα	3691.7	1.79 03		35.06	3.36
N Kα	392.4	1.11 04	11.67	23.11	31.6	Ba Lα	4466.3	1.18 03		28.01	2.78
Ti Lℓ	395.3	1.14 04	12.20	23.85	31.4	Ti Kα	4510.8	1.15 03		27.61	2.75
Ti Lα	452.2	1.22 04	17.83	29.15	27.4	V Kα	4952.2	9.60 02		25.19	2.50
V Lα	511.3	1.19 04	22.78	32.35	24.3	Cr Kα	5414.7	7.70 02		22.10	2.29
O Kα	524.9	1.19 04	24.08	33.08	23.6	Mn Kα	5898.8	6.22 02		19.45	2.10
Mn Lℓ	556.3	1.13 04	26.35	33.26	22.3	Co Kα	6930.3	4.15 02		15.23	1.79
Cr Lα	572.8	1.10 04	26.68	33.34	21.6	Ni Kα	7478.2	3.42 02		13.55	1.66
Mn Lα	637.4	1.16 04	31.72	39.03	19.5	Cu Kα	8047.8	2.84 02		12.10	1.54
F Kα	676.8	1.06 04	36.34	38.14	18.3	Zn Kα	8638.9	2.37 02		10.84	1.44
Fe Lα	705.0	1.01 04	38.55	37.78	17.6	Ge Kα	9886.4	1.68 02		8.79	1.25

ABSORPTION EDGE

M_5** 3000 eV 4.133 A N_7** 263 eV 47.1 A





For E < 350 eV ------- (1)

References:

XI. Low-Energy X-Ray Interaction Coefficient Tables

See page 19 for Explanation of Tables

TABLE I. PHOTOABSORPTION CROSS SECTION, μ
ATOMIC SCATTERING FACTOR, $f_1 + if_2$

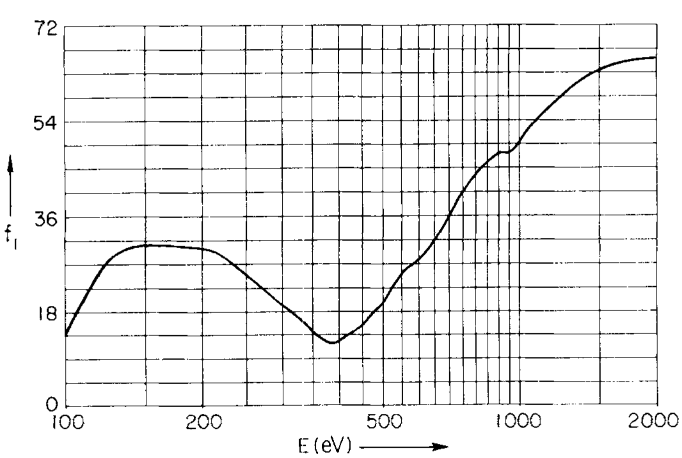
Atomic Weight = 226 Z = 88

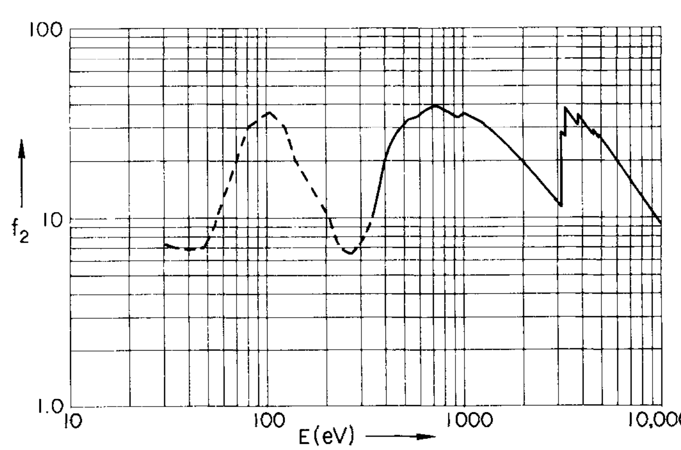
μ(barns/atom) = μ(cm^2/gm) x 375.2 RADIUM (Ra)
Eμ(E) = 186.1 f_2 keVcm^2/gm

LINE	E(eV)	μ(cm^2/gm)	f_1	f_2	λ(A)	LINE	E(eV)	μ(cm^2/gm)	f_1	f_2	λ(A)
Na $L_{2,3}M$	30.5	4.41 04		7.22	407.1	Co Lα	776.2	9.00 03	42.61	37.53	16.0
Mg $L_{2,3}M$	49.3	2.87 04		7.61	251.5	Ni Lα	851.5	7.78 03	46.24	35.58	14.56
Al $L_{2,3}M$	72.4	5.84 04		22.70	171.4	Cu Lα	929.7	6.73 03	47.83	33.60	13.33
Si $L_{2,3}M$	91.5	7.05 04		34.63	135.5	Zn Lα	1011.7	6.57 03	50.62	35.69	12.25
Be K	108.5	5.94 04	19.16	34.61	114.0	Na Kα	1041.0	6.24 03	52.36	34.87	11.91
Sr Mζ	114.0	5.40 04	22.69	33.10	108.7	Ge Lα	1188.0	5.08 03	57.14	32.41	10.44
Y Mζ	132.8	3.53 04	29.58	25.21	93.4	Mg Kα	1253.6	4.67 03	59.05	31.45	9.89
S Lℓ	148.7	2.49 04	31.06	19.87	83.4	Al Kα	1486.7	3.32 03	63.14	26.50	8.34
Zr Mζ	151.1	2.37 04	31.11	19.20	82.1	Si Kα	1740.0	2.41 03	64.98	22.53	7.13
Nb Mζ	171.7	1.61 04	30.94	14.81	72.2	Zr Lα	2042.4	1.72 03	65.55	18.90	6.07
B Kα	183.3	1.30 04	30.69	12.82	67.6	Nb Lα	2165.9	1.52 03		17.67	5.73
Mo Mζ	192.6	1.11 04	30.23	11.45	64.4	Mo Lα	2293.2	1.34 03		16.53	5.41
W N_5N_7	212.2	7.74 03	29.05	8.83	58.4	Cl Kα	2622.4	9.96 02		14.03	4.73
C Kα	277.0	4.54 03	21.70	6.76	44.7	Ag Lα	2984.3	7.40 02		11.86	4.16
Ag Mζ	311.7	4.88 03	18.11	8.17	39.8	Ca Kα	3691.7	1.59 03		31.62	3.36
N Kα	392.4	9.20 03	11.87	19.40	31.6	Ba Lα	4466.3	1.15 03		27.58	2.78
Ti Lℓ	395.3	9.60 03	12.07	20.39	31.4	Ti Kα	4510.8	1.19 03		28.81	2.75
Ti Lα	452.2	1.14 04	16.07	27.65	27.4	V Kα	4952.2	9.88 02		26.28	2.50
V Lα	511.3	1.18 04	21.19	32.36	24.3	Cr Kα	5414.7	7.93 02		23.07	2.29
O Kα	524.9	1.19 04	22.81	33.47	23.6	Mn Kα	5898.8	6.41 02		20.31	2.10
Mn Lℓ	556.3	1.13 04	25.78	33.83	22.3	Co Kα	6930.3	4.27 02		15.91	1.79
Cr Lα	572.8	1.10 04	26.64	33.97	21.6	Ni Kα	7478.2	3.52 02		14.15	1.66
Mn Lα	637.4	1.08 04	30.73	37.05	19.5	Cu Kα	8047.8	2.92 02		12.64	1.54
F Kα	676.8	1.06 04	34.07	38.40	18.3	Zn Kα	8638.9	2.44 02		11.32	1.44
Fe Lα	705.0	1.03 04	36.94	39.12	17.6	Ge Kα	9886.4	1.73 02		9.17	1.25

ABSORPTION EDGE

M_5** 3109 eV 3.988 A N_7** 288 eV 43.1 A





For E < 350 eV ------- (1)

References:

XI. Low-Energy X-Ray Interaction Coefficient Tables

See page 19 for Explanation of Tables

TABLE I. PHOTOABSORPTION CROSS SECTION, μ
ATOMIC SCATTERING FACTOR, $f_1 + if_2$

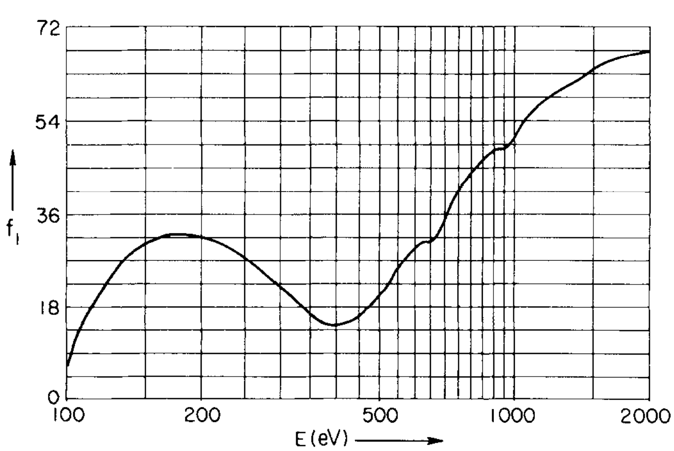
Atomic Weight = 227 Z = 89

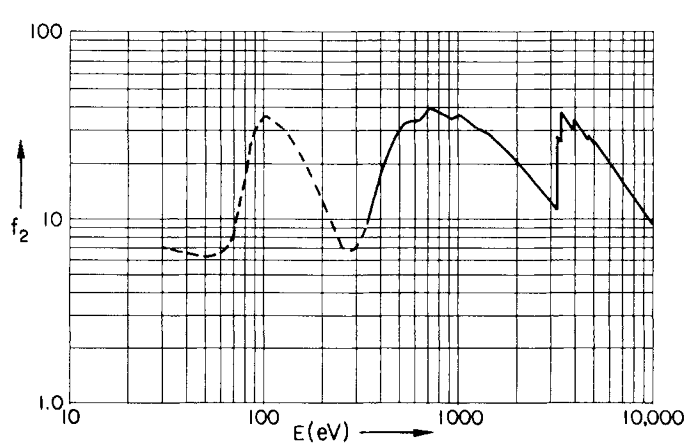
μ(barns/atom) = μ(cm^2/gm) x 376.9 ACTINIUM (Ac)
$E\mu(E)$ = 185.3 f_2 keVcm^2/gm

LINE	E(eV)	μ(cm^2/gm)	f_1	f_2	λ(A)	LINE	E(eV)	μ(cm^2/gm)	f_1	f_2	λ(A)
Na $L_{2,3}M$	30.5	4.42 04		7.26	407.1	Co Lα	776.2	9.12 03	42.42	38.19	16.0
Mg $L_{2,3}M$	49.3	2.37 04		6.30	251.5	Ni Lα	851.5	7.91 03	46.45	36.34	14.56
Al $L_{2,3}M$	72.4	2.55 04		9.94	171.4	Cu Lα	929.7	6.87 03	48.43	34.46	13.33
Si $L_{2,3}M$	91.5	6.16 04		30.44	135.5	Zn Lα	1011.7	6.67 03	51.61	36.43	12.25
Be K	108.5	5.91 04	14.99	34.60	114.	Na Kα	1041.0	6.34 03	53.62	35.62	11.91
Sr Mζ	114.0	5.40 04	18.35	33.21	108.7	Ge Lα	1188.0	4.99 03	58.39	32.01	10.44
Y Mζ	132.8	3.97 04	27.01	28.44	93.4	Mg Kα	1253.6	4.53 03	59.58	30.64	9.89
S Lℓ	148.7	2.90 04	30.28	23.30	83.4	Al Kα	1486.7	3.44 03	63.42	27.61	8.34
Zr Mζ	151.1	2.78 04	30.58	22.65	82.1	Si Kα	1740.0	2.51 03	66.09	23.57	7.13
Nb Mζ	171.7	1.89 04	32.35	17.53	72.2	Zr Lα	2042.4	1.80 03	67.16	19.80	6.07
B Kα	183.3	1.52 04	32.32	15.06	67.6	Nb Lα	2165.9	1.58 03		18.51	5.73
Mo Mζ	192.6	1.29 04	32.02	13.43	64.4	Mo Lα	2293.2	1.40 03		17.31	5.41
W N_5N_7	212.2	9.37 03	31.02	10.73	58.4	Cl Kα	2622.4	1.04 03		14.67	4.73
C Kα	277.0	4.54 03	24.55	6.78	44.7	Ag Lα	2984.3	7.67 02		12.35	4.16
Ag Mζ	311.7	4.64 03	20.81	7.80	39.8	Ca Kα	3691.7	1.63 03		32.53	3.36
N Kα	392.4	7.99 03	14.26	16.92	31.6	Ba Lα	4466.3	1.18 03		28.45	2.78
Ti Lℓ	395.3	8.32 03	14.25	17.75	31.4	Ti Kα	4510.8	1.15 03		28.03	2.75
Ti Lα	452.2	1.05 04	16.39	25.69	27.4	V Kα	4952.2	9.69 02		25.89	2.50
V Lα	511.3	1.15 04	21.05	31.64	24.3	Cr Kα	5414.7	8.11 02		23.71	2.29
O Kα	524.9	1.17 04	22.88	33.08	23.6	Mn Kα	5898.8	6.58 02		20.94	2.10
Mn Lℓ	556.3	1.12 04	26.39	33.65	22.3	Co Kα	6930.3	4.40 02		16.44	1.79
Cr Lα	572.8	1.10 04	27.79	33.91	21.6	Ni Kα	7478.2	3.62 02		14.62	1.66
Mn Lα	637.4	9.89 03	30.58	34.00	19.5	Cu Kα	8047.8	3.00 02		13.04	1.54
F Kα	676.8	1.03 04	32.24	37.69	18.3	Zn Kα	8638.9	2.50 02		11.67	1.44
Fe Lα	705.0	1.04 04	35.68	39.64	17.6	Ge Kα	9886.4	1.77 02		9.43	1.25

ABSORPTION EDGE

M_5** 3219 eV 3.852 A N_7** 312 eV 39.7 A





For E < 350 eV ------- (1)

References:

XI. Low-Energy X-Ray Interaction Coefficient Tables

See page 19 for Explanation of Tables

TABLE I. PHOTOABSORPTION CROSS SECTION, μ
ATOMIC SCATTERING FACTOR, $f_1 + if_2$

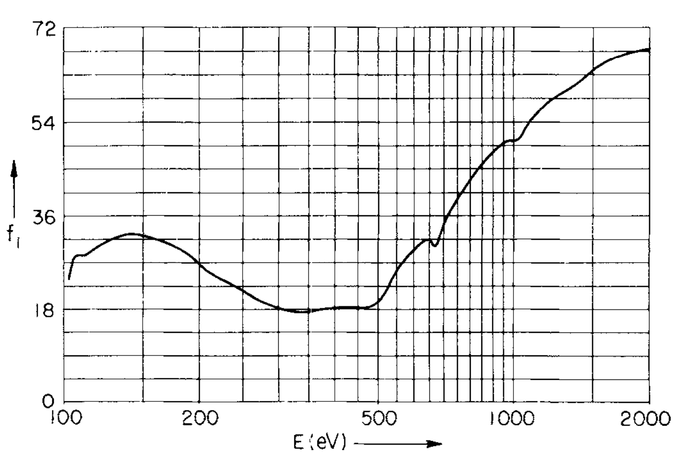
Atomic Weight = 232.0 Z = 90

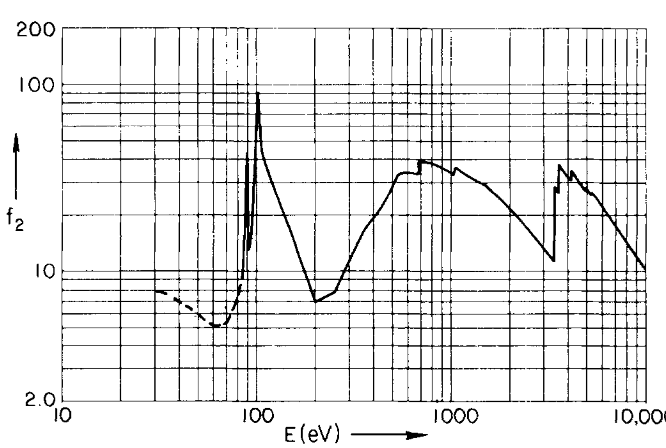
μ(barns/atom) = μ(cm^2/gm) x 385.3 THORIUM (Th)
$E\mu(E)$ = 181.3 f_2 keVcm^2/gm

LINE	E(eV)	μ(cm^2/gm)	f_1	f_2	λ(A)	LINE	E(eV)	μ(cm^2/gm)	f_1	f_2	λ(A)
Na $L_{2,3}M$	30.5	4.73 04		7.94	407.1	Co Lα	776.2	8.98 03	41.44	38.44	16.0
Mg $L_{2,3}M$	49.3	2.30 04		6.25	251.5	Ni Lα	851.5	7.89 03	46.08	37.04	14.56
Al $L_{2,3}M$	72.4	1.27 04		5.08	171.4	Cu Lα	929.7	6.87 03	49.29	35.22	13.33
Si $L_{2,3}M$	91.5	2.60 04		13.13	135.5	Zn Lα	1011.7	5.96 03	49.86	33.26	12.25
Be K	108.5	6.84 04	28.35	40.93	114.0	Na Kα	1041.0	6.31 03	51.01	36.24	11.91
Sr Mζ	114.0	5.46 04	29.73	34.33	108.7	Ge Lα	1188.0	5.02 03	57.56	32.87	10.44
Y Mζ	132.8	3.06 04	32.76	22.39	93.4	Mg Kα	1253.6	4.57 03	58.91	31.59	9.89
S Lℓ	148.7	1.96 04	32.71	16.11	83.4	Al Kα	1486.7	3.53 03	63.35	28.93	8.34
Zr Mζ	151.1	1.85 04	32.57	15.38	82.1	Si Kα	1740.0	2.57 03	66.52	24.64	7.13
Nb Mζ	171.7	1.12 04	30.80	10.60	72.2	Zr Lα	2042.4	1.84 03	67.85	20.72	6.07
B Kα	183.3	8.67 03	29.47	8.77	67.6	Nb Lα	2165.9	1.62 03		19.39	5.73
Mo Mζ	192.6	7.15 03	28.21	7.59	64.4	Mo Lα	2293.2	1.44 03		18.15	5.41
W N_5N_7	212.2	6.00 03	25.05	7.02	58.4	Cl Kα	2622.4	1.07 03		15.45	4.73
C Kα	277.0	6.28 03	19.51	9.59	44.7	Ag Lα	2984.3	7.96 02		13.10	4.16
Ag Mζ	311.7	7.25 03	18.02	12.46	39.8	Ca Kα	3691.7	1.70 03		34.53	3.36
N Kα	392.4	8.81 03	18.29	19.06	31.6	Ba Lα	4466.3	1.23 03		30.22	2.78
Ti Lℓ	395.3	8.83 03	18.30	19.26	31.4	Ti Kα	4510.8	1.20 03		29.77	2.75
Ti Lα	452.2	9.33 03	18.48	23.28	27.4	V Kα	4952.2	1.00 03		27.45	2.50
V Lα	511.3	1.09 04	20.60	30.81	24.3	Cr Kα	5414.7	8.44 02		25.20	2.29
O Kα	524.9	1.13 04	22.50	32.72	23.6	Mn Kα	5898.8	6.84 02		22.24	2.10
Mn Lℓ	556.3	1.09 04	26.28	33.38	22.3	Co Kα	6930.3	4.57 02		17.46	1.79
Cr Lα	572.8	1.07 04	27.76	33.71	21.6	Ni Kα	7478.2	3.77 02		15.54	1.66
Mn Lα	637.4	9.64 03	31.53	33.90	19.5	Cu Kα	8047.8	3.12 02		13.87	1.54
F Kα	676.8	1.04 04	28.39	38.97	18.3	Zn Kα	8638.9	2.61 02		12.42	1.44
Fe Lα	705.0	9.98 03	35.38	38.81	17.6	Ge Kα	9886.4	1.84 02		10.05	1.25

ABSORPTION EDGE

M_1*	5181 eV	2.393 A	N_5**	676 eV	18.3 A
M_3	4041 eV	3.068 A			
M_4	3485 eV	3.557 A			
M_5	3325 eV	3.729 A			





For 70 < E < 130 eV ——— (123)
For E < 70 eV - - - - - - - (1)

References: 123

XI. Low-Energy X-Ray Interaction Coefficient Tables

See page 19 for Explanation of Tables

TABLE I. PHOTOABSORPTION CROSS SECTION, μ
ATOMIC SCATTERING FACTOR, $f_1 + if_2$

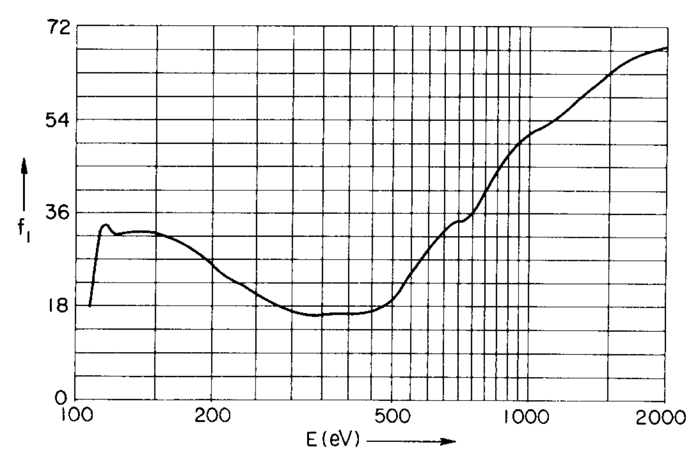
Atomic Weight = 231.0 Z = 91

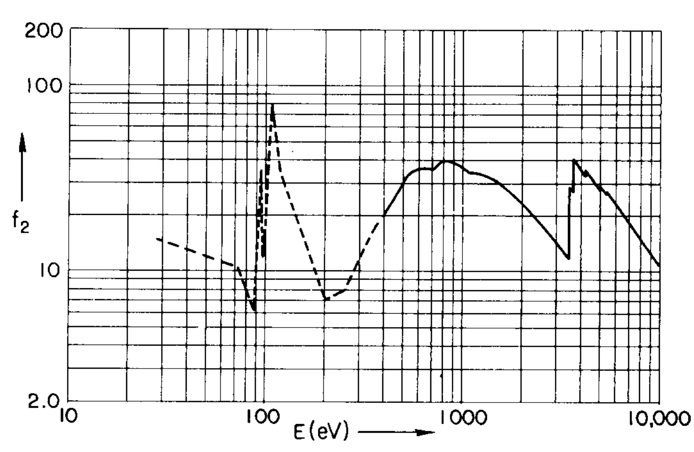
μ(barns/atom) = μ(cm²/gm) x 383.5 PROTACTINIUM (Pa)
Eμ(E) = 182.1 f_2 keVcm²/gm

LINE	E(eV)	μ(cm²/gm)	f_1	f_2	λ(A)	LINE	E(eV)	μ(cm²/gm)	f_1	f_2	λ(A)
Na $L_{2,3}M$	30.5	8.60 04		14.38	407.1	Co Lα	776.2	9.22 03	38.17	39.29	16.0
Mg $L_{2,3}M$	49.3	4.45 04		12.04	251.5	Ni Lα	851.5	8.40 03	44.24	39.27	14.56
Al $L_{2,3}M$	72.4	2.25 04		10.13	171.4	Cu Lα	929.7	7.33 03	48.81	37.39	13.33
Si $L_{2,3}M$	91.5	4.18 04		20.98	135.5	Zn Lα	1011.7	6.35 03	51.73	35.28	12.25
Be K	108.5	1.16 05	17.01	69.21	114.	Na Kα	1041.0	6.04 03	52.25	34.50	11.91
Sr Mζ	114.0	7.17 04	34.24	44.87	108.7	Ge Lα	1188.0	5.17 03	55.51	33.74	10.44
Y Mζ	132.8	3.26 04	32.60	23.77	93.4	Mg Kα	1253.6	4.86 03	57.33	33.44	9.89
S Lℓ	148.7	2.08 04	32.27	16.94	83.4	Al Kα	1486.7	3.76 03	62.87	30.72	8.34
Zr Mζ	151.1	1.95 04	32.11	16.15	82.1	Si Kα	1740.0	2.77 03	66.54	26.45	7.13
Nb Mζ	171.7	1.17 04	30.13	11.02	72.2	Zr Lα	2042.4	2.00 03	68.39	22.38	6.07
B Kα	183.3	9.00 03	28.69	9.06	67.6	Nb Lα	2165.9	1.76 03		20.97	5.73
Mo Mζ	192.6	7.39 03	27.34	7.81	64.4	Mo Lα	2293.2	1.56 03		19.65	5.41
W N_5N_7	212.2	6.18 03	23.98	7.20	58.4	Cl Kα	2622.4	1.16 03		16.72	4.73
C Kα	277.0	6.47 03	18.18	9.84	44.7	Ag Lα	2984.3	8.63 02		14.14	4.16
Ag Mζ	311.7	7.47 03	16.52	12.79	39.8	Ca Kα	3691.7	1.95 03		39.50	3.36
N Kα	392.4	9.08 03	16.59	19.56	31.6	Ba Lα	4466.3	1.32 03		32.26	2.78
Ti Lℓ	395.3	9.11 03	16.55	19.77	31.4	Ti Kα	4510.8	1.28 03		31.79	2.75
Ti Lα	452.2	1.02 04	17.07	25.20	27.4	V Kα	4952.2	1.02 03		27.74	2.50
V Lα	511.3	1.13 04	20.06	31.61	24.3	Cr Kα	5414.7	9.00 02		26.76	2.29
O Kα	524.9	1.15 04	21.67	33.18	23.6	Mn Kα	5898.8	7.31 02		23.69	2.10
Mn Lℓ	556.3	1.13 04	25.00	34.49	22.3	Co Kα	6930.3	4.90 02		18.64	1.79
Cr Lα	572.8	1.12 04	26.63	35.16	21.6	Ni Kα	7478.2	4.04 02		16.58	1.66
Mn Lα	637.4	1.03 04	31.85	35.95	19.5	Cu Kα	8047.8	3.35 02		14.79	1.54
F Kα	676.8	9.53 03	34.05	35.43	18.3	Zn Kα	8638.9	2.79 02		13.23	1.44
Fe Lα	705.0	9.11 03	34.51	35.27	17.6	Ge Kα	9886.4	1.97 02		10.68	1.25

ABSORPTION EDGE

M_2*	5006 eV	2.477 A	N_7**	358 eV	34.6 A
M_3*	4176 eV	2.969 A			
M_5**	3442 eV	3.602 A			





For E < 400 eV -------- (1)

References:

XI. Low-Energy X-Ray Interaction Coefficient Tables

See page 19 for Explanation of Tables

TABLE I. PHOTOABSORPTION CROSS SECTION, μ
ATOMIC SCATTERING FACTOR, $f_1 + if_2$

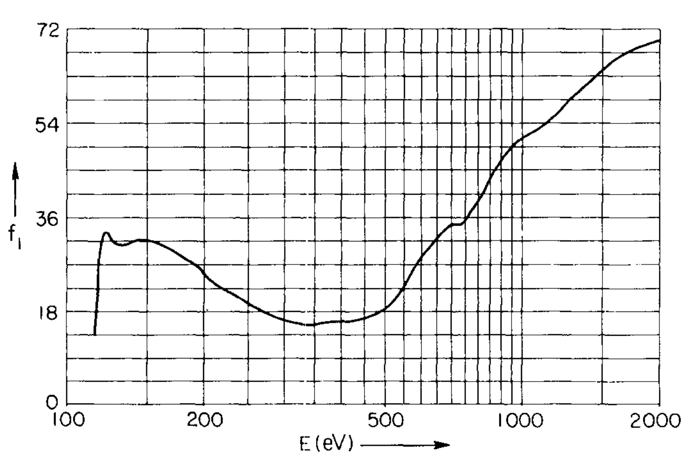
Atomic Weight = 238.0   Z = 92

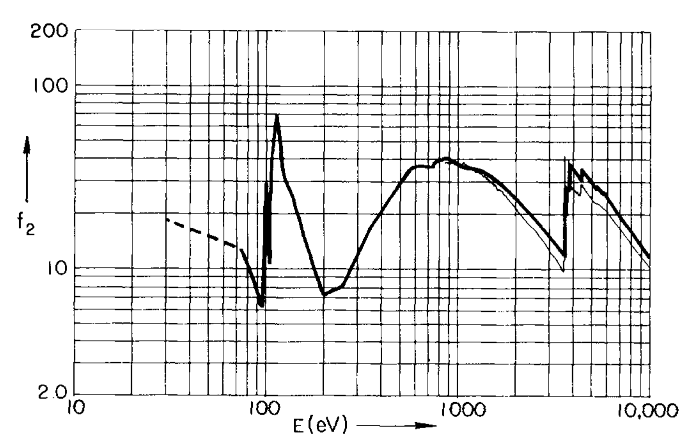
μ(barns/atom) = μ(cm^2/gm) x 395.2   URANIUM (U)
$E\mu(E)$ = 176.7 f_2 keVcm^2/gm

LINE	E(eV)	μ(cm^2/gm)	f_1	f_2	λ(A)	LINE	E(eV)	μ(cm^2/gm)	f_1	f_2	λ(A)
Na $L_{2,3}M$	30.5	9.38 04		16.16	407.1	Co Lα	776.2	8.90 03	37.61	39.11	16.0
Mg $L_{2,3}M$	49.3	5.11 04		14.25	251.5	Ni Lα	851.5	8.42 03	43.26	40.57	14.56
Al $L_{2,3}M$	72.4	3.15 04		12.89	171.4	Cu Lα	929.7	7.36 03	48.36	38.71	13.33
Si $L_{2,3}M$	91.5	1.28 04		6.65	135.5	Zn Lα	1011.7	6.40 03	51.49	36.61	12.25
Be K	108.5	7.64 04	-16.23	46.90	114.	Na Kα	1041.0	6.09 03	52.01	35.88	11.91
Sr Mζ	114.0	1.01 05	14.38	65.18	108.7	Ge Lα	1188.0	5.27 03	55.64	35.40	10.44
Y Mζ	132.8	3.48 04	31.94	26.19	93.4	Mg Kα	1253.6	4.96 03	57.77	35.20	9.89
S Lℓ	148.7	2.22 04	32.71	18.68	83.4	Al Kα	1486.7	3.81 03	63.86	32.03	8.34
Zr Mζ	151.1	2.06 04	32.80	17.60	82.1	Si Kα	1740.0	2.80 03	67.72	27.54	7.13
Nb Mζ	171.7	1.18 04	30.27	11.44	72.2	Zr Lα	2042.4	2.01 03	69.75	23.28	6.07
B Kα	183.3	9.02 03	28.71	9.36	67.6	Nb Lα	2165.9	1.78 03		21.82	5.73
Mo Mζ	192.6	7.38 03	27.27	8.04	64.4	Mo Lα	2293.2	1.58 03		20.44	5.41
W N_5N_7	212.2	6.15 03	23.75	7.38	58.4	Cl Kα	2622.4	1.17 03		17.41	4.73
C Kα	277.0	6.44 03	17.77	10.09	44.7	Ag Lα	2984.3	8.74 02		14.76	4.16
Ag Mζ	311.7	7.43 03	16.21	13.11	39.8	Ca Kα	3691.7	1.29 03		26.99	3.36
N Kα	392.4	9.03 03	16.30	20.06	31.6	Ba Lα	4466.3	1.32 03		33.43	2.78
Ti Lℓ	395.3	9.06 03	16.26	20.27	31.4	Ti Kα	4510.8	1.29 03		32.93	2.75
Ti Lα	452.2	9.94 03	17.00	25.44	27.4	V Kα	4952.2	1.02 03		28.62	2.50
V Lα	511.3	1.09 04	19.61	31.40	24.3	Cr Kα	5414.7	8.70 02		26.66	2.29
O Kα	524.9	1.11 04	20.70	32.85	23.6	Mn Kα	5898.8	7.35 02		24.52	2.10
Mn Lℓ	556.3	1.13 04	24.04	35.60	22.3	Co Kα	6930.3	4.93 02		19.31	1.79
Cr Lα	572.8	1.11 04	26.10	36.04	21.6	Ni Kα	7478.2	4.07 02		17.21	1.66
Mn Lα	637.4	1.02 04	31.53	36.64	19.5	Cu Kα	8047.8	3.38 02		15.38	1.54
F Kα	676.8	9.49 03	33.88	36.35	18.3	Zn Kα	8638.9	2.82 02		13.78	1.44
Fe Lα	705.0	9.09 03	35.02	36.28	17.6	Ge Kα	9886.4	2.00 02		11.17	1.25

ABSORPTION EDGE

M_1*	5553 eV	2.393 A	N_5**	740 eV	16.8 A
M_3	4299 eV	2.884 A			
M_4	3720 eV	3.333 A			
M_5	3545 eV	3.497 A			





For 76 eV < E < 130 eV ———— (123)
For 130 eV < E < 450 eV ———— (84)
For E < 76 eV - - - - - - - (1)
———— (140)

References: 84, 123, 140

XI. Low-Energy X-Ray Interaction Coefficient Tables

See page 19 for Explanation of Tables

TABLE I. PHOTOABSORPTION CROSS SECTION, μ
ATOMIC SCATTERING FACTOR, $f_1 + if_2$

Atomic Weight = 237.0 Z = 93

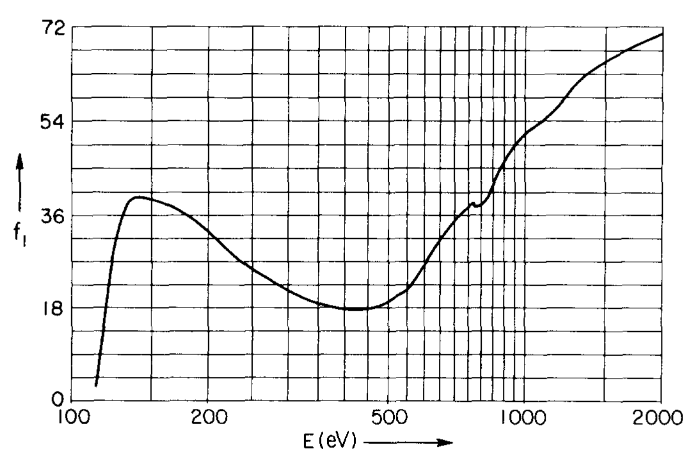
μ(barns/atom) = μ(cm^2/gm) x 393.6 NEPTUNIUM (Np)
$E\mu(E)$ = 177.4 f_2 keVcm^2/gm

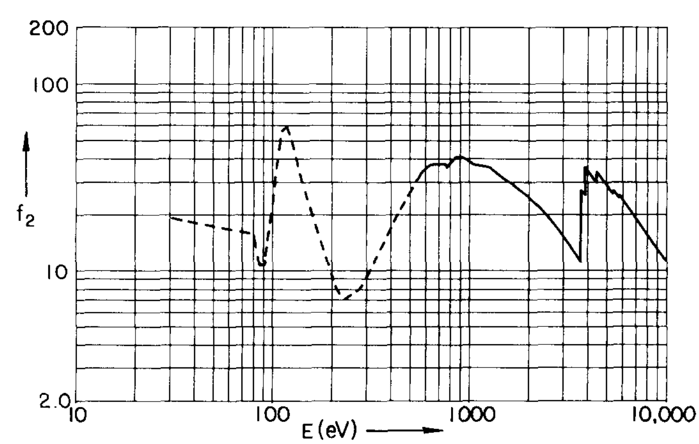
LINE	E(eV)	μ(cm^2/gm)	f_1	f_2	λ(A)
Na $L_{2,3}M$	30.5	1.11 05		19.00	407.1
Mg $L_{2,3}M$	49.3	6.25 04		17.35	251.5
Al $L_{2,3}M$	72.4	3.95 04		16.13	171.4
Si $L_{2,3}M$	91.5	2.16 04		11.16	135.5
Be K	108.5	7.87 04	-18.03	48.12	114.
Sr Mζ	114.0	9.04 04	4.80	58.09	108.7
Y Mζ	132.8	5.27 04	38.77	39.45	93.4
S Lℓ	148.7	2.99 04	39.66	25.03	83.4
Zr Mζ	151.1	2.78 04	39.55	23.66	82.1
Nb Mζ	171.7	1.58 04	37.19	15.30	72.2
B Kα	183.3	1.19 04	35.57	12.30	67.6
Mo Mζ	192.6	9.60 03	34.19	10.42	64.4
W N_5N_7	212.2	6.54 03	30.78	7.82	58.4
C Kα	277.0	5.18 03	23.14	8.09	44.7
Ag Mζ	311.7	5.80 03	20.61	10.19	39.8
N Kα	392.4	7.56 03	17.72	16.71	31.6
Ti Lℓ	395.3	7.62 03	17.66	16.98	31.4
Ti Lα	452.2	8.79 03	17.78	22.39	27.4
V Lα	511.3	9.85 03	19.54	28.38	24.3
O Kα	524.9	9.83 03	20.60	29.06	23.6
Mn Lℓ	556.3	1.04 04	21.76	32.52	22.3
Cr Lα	572.8	1.07 04	23.32	34.44	21.6
Mn Lα	637.4	1.05 04	29.82	37.65	19.5
F Kα	676.8	9.87 03	33.41	37.63	18.3
Fe Lα	705.0	9.45 03	35.28	37.52	17.6

LINE	E(eV)	μ(cm^2/gm)	f_1	f_2	λ(A)
Co Lα	776.2	8.28 03	38.40	36.23	16.0
Ni Lα	851.5	8.66 03	41.55	41.53	14.56
Cu Lα	929.7	7.70 03	47.95	40.35	13.33
Zn Lα	1011.7	6.73 03	51.96	38.34	12.25
Na Kα	1041.0	6.40 03	52.75	37.53	11.91
Ge Lα	1188.0	5.48 03	57.05	36.68	10.44
Mg Kα	1253.6	5.14 03	59.48	36.32	9.89
Al Kα	1486.7	3.77 03	65.09	31.55	8.34
Si Kα	1740.0	2.87 03	68.35	28.16	7.13
Zr Lα	2042.4	2.12 03	70.87	24.40	6.07
Nb Lα	2165.9	1.88 03		23.00	5.73
Mo Lα	2293.2	1.67 03		21.63	5.41
Cl Kα	2622.4	1.25 03		18.47	4.73
Ag Lα	2984.3	9.24 02		15.53	4.16
Ca Kα	3691.7	1.32 03		27.40	3.36
Ba Lα	4466.3	1.36 03		34.20	2.78
Ti Kα	4510.8	1.33 03		33.69	2.75
V Kα	4952.2	1.05 03		29.28	2.50
Cr Kα	5414.7	8.89 02		27.14	2.29
Mn Kα	5898.8	7.48 02		24.85	2.10
Co Kα	6930.3	5.03 02		19.63	1.79
Ni Kα	7478.2	4.15 02		17.50	1.66
Cu Kα	8047.8	3.45 02		15.64	1.54
Zn Kα	8638.9	2.88 02		14.02	1.44
Ge Kα	9886.4	2.04 02		11.36	1.25

ABSORPTION EDGE

M_5** 3664 eV 3.38 A N_7** 404 eV 30.7 A





For E < 550 eV ------- (1)

References:

XI. Low-Energy X-Ray Interaction Coefficient Tables

See page 19 for Explanation of Tables

TABLE I. PHOTOABSORPTION CROSS SECTION, μ
ATOMIC SCATTERING FACTOR, $f_1 + if_2$

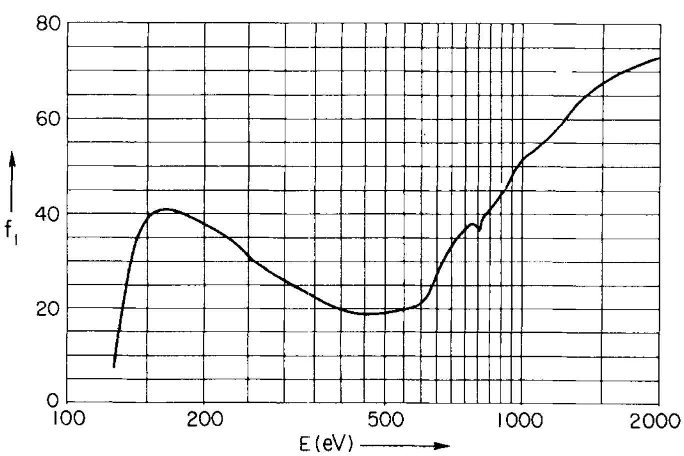
Atomic Weight = 244 Z = 94

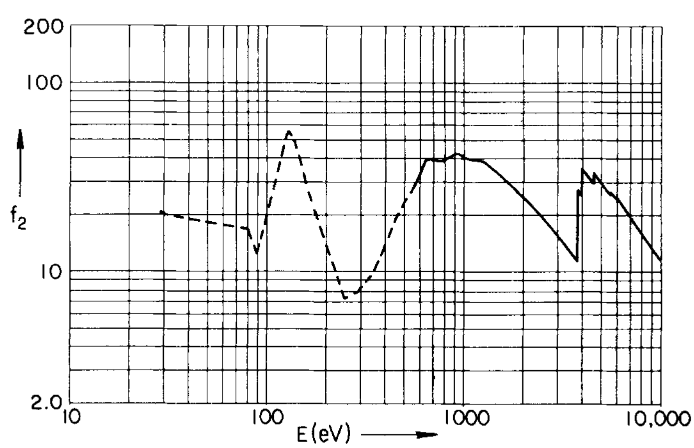
μ(barns/atom) = μ(cm^2/gm) x 405.1 PLUTONIUM (Pu)
Eμ(E) = 172.4 f_2 keVcm^2/gm

LINE	E(eV)	μ(cm^2/gm)	f_1	f_2	λ(A)	LINE	E(eV)	μ(cm^2/gm)	f_1	f_2	λ(A)
Na $L_{2,3}M$	30.5	1.15 05		20.36	407.1	Co Lα	776.2	8.70 03	38.36	39.19	16.0
Mg $L_{2,3}M$	49.3	6.58 04		18.80	251.5	Ni Lα	851.5	8.40 03	41.22	41.49	14.56
Al $L_{2,3}M$	72.4	4.20 04		17.65	171.4	Cu Lα	929.7	8.07 03	46.84	43.52	13.33
Si $L_{2,3}M$	91.5	2.64 04		13.99	135.5	Zn Lα	1011.7	7.04 03	52.11	41.28	12.25
Be K	108.5	4.55 04	-5.57	28.64	114.	Na Kα	1041.0	6.69 03	53.08	40.41	11.91
Sr Mζ	114.0	5.39 04	-4.93	35.66	108.7	Ge Lα	1188.0	5.74 03	58.10	39.57	10.44
Y Mζ	132.8	6.93 04	23.30	53.40	93.4	Mg Kα	1253.6	5.39 03	60.89	39.21	9.89
S Lℓ	148.7	4.43 04	39.29	38.20	83.4	Al Kα	1486.7	3.92 03	67.47	33.82	8.34
Zr Mζ	151.1	4.11 04	40.05	36.05	82.1	Si Kα	1740.0	2.89 03	70.97	29.15	7.13
Nb Mζ	171.7	2.28 04	41.21	22.71	72.2	Zr Lα	2042.4	2.09 03	73.15	24.72	6.07
B Kα	183.3	1.72 04	39.85	18.26	67.6	Nb Lα	2165.9	1.85 03		23.19	5.73
Mo Mζ	192.6	1.41 04	38.86	15.73	64.4	Mo Lα	2293.2	1.64 03		21.75	5.41
W N_5N_7	212.2	9.55 03	36.64	11.75	58.4	Cl Kα	2622.4	1.22 03		18.60	4.73
C Kα	277.0	4.88 03	28.10	7.85	44.7	Ag Lα	2984.3	9.14 02		15.83	4.16
Ag Mζ	311.7	4.86 03	25.31	8.79	39.8	Ca Kα	3691.7	5.53 02		11.84	3.36
N Kα	392.4	5.99 03	20.16	13.64	31.6	Ba Lα	4466.3	1.18 03		30.51	2.78
Ti Lℓ	395.3	6.06 03	20.05	13.89	31.4	Ti Kα	4510.8	1.15 03		30.07	2.75
Ti Lα	452.2	7.42 03	18.85	19.47	27.4	V Kα	4952.2	1.06 03		30.52	2.50
V Lα	511.3	8.33 03	19.44	24.72	24.3	Cr Kα	5414.7	8.52 02		26.74	2.29
O Kα	524.9	8.53 03	19.62	25.97	23.6	Mn Kα	5898.8	7.28 02		24.91	2.10
Mn Lℓ	556.3	8.98 03	20.20	28.99	22.3	Co Kα	6930.3	5.09 02		20.45	1.79
Cr Lα	572.8	9.22 03	20.50	30.63	21.6	Ni Kα	7478.2	4.20 02		18.23	1.66
Mn Lα	637.4	1.08 04	25.67	39.87	19.5	Cu Kα	8047.8	3.49 02		16.29	1.54
F Kα	676.8	1.03 04	31.18	40.42	18.3	Zn Kα	8638.9	2.91 02		14.59	1.44
Fe Lα	705.0	9.93 03	34.03	40.61	17.6	Ge Kα	9886.4	2.06 02		11.82	1.25

ABSORPTION EDGE

M_1*	5926 eV	2.092 A	N_7**	428 eV	29.0 A
M_2*	5549 eV	2.234 A			
M_5**	3778 eV	3.28 A			





For E < 550 eV ------ (1)

References:

XI. Low-Energy X-Ray Interaction Coefficient Tables

See page 19 for Explanation of Tables

TABLE II. SPECULAR REFLECTIVITY, P(%) BERYLLIUM

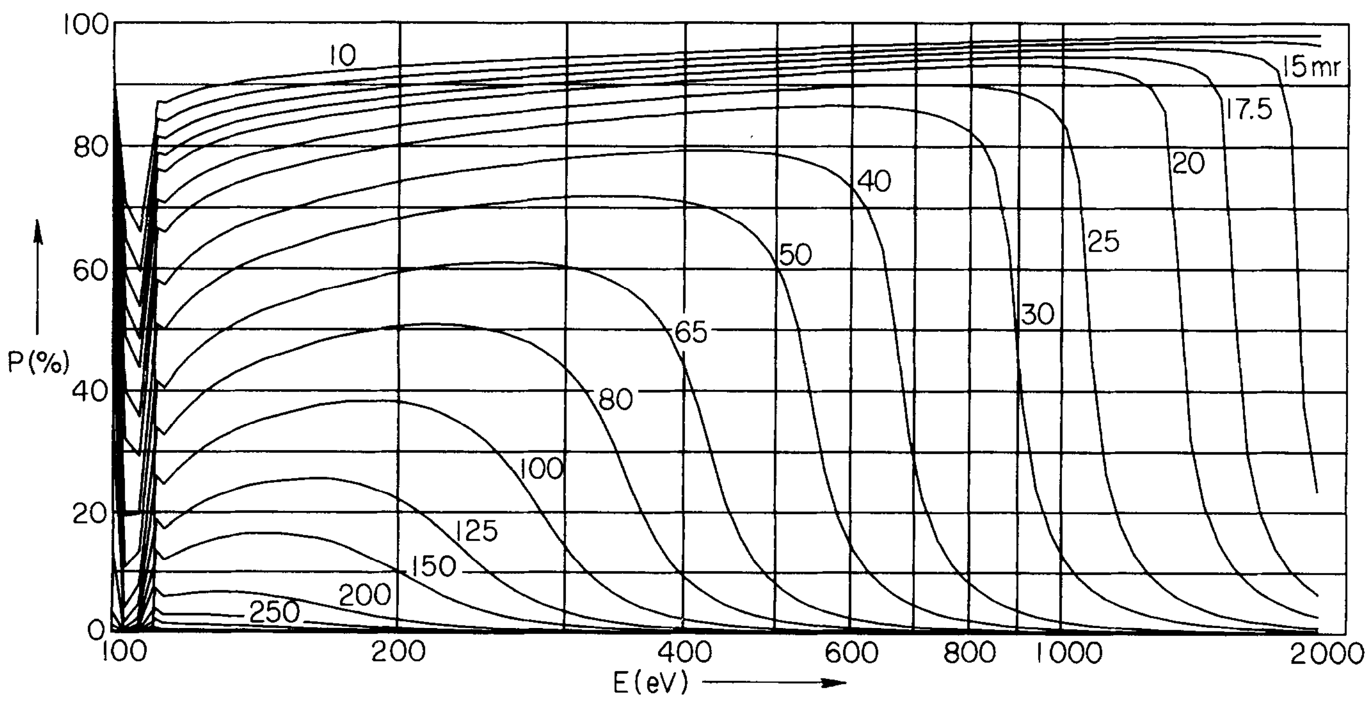
Assumed Mirror Density, ρ = 1.85 gm/cm^3

GRAZING INCIDENCE ANGLE, θ (milliradians)

E(eV)	10	12.5	15	17.5	20	25	30	40	50	65	λ(A)
108.5	73.7	68.3	63.4	58.7	54.5	46.9	40.4	30.1	22.5	14.8	114.
151.1	91.5	89.5	87.6	85.6	83.7	80.0	76.5	69.7	63.4	54.5	82.1
183.3	92.8	91.1	89.4	87.7	86.0	82.8	79.6	73.4	67.5	58.8	67.6
192.6	93.1	91.4	89.8	88.2	86.6	83.5	80.4	74.4	68.5	59.9	64.4
277.0	94.3	92.9	91.5	90.1	88.7	86.0	83.2	77.5	71.4	61.1	44.7
392.4	95.2	94.0	92.8	91.6	90.3	87.8	85.1	78.9	70.8	46.8	31.6
452.2	95.6	94.5	93.4	92.2	91.1	88.6	85.9	79.0	67.8	18.4	27.4
524.9	96.0	95.0	94.0	92.9	91.7	89.3	86.4	77.9	51.7	5.86	23.6
572.8	96.3	95.3	94.3	93.2	92.1	89.6	86.5	75.6	23.2	3.38	21.6
676.8	96.7	95.8	94.9	93.9	92.8	90.1	86.2	44.5	5.88	1.34	18.3
705.0	96.8	95.9	95.0	93.9	92.8	90.0	85.7	26.5	4.51	1.09	17.6
776.2	97.0	96.2	95.3	94.2	93.1	89.9	83.7	10.6	2.54	6.73-01	16.0
851.5	97.2	96.4	95.5	94.5	93.3	89.5	76.1	5.41	1.53	4.33-01	14.56
929.7	97.4	96.6	95.7	94.6	93.3	88.0	28.4	3.14	9.76-01	2.88-01	13.33
1011.7	97.5	96.8	95.9	94.7	93.1	82.9	12.0	1.95	6.45-01	1.97-01	12.25
1041.0	97.6	96.8	95.9	94.7	93.0	76.3	9.56	1.68	5.63-01	1.73-01	11.91
1188.0	97.8	97.1	96.1	94.6	91.5	14.1	3.91	8.55-01	3.04-01	9.70-02	10.44
1253.6	97.9	97.1	96.1	94.3	88.9	9.06	2.84	6.59-01	2.39-01	7.69-02	9.89
1486.7	98.1	97.3	95.7	84.8	13.5	2.99	1.14	2.98-01	1.12-01	3.72-02	8.34
1740.0	98.2	97.1	85.8	10.9	4.36	1.28	5.34-01	1.48-01	5.73-02	1.92-02	7.13

GRAZING INCIDENCE ANGLE, θ (milliradians)

E(eV)	80	100	125	150	200	250	300	400	500	(45°) 785	λ(A)
108.5	9.89	5.95	3.31	1.94	7.60-01	3.42-01	1.72-01	5.43-02	2.14-02	3.68-03	114.
151.1	46.4	36.4	25.5	16.5	5.75	2.09	8.98-01	2.38-01	8.55-02	1.31-02	82.1
183.3	50.3	38.9	25.0	13.2	3.23	1.07	4.50-01	1.19-01	4.30-02	6.65-03	67.6
192.6	51.2	39.2	24.0	11.6	2.63	8.70-01	3.68-01	9.79-02	3.54-02	5.49-03	64.4
277.0	47.7	22.6	5.60	2.02	4.91-01	1.77-01	7.83-02	2.18-02	8.06-03	1.28-03	44.7
392.4	10.9	2.68	8.52-01	3.62-01	1.01-01	3.83-02	1.74-02	4.98-03	1.86-03	3.01-04	31.6
452.2	4.18	1.24	4.28-01	1.88-01	5.39-02	2.08-02	9.51-03	2.74-03	1.03-03	1.66-04	27.4
524.9	1.77	5.91-01	2.14-01	9.66-02	2.83-02	1.10-02	5.05-03	1.46-03	5.50-04	8.94-05	23.6
572.8	1.12	3.90-01	1.44-01	6.58-02	1.94-02	7.59-03	3.50-03	1.01-03	3.82-04	6.21-05	21.6
676.8	4.93-01	1.81-01	6.91-02	3.20-02	9.58-03	3.76-03	1.74-03	5.06-04	1.91-04	3.11-05	18.3
705.0	4.06-01	1.51-01	5.79-02	2.68-02	8.07-03	3.17-03	1.47-03	4.27-04	1.61-04	2.63-05	17.6
776.2	2.60-01	9.85-02	3.82-02	1.78-02	5.39-03	2.12-03	9.84-04	2.87-04	1.08-04	1.77-05	16.0
851.5	1.71-01	6.58-02	2.58-02	1.21-02	3.66-03	1.44-03	6.71-04	1.96-04	7.39-05	1.21-05	14.56
929.7	1.16-01	4.51-02	1.78-02	8.35-03	2.54-03	1.00-03	4.67-04	1.36-04	5.15-05	8.41-06	13.33
1011.7	8.04-02	3.14-02	1.25-02	5.87-03	1.79-03	7.09-04	3.30-04	9.62-05	3.64-05	5.95-06	12.25
1041.0	7.10-02	2.79-02	1.11-02	5.21-03	1.59-03	6.30-04	2.93-04	8.56-05	3.24-05	5.29-06	11.91
1188.0	4.04-02	1.60-02	6.38-03	3.02-03	9.25-04	3.67-04	1.71-04	4.99-05	1.89-05	3.08-06	10.44
1253.6	3.21-02	1.28-02	5.11-03	2.42-03	7.42-04	2.94-04	1.37-04	4.00-05	1.51-05	2.48-06	9.89
1486.7	1.57-02	6.30-03	2.53-03	1.20-03	3.70-04	1.47-04	6.84-05	2.00-05	7.57-06	1.24-06	8.34
1740.0	8.20-03	3.30-03	1.33-03	6.33-04	1.95-04	7.75-05	3.61-05	1.06-05	4.00-06	6.54-07	7.13



XI. Low-Energy X-Ray Interaction Coefficient Tables

See page 19 for Explanation of Tables

TABLE II. SPECULAR REFLECTIVITY, P(%) CARBON

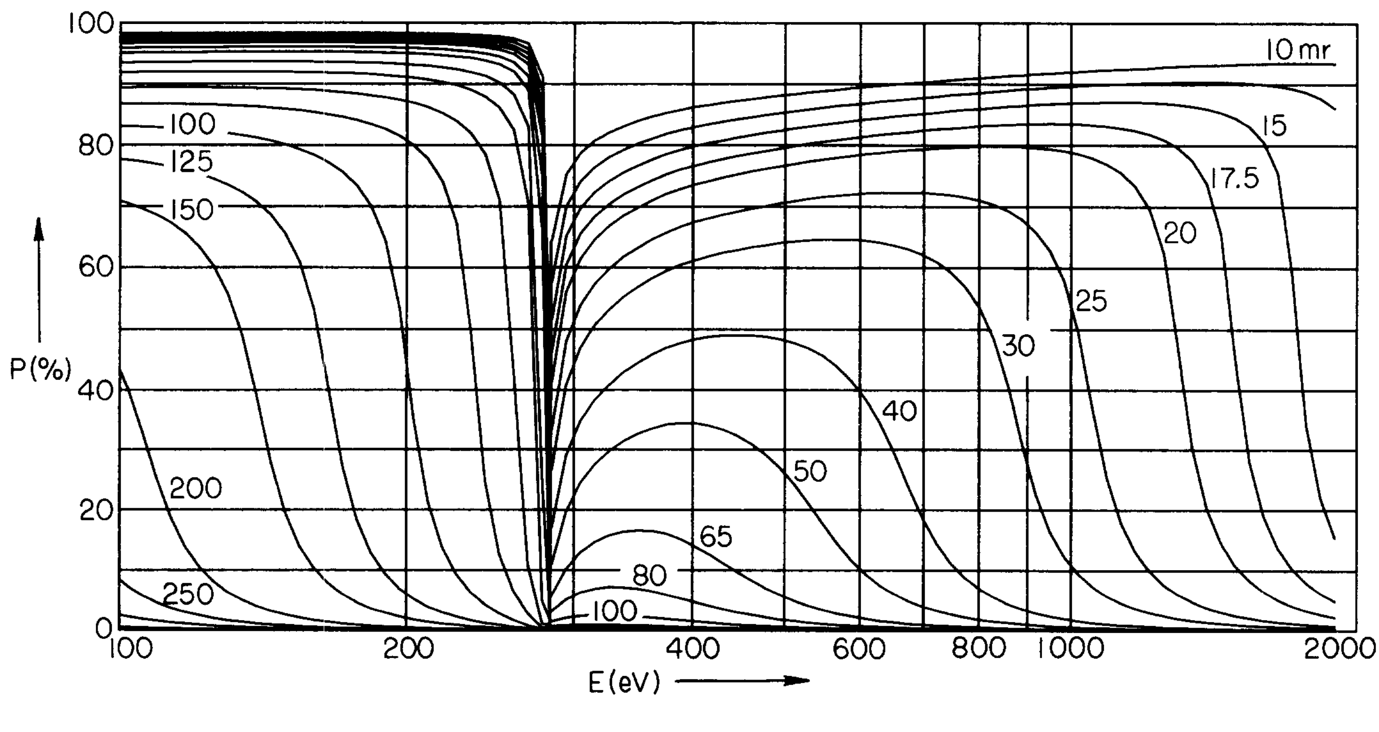
Assumed Mirror Density, ρ = 1.54 gm/cm^3

GRAZING INCIDENCE ANGLE, θ (milliradians)

E(eV)	10	12.5	15	17.5	20	25	30	40	50	65	λ(A)
108.5	98.4	98.0	97.6	97.2	96.8	96.0	95.2	93.7	92.0	89.5	114.
151.1	98.5	98.1	97.7	97.3	96.9	96.1	95.3	93.7	92.0	89.2	82.1
183.3	98.4	98.1	97.7	97.3	96.9	96.1	95.2	93.5	91.6	88.2	67.6
192.6	98.4	98.0	97.6	97.2	96.8	96.0	95.2	93.4	91.4	87.7	64.4
277.0	93.3	91.6	89.8	87.9	85.9	81.3	75.4	51.0	9.78	1.99	44.7
392.4	86.0	82.7	79.5	76.3	73.2	67.0	60.7	48.0	34.5	14.9	31.6
452.2	87.5	84.5	81.5	78.5	75.5	69.4	63.1	49.1	31.8	9.19	27.4
524.9	88.7	85.9	83.1	80.2	77.3	71.2	64.5	47.2	22.0	4.35	23.6
572.8	89.2	86.6	83.8	81.1	78.2	71.9	64.7	43.5	13.8	2.75	21.6
676.8	90.2	87.7	85.1	82.3	79.3	72.4	63.0	23.5	4.88	1.18	18.3
705.0	90.4	87.9	85.3	82.6	79.5	72.3	61.9	17.5	3.84	9.64-01	17.6
776.2	90.9	88.5	85.9	83.1	79.9	71.5	56.8	8.62	2.24	6.08-01	16.0
851.5	91.4	89.0	86.4	83.4	79.9	69.6	43.0	4.69	1.38	3.94-01	14.56
929.7	91.8	89.4	86.7	83.6	79.6	65.1	20.6	2.79	8.85-01	2.64-01	13.33
1011.7	92.1	89.8	87.0	83.5	78.8	52.2	10.1	1.76	5.88-01	1.81-01	12.25
1041.0	92.2	89.9	87.1	83.5	78.3	42.6	8.15	1.51	5.13-01	1.59-01	11.91
1188.0	92.7	90.3	87.1	82.2	72.1	11.7	3.46	7.76-01	2.78-01	8.90-02	10.44
1253.6	92.9	90.4	86.9	81.0	62.9	7.76	2.53	5.98-01	2.18-01	7.05-02	9.89
1486.7	93.4	90.4	84.6	47.8	11.2	2.65	1.03	2.71-01	1.03-01	3.40-02	8.34
1740.0	93.5	89.1	45.6	9.11	3.79	1.14	4.81-01	1.34-01	5.20-02	1.75-02	7.13

GRAZING INCIDENCE ANGLE, θ (milliradians)

E(eV)	80	100	125	150	200	250	300	400	500	(45°) 785	λ(A)
108.5	86.9	83.0	77.1	69.0	27.5	4.99	1.71	3.91-01	1.33-01	1.93-02	114.
151.1	85.9	79.9	64.3	17.6	2.46	7.66-01	3.18-01	8.37-02	3.02-02	4.66-03	82.1
183.3	83.5	70.4	13.4	3.77	8.12-01	2.82-01	1.23-01	3.36-02	1.23-02	1.95-03	67.6
192.6	82.3	61.5	8.49	2.69	6.14-01	2.17-01	9.53-02	2.63-02	9.70-03	1.54-03	64.4
277.0	7.07-01	2.55-01	9.61-02	4.42-02	1.32-02	5.16-03	2.39-03	6.93-04	2.61-04	4.25-05	44.7
392.4	5.18	1.66	5.77-01	2.54-01	7.28-02	2.80-02	1.28-02	3.69-03	1.38-03	2.24-04	31.6
452.2	2.87	9.38-01	3.35-01	1.50-01	4.35-02	1.68-02	7.73-03	2.23-03	8.38-04	1.36-04	27.4
524.9	1.44	4.95-01	1.82-01	8.28-02	2.44-02	9.50-03	4.38-03	1.27-03	4.77-04	7.76-05	23.6
572.8	9.52-01	3.38-01	1.26-01	5.79-02	1.72-02	6.71-03	3.10-03	8.99-04	3.39-04	5.51-05	21.6
676.8	4.40-01	1.63-01	6.25-02	2.90-02	8.70-03	3.42-03	1.58-03	4.61-04	1.74-04	2.83-05	18.3
705.0	3.66-01	1.36-01	5.26-02	2.44-02	7.36-03	2.89-03	1.34-03	3.90-04	1.47-04	2.40-05	17.6
776.2	2.37-01	9.00-02	3.50-02	1.64-02	4.95-03	1.95-03	9.05-04	2.64-04	9.96-05	1.63-05	16.0
851.5	1.57-01	6.04-02	2.37-02	1.11-02	3.38-03	1.33-03	6.19-04	1.81-04	6.82-05	1.11-05	14.56
929.7	1.07-01	4.15-02	1.64-02	7.71-03	2.35-03	9.29-04	4.32-04	1.26-04	4.76-05	7.78-06	13.33
1011.7	7.40-02	2.90-02	1.15-02	5.42-03	1.66-03	6.56-04	3.05-04	8.90-05	3.37-05	5.50-06	12.25
1041.0	6.54-02	2.57-02	1.02-02	4.82-03	1.47-03	5.83-04	2.71-04	7.92-05	2.99-05	4.89-06	11.91
1188.0	3.71-02	1.47-02	5.88-03	2.78-03	8.53-04	3.38-04	1.57-04	4.60-05	1.74-05	2.85-06	10.44
1253.6	2.96-02	1.18-02	4.70-03	2.23-03	6.84-04	2.71-04	1.26-04	3.69-05	1.40-05	2.28-06	9.89
1486.7	1.44-02	5.77-03	2.32-03	1.10-03	3.39-04	1.35-04	6.27-05	1.83-05	6.94-06	1.14-06	8.34
1740.0	7.47-03	3.01-03	1.21-03	5.77-04	1.78-04	7.07-05	3.29-05	9.64-06	3.65-06	5.97-07	7.13



XI. Low-Energy X-Ray Interaction Coefficient Tables

See page 19 for Explanation of Tables

TABLE II. SPECULAR REFLECTIVITY, P(%) FUSED QUARTZ

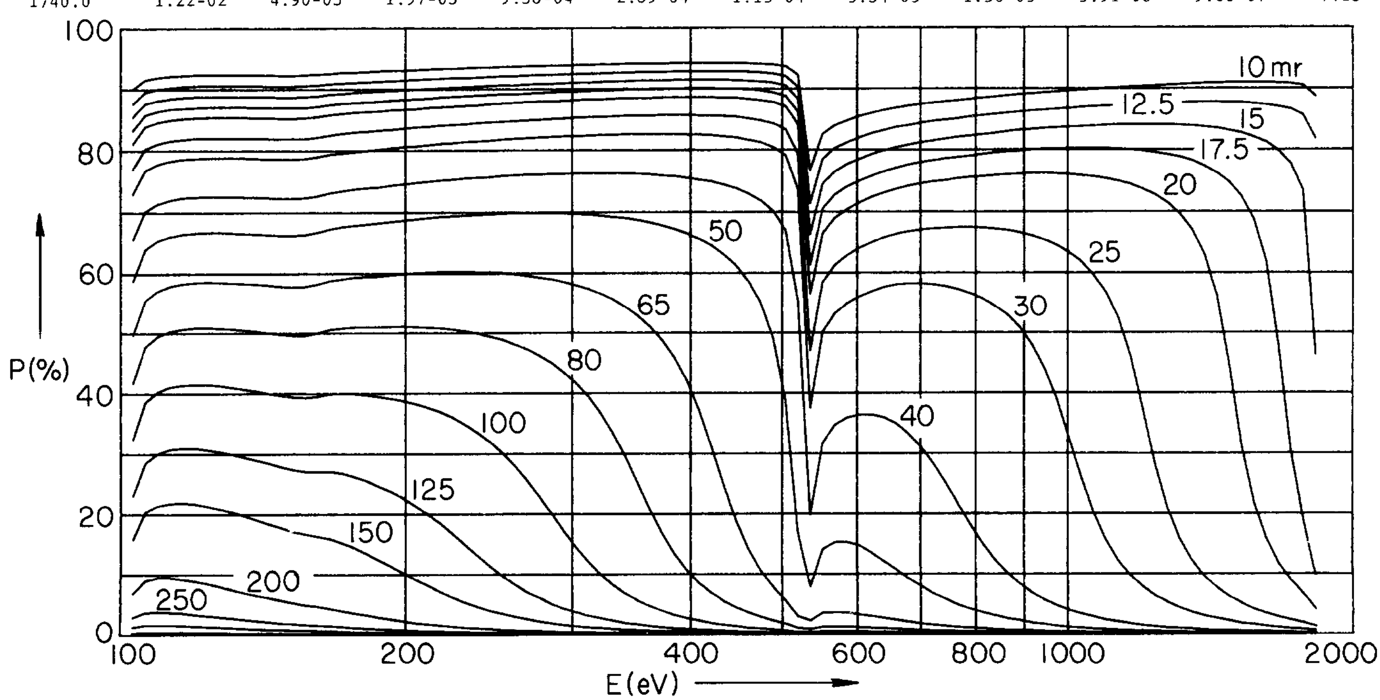
Assumed Mirror Density, ρ = 2.20 gm/cm^3

GRAZING INCIDENCE ANGLE, θ (milliradians)

E(eV)	10	12.5	15	17.5	20	25	30	40	50	65	λ(A)
108.5	92.0	90.1	88.3	86.4	84.6	81.1	77.8	71.4	65.4	57.1	114.
151.1	92.4	90.6	88.8	87.0	85.3	81.9	78.7	72.4	66.4	57.9	82.1
183.3	93.0	91.4	89.7	88.1	86.5	83.3	80.2	74.2	68.4	59.9	67.6
192.6	93.2	91.5	89.9	88.3	86.8	83.6	80.6	74.7	68.8	60.2	64.4
277.0	94.0	92.5	91.0	89.6	88.1	85.3	82.4	76.5	70.3	59.8	44.7
392.4	94.4	93.0	91.7	90.3	88.8	85.9	82.9	76.0	67.3	44.3	31.6
452.2	94.4	93.0	91.6	90.2	88.7	85.6	82.2	74.0	61.1	17.4	27.4
524.9	92.2	90.3	88.2	86.2	84.0	79.2	73.5	55.2	17.2	3.03	23.6
572.8	83.8	79.9	76.1	72.4	68.6	60.8	52.6	34.3	15.4	3.72	21.6
676.8	87.0	83.8	80.5	77.2	73.8	66.4	57.8	33.4	9.60	2.12	18.3
705.0	87.3	84.1	80.9	77.6	74.2	66.6	57.6	30.4	7.78	1.77	17.6
776.2	88.1	85.1	81.9	78.7	75.2	67.1	56.6	20.4	4.62	1.14	16.0
851.5	88.8	85.9	82.8	79.5	75.9	67.1	53.7	11.3	2.82	7.45-01	14.56
929.7	89.3	86.4	83.3	79.9	76.0	65.7	46.4	6.40	1.78	4.99-01	13.33
1011.7	89.7	86.9	83.8	80.2	76.0	63.1	31.3	3.84	1.17	3.40-01	12.25
1041.0	89.9	87.0	83.9	80.2	75.8	61.5	25.0	3.26	1.01	2.99-01	11.91
1188.0	90.4	87.6	84.2	80.0	74.1	41.6	8.64	1.58	5.36-01	1.66-01	10.44
1253.6	90.6	87.7	84.2	79.5	72.4	25.5	5.95	1.20	4.16-01	1.31-01	9.89
1486.7	91.1	87.8	83.2	74.7	44.2	6.12	2.10	5.10-01	1.88-01	6.10-02	8.34
1740.0	90.8	86.5	77.0	26.9	8.24	2.13	8.46-01	2.27-01	8.65-02	2.88-02	7.13

GRAZING INCIDENCE ANGLE, θ (milliradians)

E(eV)	80	100	125	150	200	250	300	400	500	(45°) 785	λ(A)
108.5	49.5	40.2	30.1	21.6	9.54	3.89	1.71	4.54-01	1.62-01	2.45-02	114.
151.1	49.8	39.6	27.7	17.4	5.45	1.86	7.81-01	2.04-01	7.31-02	1.12-02	82.1
183.3	51.4	40.0	25.6	13.3	3.16	1.04	4.36-01	1.15-01	4.17-02	6.44-03	67.6
192.6	51.6	39.6	24.2	11.7	2.62	8.65-01	3.65-01	9.72-02	3.52-02	5.45-03	64.4
277.0	46.8	23.4	6.07	2.18	5.27-01	1.89-01	8.37-02	2.33-02	8.60-03	1.37-03	44.7
392.4	11.8	2.89	9.13-01	3.87-01	1.07-01	4.07-02	1.85-02	5.29-03	1.98-03	3.19-04	31.6
452.2	4.15	1.24	4.28-01	1.89-01	5.40-02	2.08-02	9.52-03	2.74-03	1.03-03	1.67-04	27.4
524.9	1.03	3.62-01	1.35-01	6.15-02	1.82-02	7.12-03	3.28-03	9.52-04	3.59-04	5.84-05	23.6
572.8	1.30	4.57-01	1.70-01	7.76-02	2.30-02	8.96-03	4.13-03	1.20-03	4.51-04	7.34-05	21.6
676.8	7.59-01	2.74-01	1.04-01	4.76-02	1.42-02	5.56-03	2.57-03	7.46-04	2.81-04	4.58-05	18.3
705.0	6.42-01	2.34-01	8.88-02	4.10-02	1.22-02	4.80-03	2.22-03	6.45-04	2.43-04	3.96-05	17.6
776.2	4.28-01	1.59-01	6.10-02	2.83-02	8.50-03	3.34-03	1.55-03	4.50-04	1.70-04	2.77-05	16.0
851.5	2.87-01	1.08-01	4.21-02	1.96-02	5.92-03	2.33-03	1.08-03	3.15-04	1.19-04	1.94-05	14.56
929.7	1.97-01	7.52-02	2.94-02	1.38-02	4.17-03	1.64-03	7.63-04	2.22-04	8.40-05	1.37-05	13.33
1011.7	1.36-01	5.27-02	2.07-02	9.73-03	2.96-03	1.17-03	5.43-04	1.58-04	5.99-05	9.78-06	12.25
1041.0	1.21-01	4.67-02	1.84-02	8.66-03	2.63-03	1.04-03	4.84-04	1.41-04	5.33-05	8.72-06	11.91
1188.0	6.81-02	2.67-02	1.06-02	5.01-03	1.53-03	6.06-04	2.82-04	8.23-05	3.11-05	5.09-06	10.44
1253.6	5.40-02	2.13-02	8.47-03	4.00-03	1.22-03	4.85-04	2.26-04	6.59-05	2.49-05	4.08-06	9.89
1486.7	2.56-02	1.02-02	4.09-03	1.94-03	5.95-04	2.36-04	1.10-04	3.22-05	1.22-05	1.99-06	8.34
1740.0	1.22-02	4.90-03	1.97-03	9.38-04	2.89-04	1.15-04	5.34-05	1.56-05	5.91-06	9.68-07	7.13



XI. Low-Energy X-Ray Interaction Coefficient Tables

See page 19 for Explanation of Tables

TABLE II. SPECULAR REFLECTIVITY, P(%) ALUMINUM OXIDE

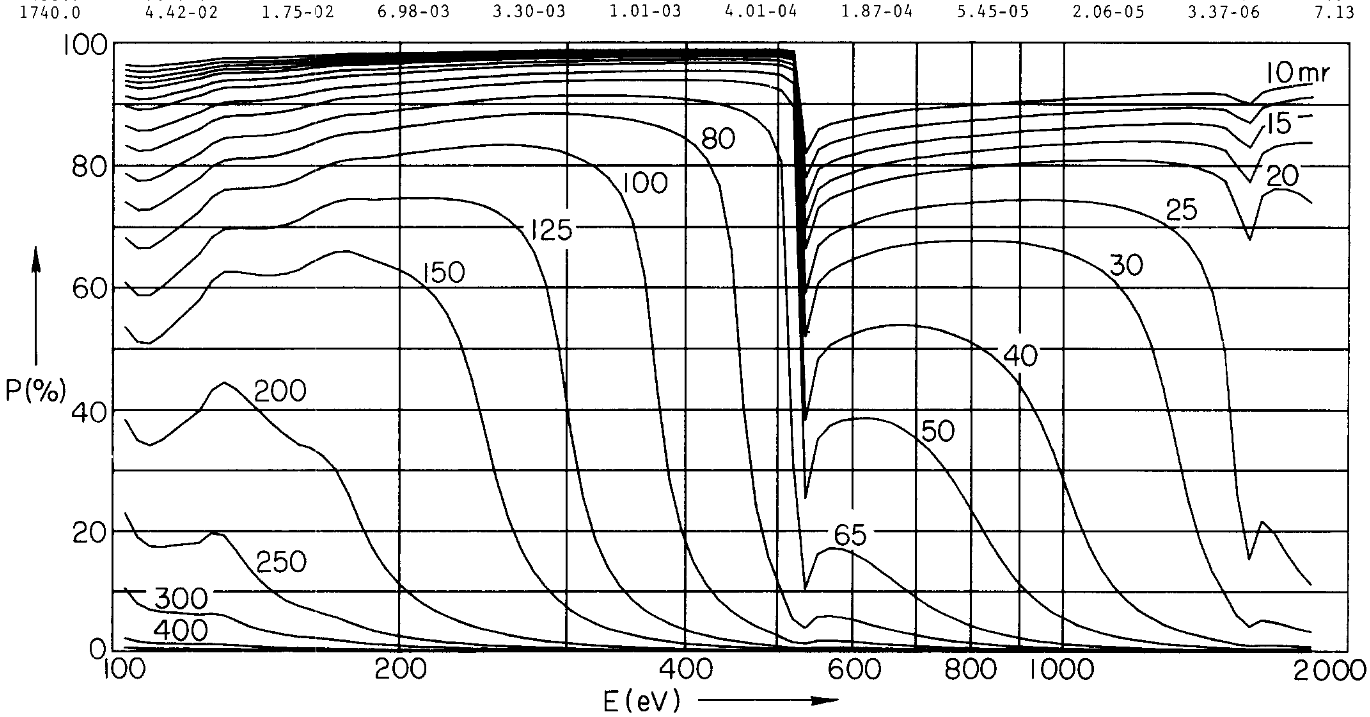
Assumed Mirror Density, ρ = 3.96 gm/cm^3

GRAZING INCIDENCE ANGLE, θ (milliradians)

E(eV)	10	12.5	15	17.5	20	25	30	40	50	65	λ(A)
108.5	94.7	93.4	92.1	90.9	89.6	87.2	84.8	80.2	75.8	69.6	114.
151.1	95.0	93.7	92.5	91.3	90.1	87.8	85.5	81.1	76.8	70.6	82.1
183.3	95.3	94.2	93.0	91.9	90.8	88.6	86.4	82.2	78.1	72.0	67.6
192.6	95.3	94.1	93.0	91.8	90.7	88.5	86.3	82.0	77.8	71.6	64.4
277.0	95.7	94.6	93.6	92.5	91.5	89.4	87.3	83.2	78.9	72.3	44.7
392.4	96.0	95.0	94.0	93.1	92.1	90.0	88.0	83.7	78.9	69.9	31.6
452.2	96.1	95.1	94.1	93.1	92.1	90.1	87.9	83.3	77.7	65.1	27.4
524.9	95.1	93.8	92.6	91.3	90.0	87.3	84.4	77.3	66.7	25.2	23.6
572.8	88.8	86.1	83.4	80.8	78.1	72.8	67.4	55.8	42.2	18.5	21.6
676.8	91.0	88.8	86.6	84.3	82.1	77.4	72.3	60.3	42.9	11.0	18.3
705.0	91.2	89.1	86.9	84.7	82.4	77.7	72.6	60.0	40.4	8.81	17.6
776.2	91.8	89.7	87.7	85.5	83.3	78.6	73.3	58.8	30.7	5.11	16.0
851.5	92.3	90.3	88.3	86.3	84.1	79.3	73.7	55.5	17.4	3.06	14.56
929.7	92.6	90.7	88.7	86.7	84.5	79.5	73.1	47.0	9.21	1.91	13.33
1011.7	93.0	91.1	89.2	87.1	84.9	79.6	72.1	29.2	5.25	1.24	12.25
1041.0	93.1	91.2	89.3	87.2	84.9	79.5	71.4	22.8	4.40	1.07	11.91
1188.0	93.5	91.7	89.7	87.6	85.1	78.3	64.3	7.71	2.03	5.57-01	10.44
1253.6	93.6	91.8	89.8	87.6	85.0	77.1	55.3	5.29	1.51	4.28-01	9.89
1486.7	93.6	91.6	89.3	86.4	82.2	55.0	9.59	1.69	5.67-01	1.75-01	8.34
1740.0	83.0	77.9	71.8	63.8	51.8	14.7	4.31	9.43-01	3.35-01	1.06-01	7.13

GRAZING INCIDENCE ANGLE, θ (milliradians)

E(eV)	80	100	125	150	200	250	300	400	500	(45°) 785	λ(A)
108.5	63.7	56.3	47.8	39.9	26.1	15.2	7.90	2.13	7.21-01	9.96-02	114.
151.1	64.6	56.9	47.5	38.3	20.9	8.68	3.48	8.15-01	2.76-01	3.93-02	82.1
183.3	65.9	57.8	47.4	36.3	14.6	4.49	1.70	4.08-01	1.41-01	2.06-02	67.6
192.6	65.4	57.0	46.1	34.2	12.0	3.56	1.37	3.33-01	1.16-01	1.71-02	64.4
277.0	65.0	53.3	32.8	12.2	2.20	7.09-01	2.98-01	7.92-02	2.86-02	4.44-03	44.7
392.4	55.8	19.5	4.18	1.53	3.80-01	1.38-01	6.14-02	1.72-02	6.36-03	1.02-03	31.6
452.2	34.7	6.32	1.74	7.03-01	1.87-01	6.99-02	3.15-02	8.94-03	3.33-03	5.35-04	27.4
524.9	5.35	1.53	5.17-01	2.26-01	6.42-02	2.46-02	1.13-02	3.23-03	1.21-03	1.96-04	23.6
572.8	5.77	1.75	5.97-01	2.61-01	7.44-02	2.85-02	1.30-02	3.75-03	1.40-03	2.27-04	21.6
676.8	3.12	9.90-01	3.49-01	1.55-01	4.49-02	1.74-02	7.96-03	2.30-03	8.62-04	1.40-04	18.3
705.0	2.57	8.32-01	2.97-01	1.33-01	3.85-02	1.49-02	6.86-03	1.98-03	7.44-04	1.21-04	17.6
776.2	1.62	5.47-01	2.00-01	9.04-02	2.65-02	1.03-02	4.75-03	1.37-03	5.17-04	8.41-05	16.0
851.5	1.04	3.64-01	1.35-01	6.19-02	1.83-02	7.15-03	3.30-03	9.57-04	3.60-04	5.87-05	14.56
929.7	6.83-01	2.47-01	9.32-02	4.29-02	1.28-02	5.01-03	2.32-03	6.73-04	2.54-04	4.13-05	13.33
1011.7	4.60-01	1.70-01	6.49-02	3.01-02	9.02-03	3.54-03	1.64-03	4.77-04	1.80-04	2.93-05	12.25
1041.0	4.02-01	1.49-01	5.74-02	2.66-02	8.01-03	3.15-03	1.46-03	4.24-04	1.60-04	2.61-05	11.91
1188.0	2.18-01	8.30-02	3.24-02	1.51-02	4.58-03	1.80-03	8.37-04	2.44-04	9.22-05	1.51-05	10.44
1253.6	1.70-01	6.51-02	2.55-02	1.20-02	3.63-03	1.43-03	6.65-04	1.94-04	7.32-05	1.20-05	9.89
1486.7	7.17-02	2.81-02	1.11-02	5.26-03	1.61-03	6.36-04	2.96-04	8.63-05	3.26-05	5.34-06	8.34
1740.0	4.42-02	1.75-02	6.98-03	3.30-03	1.01-03	4.01-04	1.87-04	5.45-05	2.06-05	3.37-06	7.13



XI. Low-Energy X-Ray Interaction Coefficient Tables

See page 19 for Explanation of Tables

TABLE II. SPECULAR REFLECTIVITY, P(%) ALUMINUM

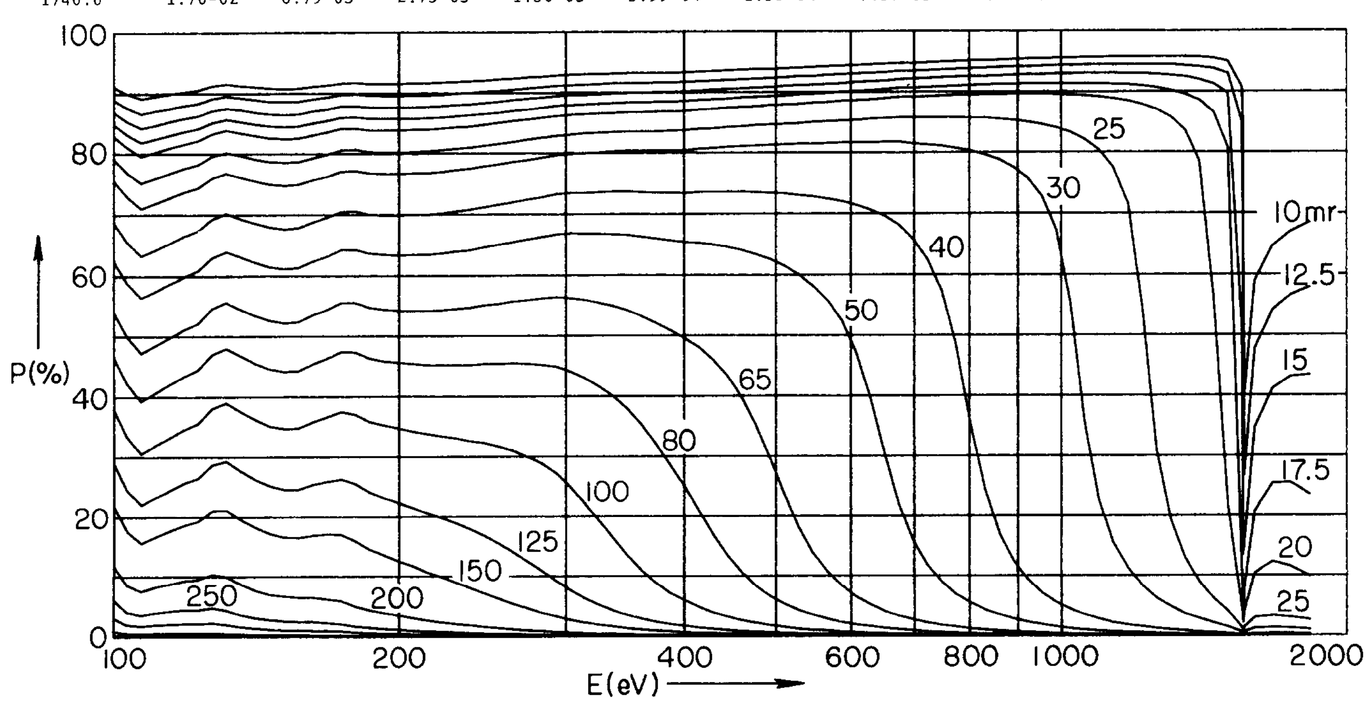
Assumed Mirror Density, ρ = 2.70 gm/cm³

GRAZING INCIDENCE ANGLE, θ (milliradians)

E(eV)	10	12.5	15	17.5	20	25	30	40	50	65	λ(A)
108.5	90.0	87.6	85.4	83.1	81.0	76.8	72.8	65.5	58.8	49.9	114.
151.1	90.9	88.8	86.7	84.6	82.6	78.7	75.0	68.0	61.5	52.6	82.1
183.3	91.4	89.4	87.4	85.4	83.5	79.7	76.1	69.3	62.9	53.9	67.6
192.6	91.6	89.6	87.6	85.7	83.8	80.1	76.5	69.8	63.3	54.3	64.4
277.0	92.6	90.8	89.0	87.3	85.5	82.1	78.8	72.2	65.6	55.6	44.7
392.4	93.6	92.0	90.5	88.9	87.4	84.2	81.0	74.3	66.6	51.9	31.6
452.2	93.9	92.4	90.9	89.4	87.8	84.7	81.5	74.2	65.2	43.1	27.4
524.9	94.2	92.8	91.3	89.8	88.3	85.1	81.7	73.5	61.1	20.1	23.6
572.8	94.4	93.0	91.6	90.1	88.6	85.4	81.8	72.6	55.6	10.2	21.6
676.8	94.9	93.6	92.2	90.8	89.3	86.0	82.0	68.4	22.0	3.37	18.3
705.0	94.9	93.6	92.3	90.8	89.3	85.9	81.7	65.5	15.1	2.64	17.6
776.2	95.2	93.9	92.5	91.1	89.6	85.9	80.9	49.2	7.07	1.55	16.0
851.5	95.4	94.1	92.8	91.3	89.7	85.7	79.2	19.3	3.82	9.49-01	14.56
929.7	95.5	94.3	93.0	91.5	89.8	85.1	75.4	8.91	2.25	6.08-01	13.33
1011.7	95.7	94.5	93.1	91.5	89.6	83.7	61.5	4.85	1.40	4.00-01	12.25
1041.0	95.7	94.5	93.1	91.5	89.5	82.9	47.0	4.01	1.20	3.48-01	11.91
1188.0	95.9	94.6	93.1	91.2	88.5	69.3	10.4	1.78	5.95-01	1.82-01	10.44
1253.6	95.9	94.6	93.0	90.8	87.4	35.0	6.68	1.30	4.47-01	1.40-01	9.89
1486.7	95.3	93.4	90.5	83.6	28.9	4.66	1.67	4.18-01	1.55-01	5.08-02	8.34
1740.0	66.9	56.5	43.0	25.7	11.7	3.11	1.22	3.20-01	1.21-01	4.00-02	7.13

GRAZING INCIDENCE ANGLE, θ (milliradians)

E(eV)	80	100	125	150	200	250	300	400	500	(45°) 785	λ(A)
108.5	42.3	33.7	25.2	18.6	9.84	5.13	2.72	8.73-01	3.37-01	5.53-02	114.
151.1	44.7	35.4	25.6	17.7	7.61	3.16	1.43	3.90-01	1.41-01	2.17-02	82.1
183.3	45.7	35.7	24.7	15.7	5.38	1.95	8.36-01	2.22-01	8.00-02	1.23-02	67.6
192.6	46.0	35.6	24.1	14.7	4.59	1.61	6.87-01	1.82-01	6.57-02	1.01-02	64.4
277.0	45.1	29.7	12.5	4.70	1.08	3.76-01	1.64-01	4.48-02	1.64-02	2.59-03	44.7
392.4	29.3	7.27	2.03	8.14-01	2.16-01	8.03-02	3.62-02	1.02-02	3.81-03	6.12-04	31.6
452.2	12.6	3.09	9.71-01	4.10-01	1.13-01	4.30-02	1.95-02	5.58-03	2.09-03	3.37-04	27.4
524.9	4.66	1.37	4.69-01	2.06-01	5.88-02	2.26-02	1.03-02	2.97-03	1.12-03	1.81-04	23.6
572.8	2.78	8.80-01	3.11-01	1.39-01	4.02-02	1.55-02	7.14-03	2.06-03	7.73-04	1.26-04	21.6
676.8	1.12	3.90-01	1.45-01	6.59-02	1.95-02	7.59-03	3.50-03	1.02-03	3.82-04	6.22-05	18.3
705.0	9.08-01	3.21-01	1.20-01	5.50-02	1.63-02	6.37-03	2.94-03	8.54-04	3.22-04	5.24-05	17.6
776.2	5.62-01	2.05-01	7.80-02	3.60-02	1.08-02	4.22-03	1.95-03	5.68-04	2.14-04	3.49-05	16.0
851.5	3.59-01	1.34-01	5.16-02	2.40-02	7.22-03	2.84-03	1.32-03	3.83-04	1.45-04	2.36-05	14.56
929.7	2.37-01	8.99-02	3.50-02	1.63-02	4.94-03	1.95-03	9.03-04	2.63-04	9.93-05	1.62-05	13.33
1011.7	1.59-01	6.12-02	2.40-02	1.13-02	3.42-03	1.35-03	6.26-04	1.83-04	6.90-05	1.13-05	12.25
1041.0	1.39-01	5.38-02	2.11-02	9.92-03	3.01-03	1.19-03	5.53-04	1.61-04	6.09-05	9.96-06	11.91
1188.0	7.47-02	2.93-02	1.16-02	5.47-03	1.67-03	6.62-04	3.08-04	8.98-05	3.40-05	5.55-06	10.44
1253.6	5.76-02	2.27-02	9.02-03	4.26-03	1.30-03	5.16-04	2.40-04	7.01-05	2.65-05	4.34-06	9.89
1486.7	2.14-02	8.54-03	3.43-03	1.63-03	4.99-04	1.98-04	9.23-05	2.70-05	1.02-05	1.67-06	8.34
1740.0	1.70-02	6.79-03	2.73-03	1.30-03	3.99-04	1.58-04	7.37-05	2.16-05	8.16-06	1.33-06	7.13



XI. Low-Energy X-Ray Interaction Coefficient Tables

See page 19 for Explanation of Tables

TABLE II. SPECULAR REFLECTIVITY, P(%) NICKEL

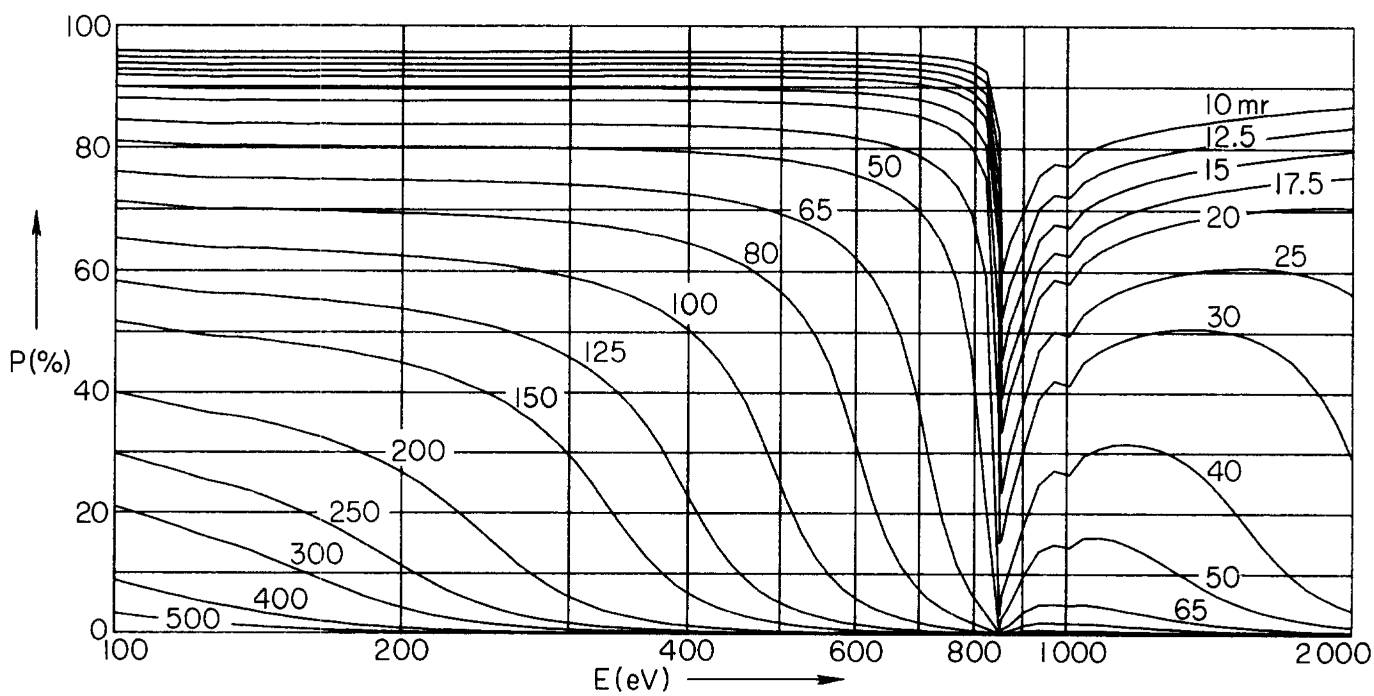
Assumed Mirror Density, ρ = 8.90 gm/cm^3

GRAZING INCIDENCE ANGLE, θ (milliradians)

E(eV)	10	12.5	15	17.5	20	25	30	40	50	65	λ(A)
108.5	95.9	94.8	93.8	92.9	91.9	89.9	88.1	84.4	80.8	75.7	114.
151.1	95.8	94.7	93.7	92.7	91.7	89.7	87.8	84.0	80.4	75.1	82.1
183.3	95.8	94.7	93.7	92.7	91.7	89.7	87.8	84.0	80.2	74.9	67.6
192.6	95.8	94.7	93.7	92.7	91.7	89.7	87.8	83.9	80.2	74.8	64.4
277.0	95.8	94.8	93.8	92.8	91.8	89.8	87.8	83.9	80.1	74.3	44.7
392.4	95.8	94.8	93.8	92.8	91.8	89.8	87.8	83.7	79.5	72.7	31.6
452.2	95.8	94.8	93.8	92.8	91.8	89.7	87.6	83.4	78.9	71.2	27.4
524.9	95.8	94.8	93.7	92.7	91.6	89.5	87.4	82.8	77.7	68.2	23.6
572.8	95.7	94.7	93.6	92.6	91.5	89.3	87.1	82.2	76.6	65.0	21.6
676.8	95.4	94.3	93.1	92.0	90.8	88.4	85.8	79.8	71.8	47.1	18.3
705.0	95.3	94.1	92.9	91.7	90.5	87.9	85.1	78.6	69.4	35.4	17.6
776.2	94.5	93.1	91.6	90.2	88.7	85.5	82.0	72.8	55.6	10.0	16.0
851.5	80.7	75.9	71.0	65.9	60.4	47.6	31.4	6.79	1.99	5.60-01	14.56
929.7	75.2	69.8	64.7	59.8	55.2	46.4	38.3	24.2	13.4	4.82	13.33
1011.7	77.5	72.6	67.8	63.2	58.7	50.2	42.1	27.1	14.8	4.98	12.25
1041.0	79.1	74.4	69.9	65.5	61.2	52.9	44.8	29.3	15.9	5.10	11.91
1188.0	82.3	78.2	74.1	70.1	66.1	58.0	49.6	31.4	14.2	3.60	10.44
1253.6	83.1	79.1	75.2	71.2	67.2	59.1	50.4	30.6	12.2	2.92	9.89
1486.7	84.9	81.2	77.4	73.6	69.5	60.7	50.2	21.5	5.61	1.37	8.34
1740.0	86.2	82.6	78.9	74.9	70.6	60.2	45.0	9.28	2.47	6.68-01	7.13

GRAZING INCIDENCE ANGLE, θ (milliradians)

E(eV)	80	100	125	150	200	250	300	400	500	(45°) 785	λ(A)
108.5	70.9	64.8	57.6	51.0	38.9	28.3	19.4	7.45	2.68	3.42-01	114.
151.1	70.0	63.5	55.8	48.3	34.2	21.4	11.5	2.88	9.22-01	1.20-01	82.1
183.3	69.6	62.8	54.5	46.3	29.7	14.9	6.24	1.38	4.50-01	6.15-02	67.6
192.6	69.5	62.7	54.1	45.6	28.2	13.0	5.15	1.14	3.73-01	5.16-02	64.4
277.0	68.4	60.1	48.6	34.9	9.50	2.64	1.02	2.52-01	8.81-02	1.32-02	44.7
392.4	65.0	51.5	25.5	7.78	1.51	5.02-01	2.14-01	5.77-02	2.10-02	3.28-03	31.6
452.2	61.4	40.6	10.3	3.30	7.43-01	2.60-01	1.14-01	3.14-02	1.15-02	1.82-03	27.4
524.9	53.2	17.4	3.86	1.43	3.58-01	1.30-01	5.81-02	1.63-02	6.03-03	9.63-04	23.6
572.8	42.0	8.68	2.26	8.89-01	2.32-01	8.62-02	3.87-02	1.09-02	4.07-03	6.53-04	21.6
676.8	10.4	2.57	8.22-01	3.50-01	9.75-02	3.71-02	1.69-02	4.83-03	1.81-03	2.92-04	18.3
705.0	7.07	1.91	6.32-01	2.73-01	7.70-02	2.94-02	1.34-02	3.85-03	1.44-03	2.33-04	17.6
776.2	2.73	8.68-01	3.07-01	1.37-01	3.97-02	1.54-02	7.05-03	2.03-03	7.64-04	1.24-04	16.0
851.5	2.21-01	8.45-02	3.30-02	1.54-02	4.68-03	1.85-03	8.56-04	2.50-04	9.43-05	1.54-05	14.56
929.7	1.91	7.03-01	2.66-01	1.22-01	3.63-02	1.42-02	6.54-03	1.90-03	7.15-04	1.16-04	13.33
1011.7	1.89	6.80-01	2.55-01	1.16-01	3.44-02	1.34-02	6.20-03	1.80-03	6.76-04	1.10-04	12.25
1041.0	1.88	6.69-01	2.49-01	1.13-01	3.35-02	1.30-02	6.02-03	1.74-03	6.56-04	1.07-04	11.91
1188.0	1.27	4.52-01	1.69-01	7.71-02	2.28-02	8.92-03	4.11-03	1.19-03	4.49-04	7.31-05	10.44
1253.6	1.04	3.71-01	1.39-01	6.39-02	1.90-02	7.42-03	3.42-03	9.94-04	3.74-04	6.10-05	9.89
1486.7	5.12-01	1.89-01	7.23-02	3.35-02	1.00-02	3.94-03	1.83-03	5.31-04	2.00-04	3.27-05	8.34
1740.0	2.60-01	9.85-02	3.83-02	1.79-02	5.41-03	2.13-03	9.88-04	2.88-04	1.09-04	1.77-05	7.13



XI. Low-Energy X-Ray Interaction Coefficient Tables

See page 19 for Explanation of Tables

TABLE II. SPECULAR REFLECTIVITY, P(%) COPPER

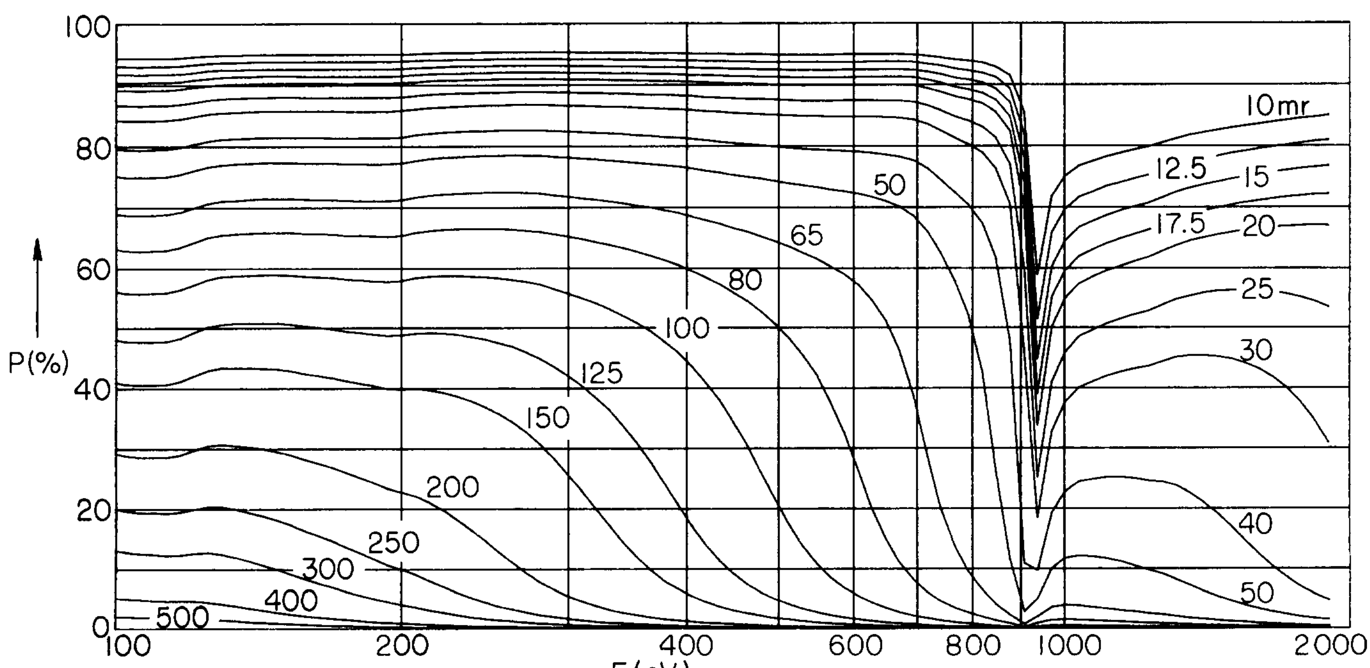
Assumed Mirror Density, ρ = 8.96 gm/cm^3

GRAZING INCIDENCE ANGLE, θ (milliradians)

E(eV)	10	12.5	15	17.5	20	25	30	40	50	65	λ(A)
108.5	94.5	93.1	91.8	90.5	89.2	86.7	84.3	79.6	75.1	68.8	114.
151.1	95.1	93.9	92.7	91.6	90.4	88.2	86.0	81.7	77.6	71.7	82.1
183.3	95.0	93.8	92.7	91.5	90.3	88.0	85.8	81.5	77.3	71.2	67.6
192.6	95.1	93.9	92.7	91.5	90.4	88.1	85.8	81.5	77.3	71.2	64.4
277.0	95.5	94.4	93.3	92.2	91.1	89.0	86.9	82.8	78.7	72.5	44.7
392.4	95.3	94.1	92.9	91.8	90.6	88.4	86.1	81.5	76.8	69.3	31.6
452.2	95.1	93.9	92.7	91.5	90.3	87.9	85.5	80.6	75.4	66.7	27.4
524.9	95.0	93.7	92.5	91.3	90.0	87.5	85.0	79.7	73.8	63.0	23.6
572.8	95.0	93.8	92.5	91.3	90.1	87.6	85.0	79.4	73.1	60.2	21.6
676.8	95.1	93.9	92.6	91.4	90.1	87.5	84.8	78.5	70.2	45.6	18.3
705.0	95.0	93.8	92.5	91.2	89.9	87.2	84.3	77.6	68.1	35.5	17.6
776.2	94.1	92.7	91.2	89.6	88.1	84.8	81.2	72.1	56.8	12.7	16.0
851.5	93.2	91.4	89.6	87.8	85.9	81.8	77.0	62.6	27.7	4.22	14.56
929.7	15.7	9.97	6.39	4.17	2.78	1.33	6.96-01	2.38-01	1.01-01	3.60-02	13.33
1011.7	75.2	69.8	64.7	59.8	55.0	46.0	37.6	22.7	11.6	3.83	12.25
1041.0	76.7	71.5	66.6	61.8	57.2	48.3	39.7	24.1	12.0	3.72	11.91
1188.0	79.4	74.7	70.1	65.6	61.1	52.1	43.1	24.9	10.5	2.80	10.44
1253.6	80.2	75.6	71.1	66.7	62.2	53.2	43.9	24.3	9.38	2.41	9.89
1486.7	82.9	78.8	74.6	70.3	65.8	56.2	44.9	17.6	4.82	1.22	8.34
1740.0	84.3	80.3	76.2	71.8	67.0	55.4	39.2	7.94	2.20	6.07-01	7.13

GRAZING INCIDENCE ANGLE, θ (milliradians)

E(eV)	80	100	125	150	200	250	300	400	500	(45°) 785	λ(A)
108.5	63.0	55.9	47.9	40.7	28.8	19.5	12.6	4.84	1.89	2.81-01	114.
151.1	66.1	59.1	50.9	43.2	29.4	17.9	9.65	2.61	8.69-01	1.17-01	82.1
183.3	65.5	58.1	49.3	40.8	25.0	12.4	5.45	1.29	4.28-01	5.96-02	67.6
192.6	65.4	58.0	49.0	40.2	23.8	11.0	4.63	1.08	3.61-01	5.07-02	64.4
277.0	66.3	57.6	45.6	31.7	8.48	2.43	9.49-01	2.36-01	8.29-02	1.24-02	44.7
392.4	60.7	46.1	20.9	6.64	1.35	4.55-01	1.95-01	5.28-02	1.93-02	3.02-03	31.6
452.2	55.7	33.8	8.84	2.96	6.81-01	2.40-01	1.06-01	2.91-02	1.07-02	1.70-03	27.4
524.9	46.7	15.1	3.59	1.35	3.41-01	1.25-01	5.56-02	1.56-02	5.79-03	9.25-04	23.6
572.8	37.0	8.20	2.18	8.65-01	2.27-01	8.44-02	3.79-02	1.07-02	3.99-03	6.40-04	21.6
676.8	10.6	2.62	8.36-01	3.56-01	9.90-02	3.76-02	1.71-02	4.90-03	1.83-03	2.96-04	18.3
705.0	7.32	1.97	6.49-01	2.80-01	7.90-02	3.02-02	1.38-02	3.95-03	1.48-03	2.39-04	17.6
776.2	3.30	1.02	3.58-01	1.59-01	4.58-02	1.77-02	8.10-03	2.34-03	8.77-04	1.42-04	16.0
851.5	1.36	4.68-01	1.72-01	7.81-02	2.30-02	8.96-03	4.13-03	1.20-03	4.50-04	7.32-05	14.56
929.7	1.58-02	6.49-03	2.65-03	1.27-03	3.94-04	1.57-04	7.33-05	2.15-05	8.14-06	1.33-06	13.33
1011.7	1.48	5.42-01	2.06-01	9.45-02	2.81-02	1.10-02	5.08-03	1.48-03	5.56-04	9.05-05	12.25
1041.0	1.40	5.11-01	1.93-01	8.86-02	2.63-02	1.03-02	4.75-03	1.38-03	5.20-04	8.46-05	11.91
1188.0	1.03	3.71-01	1.40-01	6.45-02	1.92-02	7.51-03	3.47-03	1.01-03	3.80-04	6.19-05	10.44
1253.6	8.82-01	3.20-01	1.21-01	5.59-02	1.67-02	6.53-03	3.02-03	8.76-04	3.30-04	5.38-05	9.89
1486.7	4.61-01	1.71-01	6.59-02	3.06-02	9.19-03	3.61-03	1.67-03	4.86-04	1.83-04	2.99-05	8.34
1740.0	2.38-01	9.05-02	3.53-02	1.65-02	4.99-03	1.97-03	9.13-04	2.66-04	1.00-04	1.64-05	7.13



XI. Low-Energy X-Ray Interaction Coefficient Tables

See page 19 for Explanation of Tables

TABLE II. SPECULAR REFLECTIVITY, P(%) GOLD

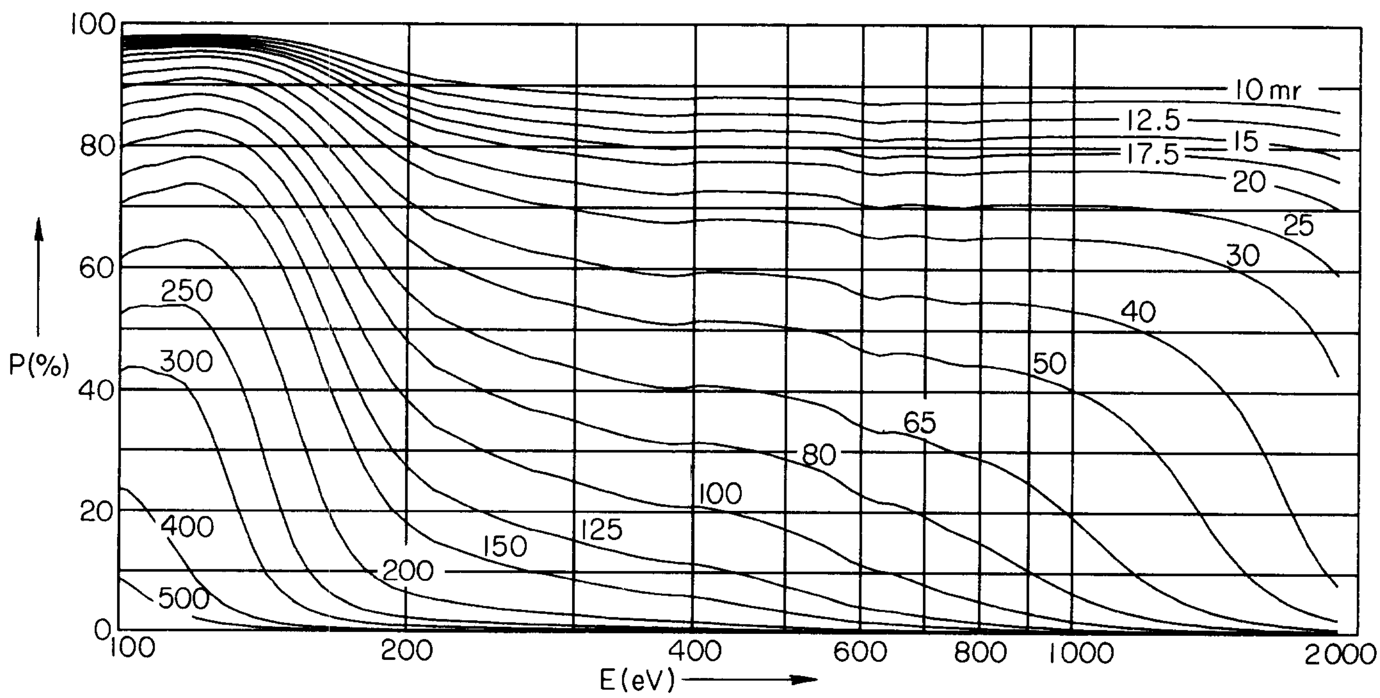
Assumed Mirror Density, ρ = 19.3 gm/cm^3

GRAZING INCIDENCE ANGLE, θ (milliradians)

E(eV)	10	12.5	15	17.5	20	25	30	40	50	65	λ(A)
108.5	98.0	97.5	97.0	96.5	96.0	95.1	94.1	92.2	90.3	87.5	114.
151.1	97.0	96.3	95.6	94.9	94.2	92.8	91.4	88.6	85.8	81.8	82.1
183.3	93.6	92.1	90.6	89.1	87.6	84.7	81.9	76.4	71.2	63.7	67.6
192.6	92.6	90.9	89.1	87.4	85.8	82.5	79.3	73.2	67.4	59.2	64.4
277.0	89.1	86.6	84.1	81.7	79.4	74.8	70.5	62.5	55.1	45.2	44.7
392.4	88.0	85.2	82.5	79.9	77.3	72.4	67.8	59.1	51.2	40.6	31.6
452.2	88.2	85.5	82.8	80.2	77.7	72.8	68.1	59.4	51.3	40.3	27.4
524.9	88.0	85.3	82.6	79.9	77.3	72.3	67.6	58.5	50.1	38.4	23.6
572.8	87.8	84.9	82.1	79.4	76.8	71.6	66.7	57.4	48.6	36.3	21.6
676.8	87.4	84.5	81.6	78.8	76.1	70.8	65.6	55.8	46.4	32.9	18.3
705.0	87.3	84.4	81.5	78.7	75.9	70.6	65.4	55.4	45.8	31.9	17.6
776.2	87.2	84.2	81.3	78.4	75.6	70.2	64.8	54.5	44.3	29.3	16.0
851.5	87.5	84.6	81.7	78.9	76.2	70.7	65.3	54.7	43.9	27.1	14.56
929.7	87.7	84.7	81.9	79.1	76.3	70.7	65.2	54.1	42.3	23.4	13.33
1011.7	87.7	84.8	82.0	79.1	76.3	70.7	65.0	53.1	40.0	18.7	12.25
1041.0	87.8	84.9	82.0	79.2	76.3	70.7	64.9	52.8	39.2	17.0	11.91
1188.0	87.9	84.9	82.0	79.1	76.2	70.3	64.1	50.1	32.5	9.08	10.44
1253.6	87.8	84.9	82.0	79.0	76.1	69.9	63.5	48.3	28.3	6.72	9.89
1486.7	87.6	84.5	81.4	78.3	75.0	68.1	60.1	37.9	12.0	2.54	8.34
1740.0	86.9	83.6	80.2	76.6	72.8	64.1	52.7	17.4	4.14	1.04	7.13

GRAZING INCIDENCE ANGLE, θ (milliradians)

E(eV)	80	100	125	150	200	250	300	400	500	(45°) 785	λ(A)
108.5	84.8	81.2	76.8	72.3	63.2	53.6	42.9	18.8	5.10	4.63-01	114.
151.1	77.7	72.1	64.9	57.2	38.4	16.3	5.45	1.09	3.52-01	4.81-02	82.1
183.3	56.5	47.3	36.2	25.7	9.77	3.36	1.36	3.43-01	1.21-01	1.80-02	67.6
192.6	51.5	41.8	30.7	20.8	7.54	2.67	1.12	2.89-01	1.03-01	1.56-02	64.4
277.0	36.5	26.6	16.7	9.85	3.25	1.23	5.43-01	1.50-01	5.48-02	8.59-03	44.7
392.4	31.3	21.0	11.6	6.01	1.76	6.51-01	2.89-01	8.03-02	2.96-02	4.68-03	31.6
452.2	30.5	19.4	9.66	4.57	1.24	4.55-01	2.01-01	5.60-02	2.06-02	3.27-03	27.4
524.9	27.8	15.9	6.81	2.96	7.82-01	2.86-01	1.27-01	3.56-02	1.32-02	2.10-03	23.6
572.8	25.0	13.0	5.00	2.11	5.59-01	2.06-01	9.22-02	2.59-02	9.61-03	1.53-03	21.6
676.8	20.6	8.94	3.10	1.30	3.48-01	1.30-01	5.83-02	1.65-02	6.14-03	9.84-04	18.3
705.0	19.2	7.83	2.65	1.11	3.00-01	1.12-01	5.05-02	1.43-02	5.33-03	8.56-04	17.6
776.2	15.9	5.79	1.92	8.09-01	2.21-01	8.32-02	3.77-02	1.07-02	4.00-03	6.43-04	16.0
851.5	12.7	4.12	1.35	5.75-01	1.59-01	6.02-02	2.74-02	7.80-03	2.92-03	4.70-04	14.56
929.7	9.19	2.82	9.42-01	4.06-01	1.14-01	4.34-02	1.98-02	5.66-03	2.12-03	3.42-04	13.33
1011.7	6.29	1.93	6.60-01	2.88-01	8.19-02	3.14-02	1.43-02	4.12-03	1.54-03	2.50-04	12.25
1041.0	5.50	1.70	5.85-01	2.57-01	7.32-02	2.81-02	1.29-02	3.69-03	1.39-03	2.24-04	11.91
1188.0	2.81	9.18-01	3.28-01	1.47-01	4.26-02	1.65-02	7.57-03	2.19-03	8.21-04	1.33-04	10.44
1253.6	2.13	7.14-01	2.59-01	1.16-01	3.40-02	1.32-02	6.07-03	1.76-03	6.60-04	1.07-04	9.89
1486.7	8.95-01	3.19-01	1.20-01	5.50-02	1.63-02	6.39-03	2.95-03	8.57-04	3.23-04	5.26-05	8.34
1740.0	3.95-01	1.47-01	5.67-02	2.64-02	7.93-03	3.12-03	1.44-03	4.20-04	1.59-04	2.59-05	7.13



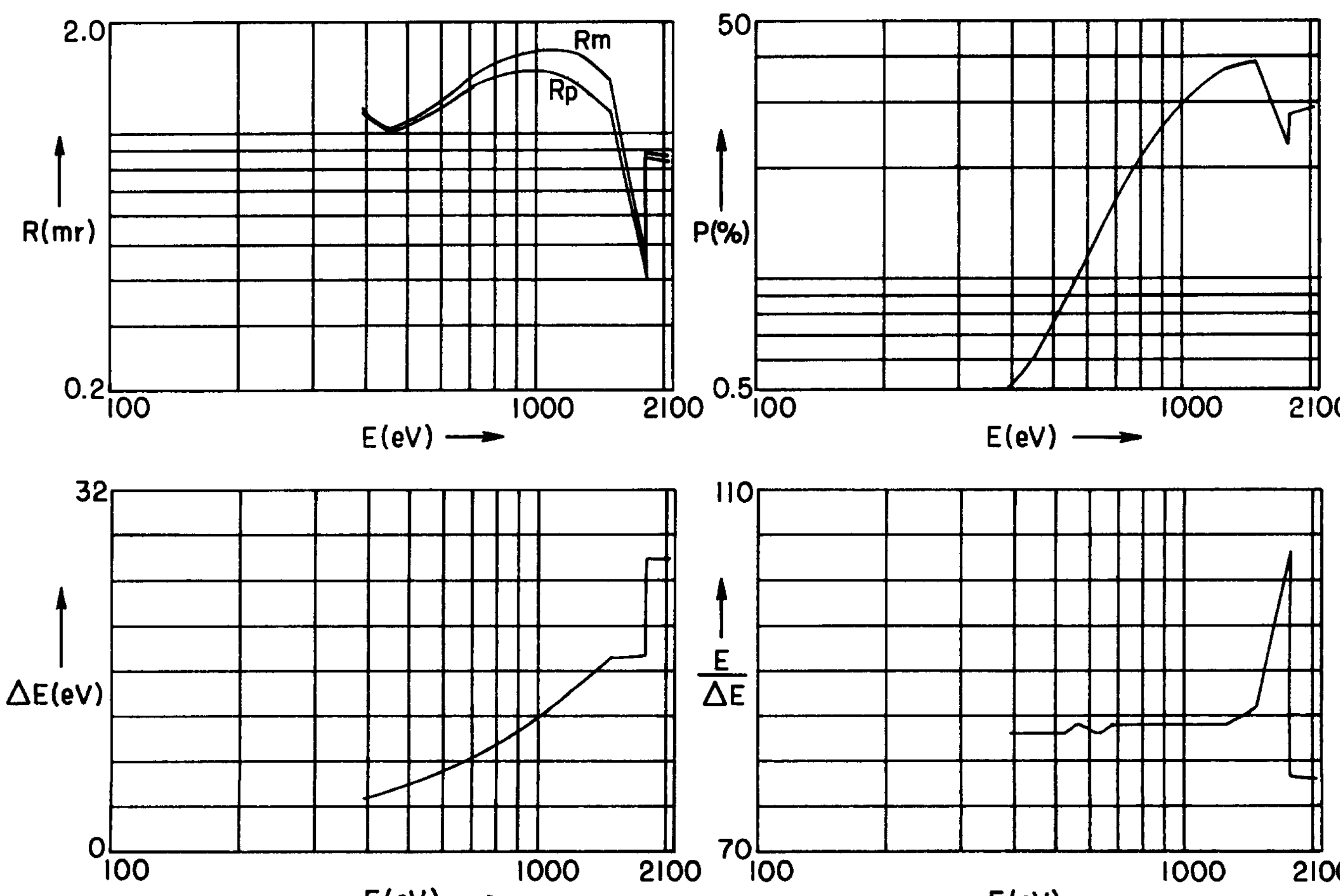
XI. Low-Energy X-Ray Interaction Coefficient Tables

See page 19 for Explanation of Tables

TABLE III. BRAGG REFLECTION CHARACTERISTICS - SPUTTERED/EVAPORATED MULTILAYERS

Tungsten/Carbon (W/C) $N = 100$ $\Gamma = 0.4$ $2d = 40$ A
(Assumed Densities, $\rho_w = 19.3$ g/cm^3, $\rho_c = 2.2$ g/cm^3)

E(eV)	R_m(mr)	R_p(mr)	P(%)	ω(mr)	L/R_p	ΔE(eV)	E/ΔE	λ(A)
392.4	1.17	1.14	5.03	15.83	1.03	4.73	83	31.6
395.3	1.14	1.12	5.04	15.49	1.03	4.75	83	31.4
452.2	1.03	1.01	6.13	11.46	1.02	5.42	83	27.4
511.3	1.09	1.06	8.09	9.22	1.04	6.09	84	24.3
524.9	1.11	1.08	8.60	8.85	1.04	6.26	84	23.6
556.3	1.16	1.12	9.83	8.09	1.04	6.61	84	22.3
572.8	1.18	1.13	10.46	7.73	1.05	6.78	84	21.7
637.4	1.29	1.23	13.18	6.72	1.06	7.60	84	19.5
676.8	1.37	1.30	15.24	6.21	1.07	8.05	84	18.3
705.0	1.41	1.33	16.52	5.90	1.08	8.39	84	17.6
776.2	1.52	1.40	20.01	5.23	1.10	9.20	84	16.0
851.5	1.59	1.45	23.52	4.68	1.12	10.07	85	14.6
929.7	1.65	1.47	26.85	4.24	1.14	11.00	85	13.3
1011.7	1.68	1.47	29.98	3.86	1.16	11.99	84	12.3
1041.0	1.69	1.46	30.99	3.75	1.17	12.34	84	11.9
1188.0	1.67	1.41	35.26	3.25	1.20	14.11	84	10.4
1253.6	1.64	1.37	36.67	3.07	1.21	14.88	84	9.89
1486.7	1.40	1.15	38.74	2.50	1.24	17.24	86	8.34
1740.0	0.58	0.52	24.77	1.82	1.28	17.38	100	7.13
2042.4	0.87	0.84	28.95	1.97	1.00	25.95	79	6.07



XI. Low-Energy X-Ray Interaction Coefficient Tables

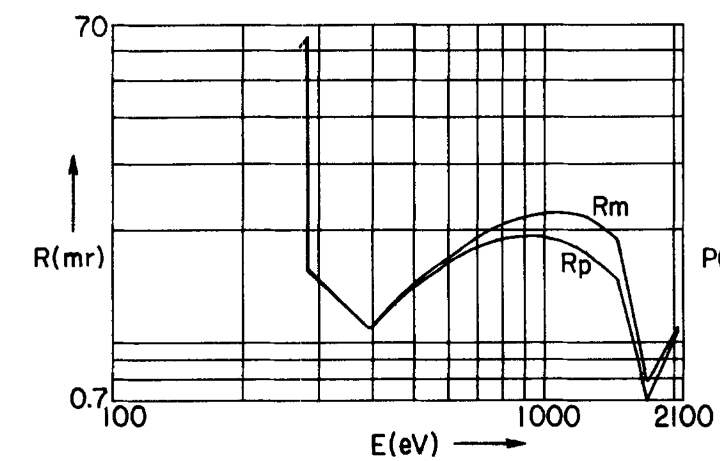
See page 19 for Explanation of Tables

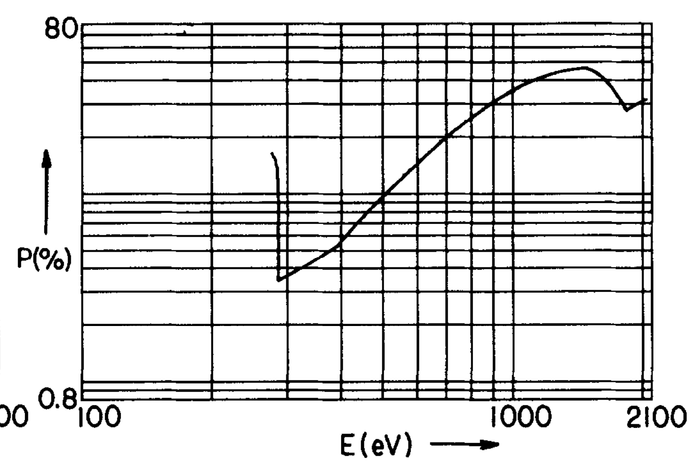
TABLE III. BRAGG REFLECTION CHARACTERISTICS - SPUTTERED/EVAPORATED MULTILAYERS

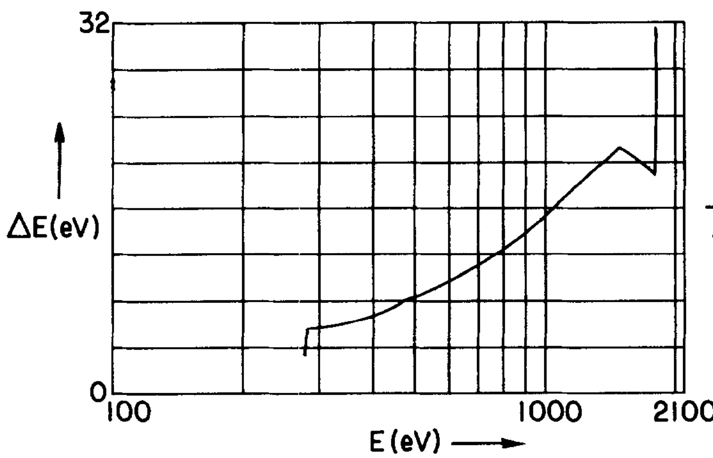
Tungsten/Carbon (W/C) N = 100 Γ = 0.4 2d = 50 A

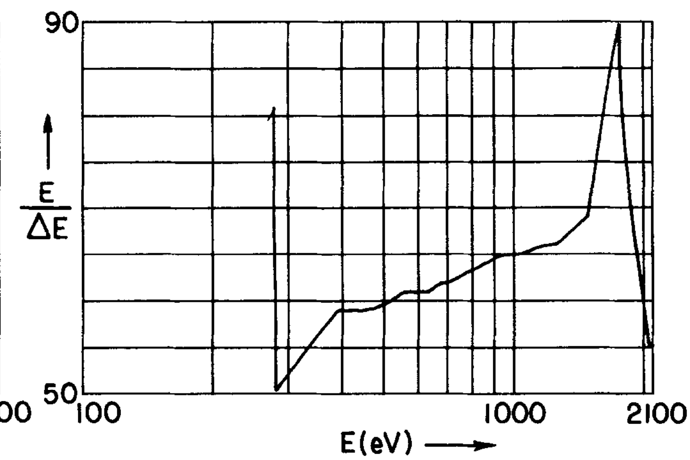
(Assumed Densities, ρ_W = 19.3 g/cm³, ρ_C = 2.2 g/cm³)

E(eV)	R_m(mr)	R_p(mr)	P(%)	ω(mr)	L/R_p	ΔE(eV)	E/ΔE	λ(A)
277.0	6.35	6.33	16.62	25.70	0.99	3.43	81	44.8
311.7	1.42	1.40	3.78	24.96	0.99	5.78	54	39.8
392.4	1.10	1.09	5.25	13.91	0.99	6.56	60	31.6
395.3	1.10	1.09	5.32	13.70	0.98	6.59	60	31.4
452.2	1.28	1.26	7.51	11.25	0.99	7.61	59	27.4
511.3	1.47	1.44	10.36	9.35	0.99	8.46	60	24.3
524.9	1.51	1.48	11.05	9.01	0.99	8.66	61	23.6
556.3	1.59	1.54	12.65	8.26	1.00	9.06	61	22.3
572.8	1.62	1.57	13.44	7.90	0.99	9.24	62	21.7
637.4	1.77	1.70	16.64	6.95	1.00	10.30	62	19.5
676.8	1.87	1.78	19.07	6.41	1.01	10.81	63	18.3
705.0	1.92	1.81	20.51	6.10	1.02	11.22	63	17.6
776.2	2.04	1.89	24.46	5.39	1.03	12.17	64	16.0
851.5	2.13	1.92	28.35	4.81	1.04	13.20	65	14.6
929.7	2.19	1.93	32.04	4.34	1.06	14.30	65	13.3
1011.7	2.22	1.91	35.50	3.94	1.08	15.48	65	12.3
1041.0	2.23	1.90	36.65	3.82	1.08	15.91	65	11.9
1188.0	2.21	1.81	41.57	3.29	1.11	17.98	66	10.4
1253.6	2.17	1.75	43.29	3.09	1.12	18.87	66	9.89
1486.7	1.87	1.46	46.69	2.47	1.16	21.33	70	8.34
1740.0	0.79	0.69	34.05	1.64	1.19	19.55	89	7.13
2042.4	1.09	1.07	31.52	2.24	0.97	36.76	56	6.07









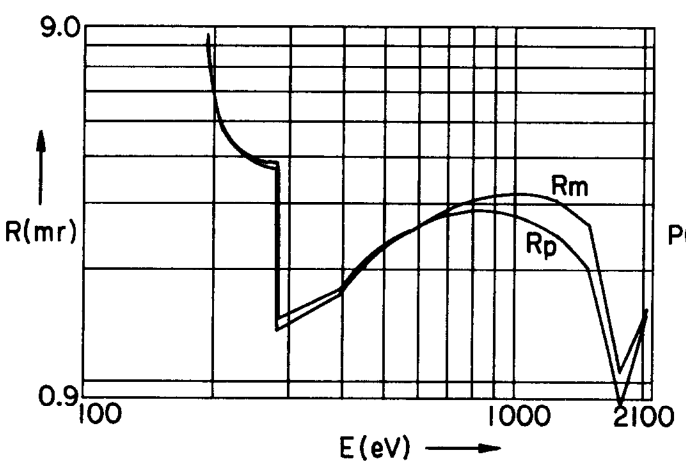
XI. Low-Energy X-Ray Interaction Coefficient Tables

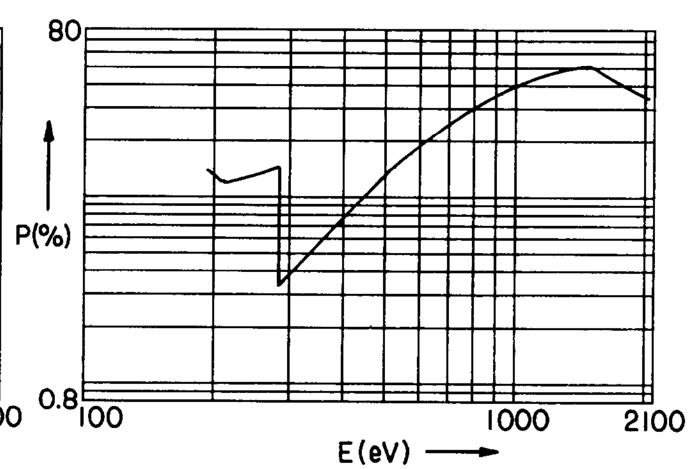
See page 19 for Explanation of Tables

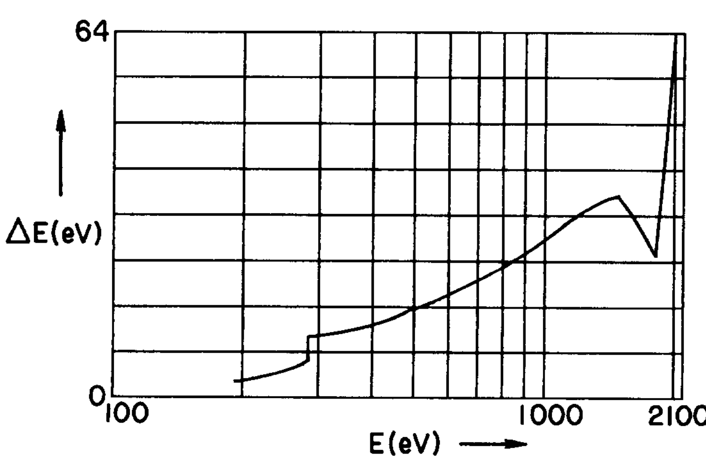
TABLE III. BRAGG REFLECTION CHARACTERISTICS - SPUTTERED/EVAPORATED MULTILAYERS

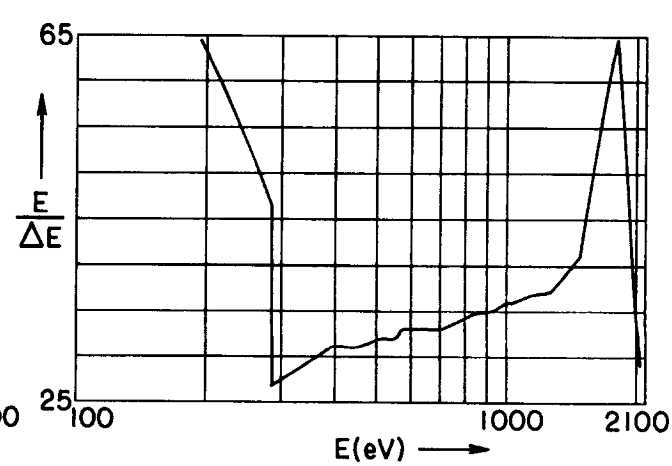
Tungsten/Carbon (W/C) N = 100 Γ = 0.4 2d = 70 A
(Assumed Densities, ρ_W = 19.3 g/cm³, ρ_C = 2.2 g/cm³)

E(eV)	R_m(mr)	R_p(mr)	P(%)	ω(mr)	L/R_p	ΔE(eV)	E/ΔE	λ(A)
192.6	8.30	8.55	13.94	38.98	0.93	2.93	66	64.4
212.2	4.63	4.77	11.82	25.81	0.94	3.45	61	58.4
277.0	3.72	3.85	14.14	17.65	0.95	5.75	48	44.8
311.7	1.47	1.55	4.13	25.10	0.98	11.03	28	39.8
392.4	1.70	1.77	7.14	16.62	0.99	12.52	31	31.6
395.3	1.71	1.78	7.25	16.42	0.98	12.58	31	31.4
452.2	2.04	2.12	10.13	14.02	0.99	14.44	31	27.4
511.3	2.33	2.39	13.57	11.84	0.99	15.88	32	24.3
524.9	2.38	2.44	14.36	11.45	0.99	16.23	32	23.6
556.3	2.48	2.52	16.15	10.55	0.99	16.91	33	22.3
572.8	2.51	2.54	17.00	10.10	0.99	17.22	33	21.7
637.4	2.70	2.70	20.43	8.98	1.00	19.13	33	19.5
676.8	2.83	2.79	22.99	8.31	1.01	20.03	34	18.3
705.0	2.88	2.81	24.45	7.93	1.01	20.78	34	17.6
776.2	3.02	2.87	28.46	7.03	1.03	22.47	35	16.0
851.5	3.11	2.88	32.35	6.28	1.04	24.24	35	14.6
929.7	3.16	2.85	36.00	5.65	1.05	26.09	36	13.3
1011.7	3.19	2.79	39.43	5.11	1.06	28.01	36	12.3
1041.0	3.20	2.76	40.57	4.94	1.07	28.68	36	11.9
1188.0	3.15	2.58	45.51	4.18	1.08	31.78	37	10.4
1253.6	3.09	2.49	47.26	3.90	1.09	33.02	38	9.89
1486.7	2.66	2.04	51.26	2.98	1.10	35.68	42	8.34
1740.0	1.15	0.97	41.73	1.69	1.07	27.96	62	7.13
2042.4	1.51	1.58	34.27	3.04	0.97	68.69	30	6.07









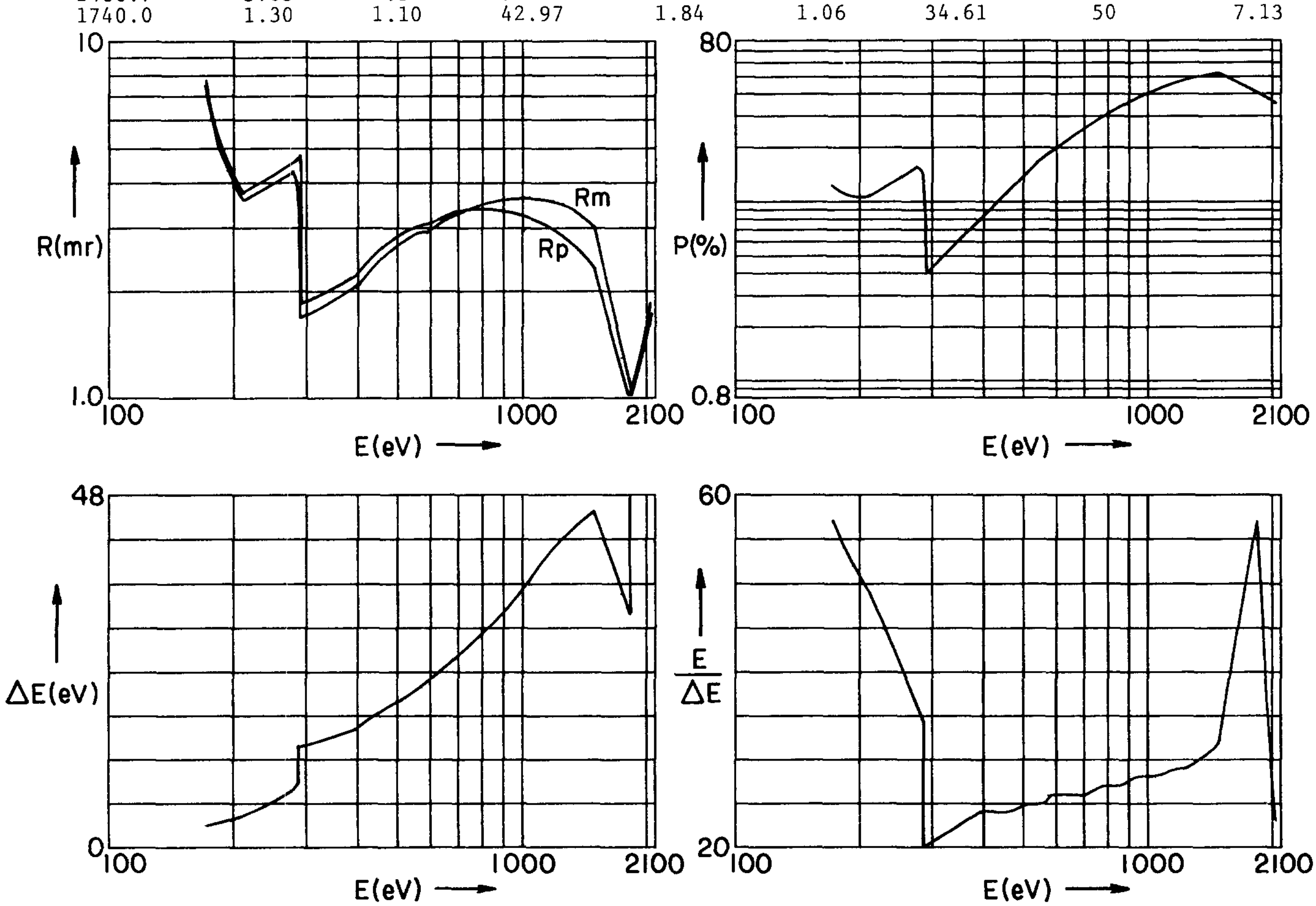
XI. Low-Energy X-Ray Interaction Coefficient Tables

See page 19 for Explanation of Tables

TABLE III. BRAGG REFLECTION CHARACTERISTICS - SPUTTERED/EVAPORATED MULTILAYERS

Tungsten/Carbon (W/C) N = 100 Γ = 0.4 2d = 80 A
(Assumed Densities, ρ_w = 19.3 g/cm^3, ρ_c = 2.2 g/cm^3)

E(eV)	R_m(mr)	R_p(mr)	P(%)	ω(mr)	L/R_p	ΔE(eV)	E/ΔE	λ(A)
171.7	7.51	7.76	12.41	39.96	0.94	2.98	58	72.2
183.3	5.12	5.31	11.06	30.77	0.94	3.36	55	67.7
192.6	4.33	4.52	10.67	27.08	0.94	3.66	53	64.4
212.2	3.58	3.78	10.75	22.33	0.93	4.27	50	58.4
277.0	4.30	4.57	15.62	19.04	0.96	7.63	36	44.8
311.7	1.76	1.93	4.75	26.98	0.98	14.23	22	39.8
392.4	2.05	2.20	8.03	18.24	0.98	16.06	24	31.6
395.3	2.05	2.21	8.14	18.03	0.98	16.13	25	31.4
452.2	2.43	2.61	11.21	15.47	0.98	18.45	25	27.4
511.3	2.74	2.90	14.80	13.12	0.98	20.24	25	24.3
524.9	2.80	2.96	15.62	12.69	0.99	20.68	25	23.6
556.3	2.91	3.04	17.44	11.71	0.99	21.54	26	22.3
572.8	2.93	3.05	18.31	11.23	0.99	21.93	26	21.7
637.4	3.13	3.22	21.80	10.00	1.00	24.34	26	19.5
676.8	3.28	3.31	24.39	9.26	1.00	25.48	27	18.3
705.0	3.33	3.34	25.85	8.84	1.01	26.42	27	17.6
776.2	3.47	3.38	29.85	7.86	1.02	28.57	27	16.0
851.5	3.57	3.37	33.71	7.02	1.03	30.81	28	14.6
929.7	3.62	3.32	37.30	6.33	1.05	33.18	28	13.3
1011.7	3.65	3.23	40.68	5.73	1.06	35.67	28	12.3
1041.0	3.65	3.20	41.80	5.55	1.07	36.54	28	11.9
1188.0	3.58	2.98	46.63	4.72	1.09	40.67	29	10.4
1253.6	3.52	2.87	48.35	4.41	1.09	42.35	30	9.89
1486.7	3.03	2.34	52.24	3.38	1.11	45.84	32	8.34
1740.0	1.30	1.10	42.97	1.84	1.06	34.61	50	7.13



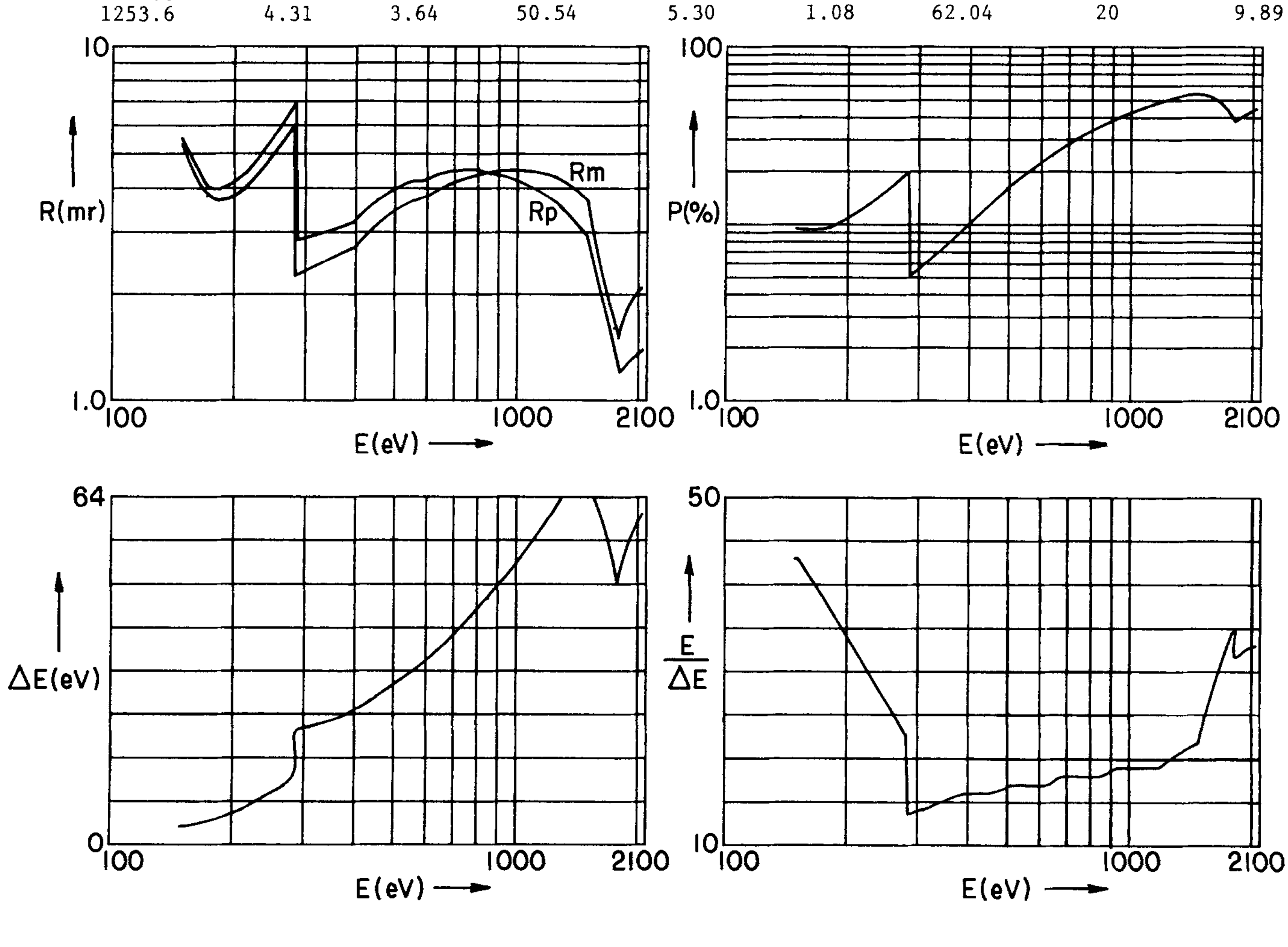
XI. Low-Energy X-Ray Interaction Coefficient Tables

See page 19 for Explanation of Tables

TABLE III. BRAGG REFLECTION CHARACTERISTICS - SPUTTERED/EVAPORATED MULTILAYERS

Tungsten/Carbon (W/C) N = 100 $\Gamma = 0.4$ 2d = 100 A
(Assumed Densities, $\rho_W = 19.3\ g/cm^3$, $\rho_C = 2.2\ g/cm^3$)

E(eV)	R_m(mr)	R_p(mr)	P(%)	ω(mr)	L/R_p	ΔE(eV)	$E/\Delta E$	λ(A)
148.7	5.31	5.54	9.54	37.48	0.95	3.38	44	83.4
151.1	5.01	5.24	9.43	35.87	0.95	3.48	43	82.1
171.7	3.79	4.07	9.39	27.59	0.94	4.30	40	72.2
183.3	3.67	3.99	9.86	25.59	0.93	4.87	38	67.7
192.6	3.74	4.10	10.46	24.77	0.93	5.42	36	64.4
212.2	3.96	4.37	11.92	23.26	0.93	6.57	32	58.4
277.0	5.86	6.64	19.29	22.25	0.95	11.93	23	44.8
311.7	2.39	2.93	5.99	31.34	0.94	21.57	14	39.8
392.4	2.71	3.19	9.63	21.51	0.96	24.03	16	31.6
395.3	2.71	3.20	9.75	21.26	0.95	24.13	16	31.4
452.2	3.15	3.72	13.15	18.33	0.95	27.45	16	27.4
511.3	3.51	4.05	16.99	15.59	0.96	29.98	17	24.3
524.9	3.58	4.12	17.86	15.09	0.96	30.60	17	23.6
556.3	3.70	4.19	19.77	13.95	0.97	31.82	17	22.3
572.8	3.72	4.19	20.66	13.38	0.97	32.39	18	21.7
637.4	3.94	4.37	24.31	11.94	0.98	35.87	18	19.5
676.8	4.11	4.46	26.96	11.07	0.98	37.51	18	18.3
705.0	4.16	4.47	28.44	10.58	0.99	38.89	18	17.6
776.2	4.32	4.48	32.47	9.41	1.00	42.00	18	16.0
851.5	4.42	4.41	36.30	8.42	1.02	45.27	19	14.6
929.7	4.47	4.31	39.85	7.60	1.03	48.71	19	13.3
1011.7	4.49	4.17	43.15	6.89	1.05	52.33	19	12.3
1041.0	4.49	4.12	44.24	6.66	1.05	53.60	19	11.9
1188.0	4.40	3.80	48.90	5.67	1.07	59.59	20	10.4
1253.6	4.31	3.64	50.54	5.30	1.08	62.04	20	9.89

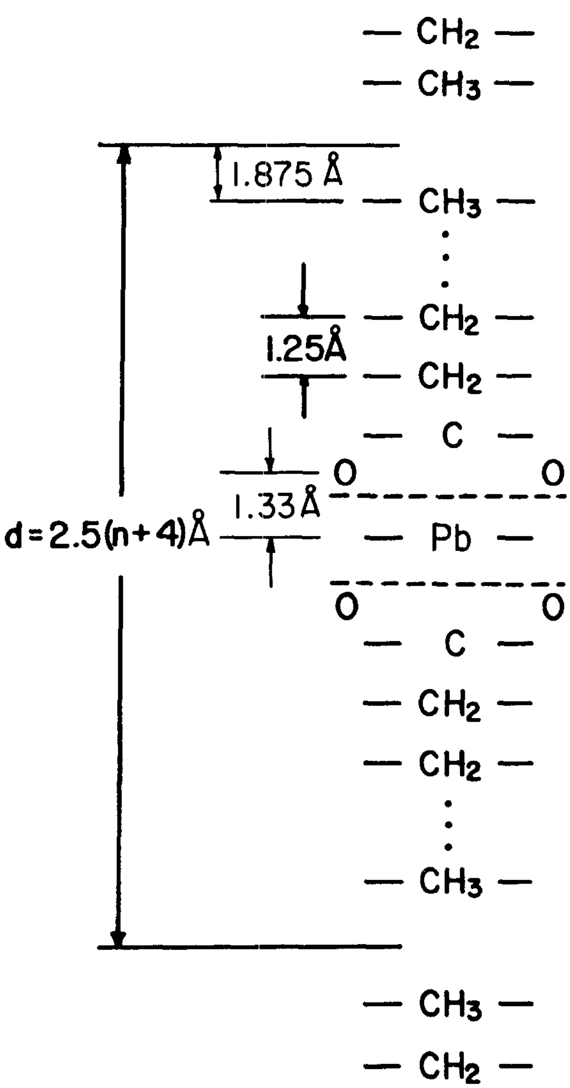


XI. Low-Energy X-Ray Interaction Coefficient Tables

See page 19 for Explanation of Tables

TABLE IV. UNIT CELL DATA FOR MOLECULAR MULTILAYERS OF THE LEAD SALTS OF STRAIGHT-CHAIN FATTY ACIDS AND FOR SELECTED ACID PHTHALATE CRYSTALS.

Molecular Multilayers



Ammonium Acid Phthalate

a = 6.39 A b = 10.23 A d = 13.07 A

z_p/d

N	O	C	H
.0404	.2828	.4512	-.0200
	.1394	.3906	.0620
	.1636	.2966	.0700
	.0970	.2658	.0840
		.3278	.4080
		.4200	.5200
		.2316	.4680
		.1692	.3020
			.2340

Sodium Acid Phthalate *

a = 6.75 A b = 9.31 A d = 13.3 A

z_p/d

Na	O	C	H
-.0062	.0934	.1544	.406
	.1398	.2236	.520
	.1312	.2574	.464
	.2694	.2908	.298
	.00002†	.3872	.242
		.4526	.020
		.4194	
		.3200	

* Hemihydrate form
† Only ½ O used here

Potassium Acid Phthalate

a = 6.46 A b = 9.6 A c = 13.315 A

z_p/d

K	O	C	H
.03878	.26258	.21761	.235
	.12732	.15685	.400
	.09314	.28937	.521
	.14401	.38466	.464
		.45050	.303
		.42058	
		.32513	
		.25841	

Rubidium Acid Phthalate

a = 6.561 A b = 10.064 A c = 13.068 A

z_p/d

Rb	O	C	H
.0459	.100	.267	.413
	.157	.296	.524
	.134	.392	.477
	.275	.453	.313
		.425	.245
		.332	
		.168	
		.226	

Thallium Acid Phthalate

a = 6.63 A b = 10.54 A c = 12.95 A

z_p/d

Tl	O	C	H
.0459	.100	.267	.413
	.157	.296	.524
	.134	.392	.477
	.275	.453	.313
		.425	.245
		.332	
		.168	
		.226	

XI. Low-Energy X-Ray Interaction Coefficient Tables

See page 19 for Explanation of Tables

TABLE V. STRUCTURE FACTOR, $F_1 + iF_2$, OF LAYERED ANALYZERS

For first-order Bragg angle scattering from a unit cell of periodicity length, d, cross-sectional area, A, and mass, W: mass density, $\rho = W/Ad$ and number of unit cells per unit volume, $\phi = (Ad)^{-1}$.

LANGMUIR-BLODGETT ANALYZERS

$[CH_3(CH_2)_nCOO]_2Pb$ — One molecule per unit cell

	Lead Laurate		Lead Myristate		Lead Stearate		Lead Behenate		Lead Lignocerate		
n	10		12		16		20		22		
d	35.0		40.0		50.0		60.0		65.0		A
A	20.4		20.4		20.4		20.4		20.4		A^2
W	605.8		661.9		774.1		886.4		942.5		amu
ρ	1.409		1.347		1.260		1.206		1.177		gm/cm^3
φ	1.401E-3		1.226E-3		9.80E-4		8.20E-4		7.52E-4		A^{-3}
E(eV)	F_1	F_2	F_1	F_2	F_1	F_2	F_1	F_2	F_1	F_2	λ(A)
108.5	41.76	17.97	41.87	18.03	41.99	18.09	44.51	18.40	42.08	18.14	114.0
114.0	41.83	16.67	41.94	16.73	42.06	16.79	44.58	17.08	42.15	16.84	108.7
132.8	40.79	12.39	40.90	12.43	41.03	12.49	43.53	12.73	41.12	12.53	93.4
148.7	38.85	10.73	38.96	10.77	39.09	10.82	41.57	11.03	39.18	10.85	83.4
151.1	38.59	10.81	38.70	10.85	38.83	10.89	41.31	11.10	38.92	10.93	82.1
171.7	36.40	9.80	36.51	9.84	36.64	9.87	39.08	10.05	36.73	9.90	72.2
183.3	35.12	9.88	35.23	9.91	35.36	9.95	37.77	10.11	35.45	9.97	67.6
192.6	34.14	10.07	34.25	10.10	34.38	10.14	36.77	10.28	34.47	10.16	64.4
212.2	31.99	11.10	32.10	11.13	32.23	11.16	34.54	11.29	32.32	11.18	58.4
277.0	30.98	20.44	31.09	20.46	31.22	20.48	32.61	20.56	31.31	20.49	44.7
311.7	33.05	23.62	33.16	23.63	33.28	23.65	35.48	25.14	33.37	23.66	39.8
392.4	37.28	28.03	37.38	28.04	37.49	28.05	40.49	29.19	37.57	28.06	31.6
395.3	37.40	28.13	37.49	28.14	37.60	28.15	40.61	29.28	37.68	28.16	31.4
452.2	38.72	31.76	38.81	31.77	38.90	31.78	42.08	32.71	38.97	31.78	27.4
511.3	39.04	32.91	39.09	32.92	39.14	32.92	42.40	33.70	39.18	32.93	24.3
524.9	35.95	33.16	35.97	33.17	35.99	33.18	39.24	33.92	36.00	33.18	23.6
556.3	44.30	48.57	44.36	48.68	44.42	48.82	47.72	49.57	44.47	48.91	22.3
572.8	48.34	47.75	48.42	47.85	48.51	47.98	51.83	48.70	48.57	48.07	21.6
637.4	57.48	44.64	57.59	44.74	57.73	44.85	61.11	45.45	57.83	44.93	19.5
676.8	59.56	42.66	59.69	42.75	59.84	42.85	63.23	43.39	59.95	42.92	18.3
705.0	61.52	45.08	61.65	45.16	61.81	45.26	65.22	45.77	61.92	45.33	17.6
776.2	68.44	41.87	68.58	41.94	68.75	42.02	72.17	42.46	68.87	42.08	16.0
851.5	72.10	38.66	72.25	38.72	72.43	38.79	75.85	39.16	72.56	38.84	14.56
929.7	75.39	37.30	75.55	37.36	75.73	37.42	79.15	37.74	75.86	37.46	13.33
1011.7	78.66	34.40	78.82	34.45	79.00	34.50	82.42	34.78	79.14	34.54	12.25
1041.0	79.54	33.37	79.69	33.41	79.88	33.46	83.29	33.72	80.02	33.50	11.91
1188.0	82.26	28.85	82.42	28.88	82.61	28.93	86.01	29.13	82.74	28.96	10.44
1253.6	82.87	27.20	83.03	27.23	83.22	27.27	86.62	27.45	83.36	27.29	9.89
1486.7	84.16	22.61	84.32	22.64	84.51	22.67	87.89	22.80	84.65	22.69	8.34
1740.0	84.02	18.80	84.18	18.82	84.37	18.84	87.74	18.95	84.51	18.86	7.13

ACID PHTHALATE ANALYZERS

$C_6H_4(COOH)(COO)M$ — Four molecules per unit cell

M	Ammonium(NH_4^+)		Sodium(Na^+) *		Potassium(K^+)		Rubidium(Rb^+)		Thallium(Tl^+)		Cation
d	13.07		13.21		13.313		13.068		12.95		A
A	65.37		62.84		62.02		66.03		69.88		A^2
W	732.7		788.5		816.9		1002.		1475		amu
ρ	1.424		1.577		1.643		1.928		2.713		gm/cm^3
φ	1.170E-3		1.205E-3		1.211E-3		1.159E-3		1.105E-3		A^{-3}
E(eV)	F_1	F_2	F_1	F_2	F_1	F_2	F_1	F_2	F_1	F_2	λ(A)
511.3	-15.16	-8.13	8.35	-13.34	21.90	19.82	51.31	33.20	64.38	98.22	24 3
524.9	-22.96	-7.80	-3.41	-12.80	13.31	19.39	43.62	32.78	59.52	99.75	23.6
556.3	-12.05	21.61	10.84	29.02	26.97	51.76	56.46	61.79	78.11	130.71	22.3
572.8	-6.58	20.77	18.01	27.85	33.73	49.73	62.71	59.77	86.98	129.59	21.6
637.4	4.57	18.16	31.95	24.29	47.83	43.38	76.09	53.44	104.98	124.84	19.5
676.8	7.94	16.54	35.71	22.02	52.09	39.55	80.13	49.46	113.79	131.78	18.3
705.0	9.62	15.75	37.54	21.10	54.31	37.84	82.31	47.72	124.51	131.97	17.6
776.2	12.58	13.80	40.58	18.40	58.29	33.07	86.48	42.63	140.16	124.17	16.0
851.5	14.72	11.94	42.17	15.88	60.97	28.73	89.24	37.84	153.47	123.19	14.56
929.7	16.12	10.63	42.25	14.10	62.63	25.37	90.78	33.92	166.36	115.27	13.33
1011.7	17.11	9.30	39.97	12.31	63.71	22.88	91.54	30.27	176.17	108.64	12.25
1041.0	17.36	8.91	37.36	11.78	63.99	21.87	91.66	29.16	179.54	105.50	11.91
1188.0	18.28	7.24	47.29	23.96	64.79	17.66	91.26	24.37	188.71	91.78	10.44
1253.6	18.53	6.65	50.04	22.02	64.92	16.19	90.63	22.65	190.95	86.67	9.89
1486.7	19.01	5.04	54.56	16.79	64.92	12.26	85.91	17.74	194.62	72.42	8.34
1740.0	19.17	3.86	56.37	13.03	64.46	9.48	67.84	13.77	192.80	60.94	7.13
2042.4	19.15	2.92	57.18	9.95	63.66	7.26	85.34	52.73	181.45	50.44	6.07

*Hemihydrate form
$C_6H_4(COOH)(COO)Na \cdot \frac{1}{2}H_2O$

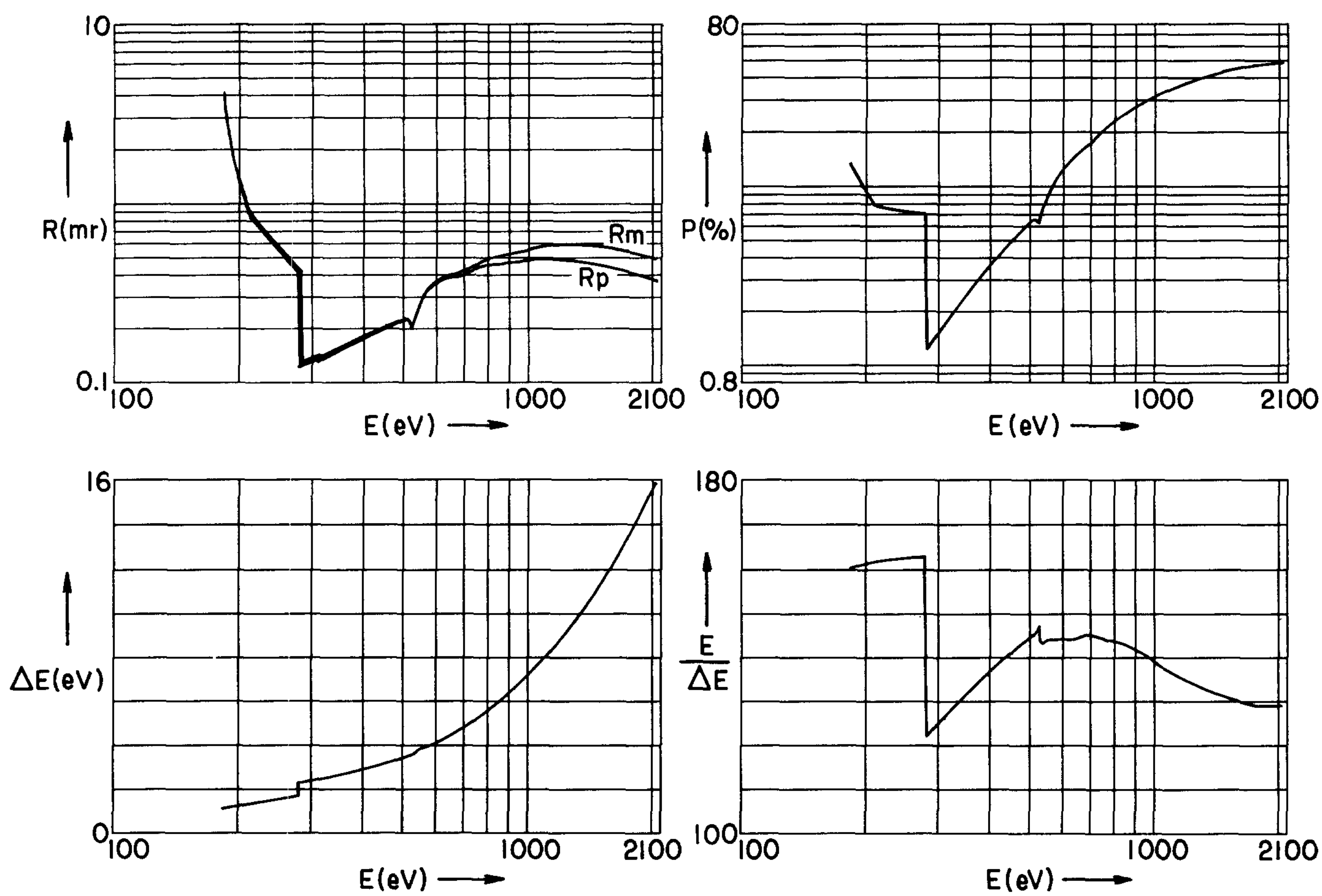
XI. Low-Energy X-Ray Interaction Coefficient Tables

See page 19 for Explanation of Tables

TABLE VI. BRAGG REFLECTION CHARACTERISTICS - THE MOLECULAR MULTILAYERS

Lead Laurate N = 150 2d = 70 A

E(eV)	R_m(mr)	R_p(mr)	P(%)	ω(mr)	L/R_p	ΔE(eV)	E/ΔE	λ(A)
183.3	4.17	3.87	13.48	25.68	1.32	1.14	161	67.7
192.6	1.98	1.85	11.07	15.02	1.32	1.19	162	64.4
212.2	0.88	0.83	7.81	9.51	1.32	1.31	162	58.4
277.0	0.43	0.41	7.14	5.13	1.31	1.70	163	44.8
311.7	0.14	0.13	1.67	5.53	1.04	2.47	126	39.8
392.4	0.18	0.17	3.44	3.75	1.12	2.89	136	31.6
395.3	0.18	0.18	3.52	3.71	1.07	2.90	136	31.4
452.2	0.21	0.20	5.06	3.04	1.13	3.20	141	27.4
511.3	0.23	0.22	6.52	2.55	1.11	3.50	146	24.3
524.9	0.21	0.20	6.30	2.45	1.14	3.55	148	23.6
556.3	0.31	0.30	9.66	2.35	1.11	3.86	144	22.3
572.8	0.34	0.33	10.79	2.28	1.10	3.97	144	21.7
637.4	0.40	0.38	14.50	2.02	1.13	4.41	145	19.5
676.8	0.41	0.39	16.15	1.88	1.15	4.65	145	18.3
705.0	0.43	0.40	17.59	1.80	1.16	4.84	146	17.6
776.2	0.48	0.45	21.73	1.64	1.16	5.39	144	16.0
851.5	0.51	0.46	25.16	1.50	1.21	5.95	143	14.6
929.7	0.53	0.47	28.43	1.38	1.23	6.56	142	13.3
1011.7	0.56	0.49	31.83	1.29	1.23	7.25	140	12.3
1041.0	0.57	0.49	32.97	1.25	1.24	7.50	139	11.9
1188.0	0.59	0.49	37.64	1.12	1.27	8.74	136	10.4
1253.6	0.59	0.48	39.32	1.07	1.29	9.29	135	9.89
1486.7	0.58	0.46	44.12	0.92	1.30	11.27	132	8.34
1740.0	0.55	0.42	47.58	0.80	1.33	13.41	130	7.13
2042.4	0.49	0.37	49.43	0.68	1.34	15.81	129	6.07



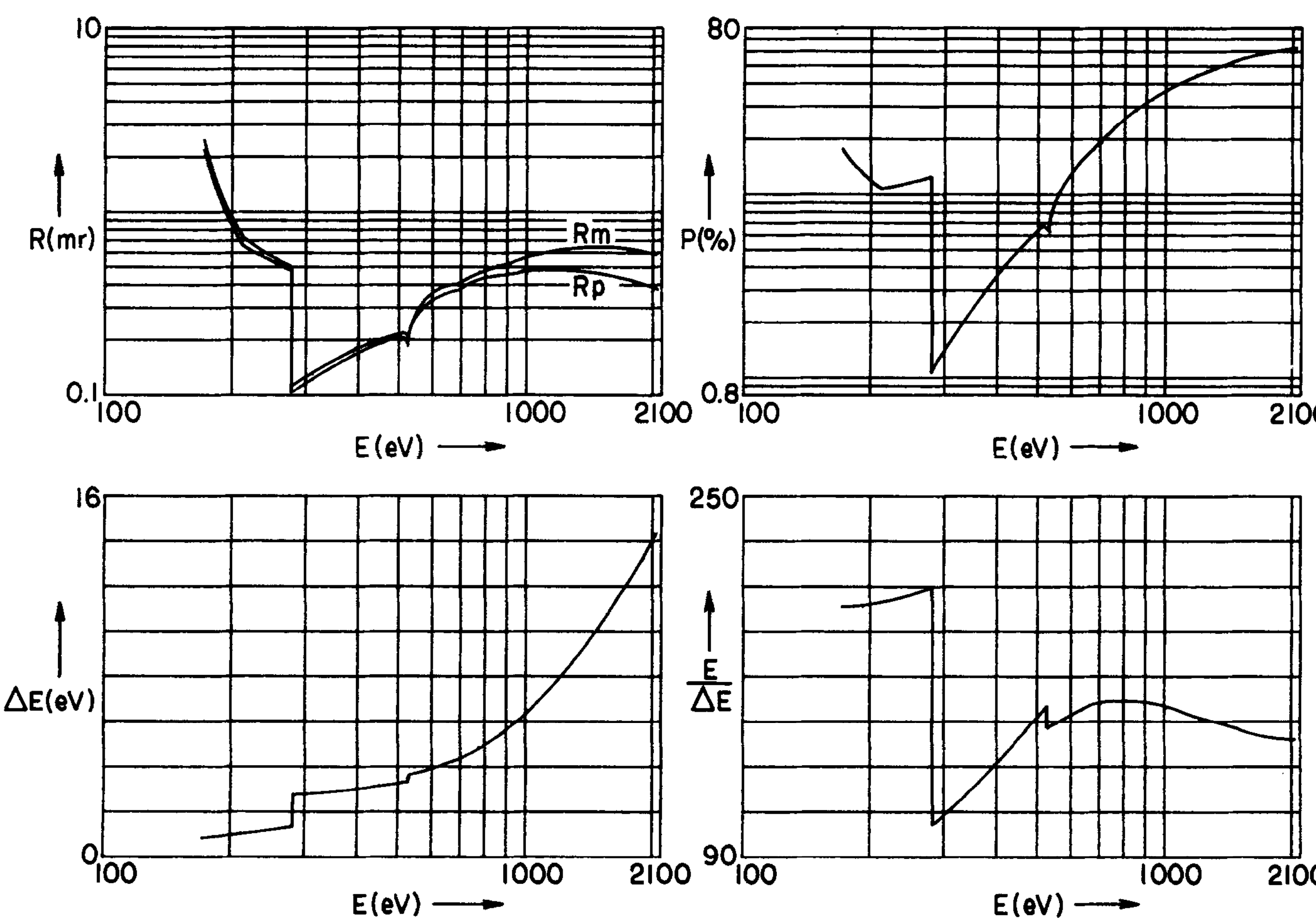
XI. Low-Energy X-Ray Interaction Coefficient Tables

See page 19 for Explanation of Tables

TABLE VI. BRAGG REFLECTION CHARACTERISTICS - THE MOLECULAR MULTILAYERS

Lead Myristate N = 200 2d = 80 A

E(eV)	R_m(mr)	R_p(mr)	P(%)	ω(mr)	L/R_p	ΔE(eV)	E/ΔE	λ(A)
171.7	2.46	2.18	17.66	10.87	1.30	0.85	201	72.2
183.3	1.48	1.32	14.42	8.06	1.30	0.91	202	67.7
192.6	1.11	0.99	12.70	6.87	1.30	0.96	201	64.4
212.2	0.73	0.65	10.79	5.33	1.30	1.04	203	58.4
277.0	0.50	0.47	12.58	3.24	1.28	1.32	210	44.8
311.7	0.13	0.12	1.58	5.21	1.01	2.81	111	39.8
392.4	0.17	0.17	3.37	3.33	0.97	3.01	130	31.6
395.3	0.18	0.17	3.45	3.29	0.98	3.02	131	31.4
452.2	0.20	0.19	5.10	2.59	1.02	3.18	142	27.4
511.3	0.22	0.20	6.79	2.09	1.04	3.32	154	24.3
524.9	0.20	0.19	6.62	1.98	1.01	3.33	158	23.6
556.3	0.30	0.29	10.06	1.96	1.00	3.73	149	22.3
572.8	0.33	0.31	11.31	1.89	1.01	3.81	151	21.7
637.4	0.39	0.36	15.57	1.63	1.04	4.11	155	19.5
676.8	0.40	0.37	17.61	1.50	1.05	4.27	158	18.3
705.0	0.42	0.39	19.27	1.43	1.04	4.44	159	17.6
776.2	0.47	0.43	24.25	1.30	1.08	4.88	159	16.0
851.5	0.51	0.45	28.58	1.17	1.09	5.34	159	14.6
929.7	0.53	0.46	32.71	1.08	1.13	5.85	159	13.3
1011.7	0.57	0.48	37.18	1.00	1.14	6.45	157	12.3
1041.0	0.58	0.48	38.63	0.98	1.16	6.67	156	11.9
1188.0	0.61	0.48	44.81	0.87	1.19	7.80	152	10.4
1253.6	0.62	0.48	47.16	0.83	1.20	8.29	151	9.89
1486.7	0.64	0.46	53.94	0.72	1.24	10.11	147	8.34
1740.0	0.63	0.43	59.15	0.63	1.27	12.10	144	7.13



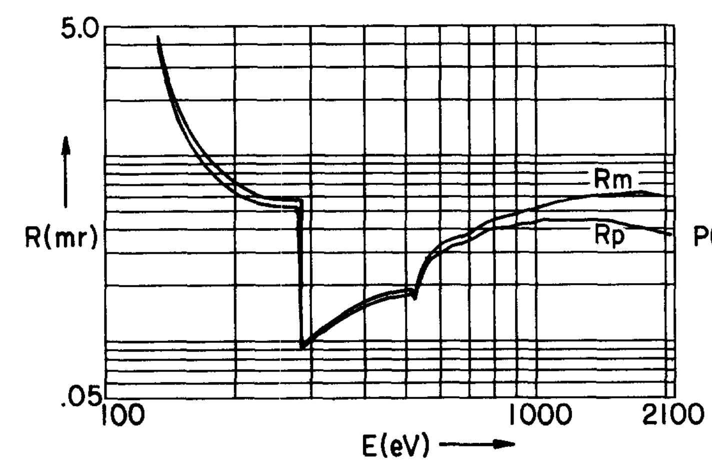
XI. Low-Energy X-Ray Interaction Coefficient Tables

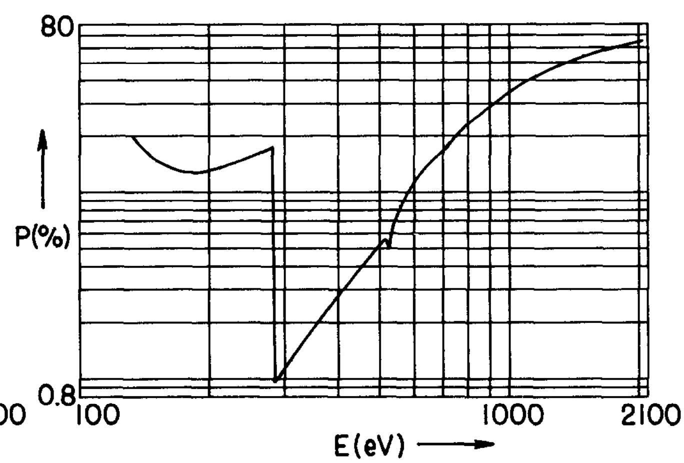
See page 19 for Explanation of Tables

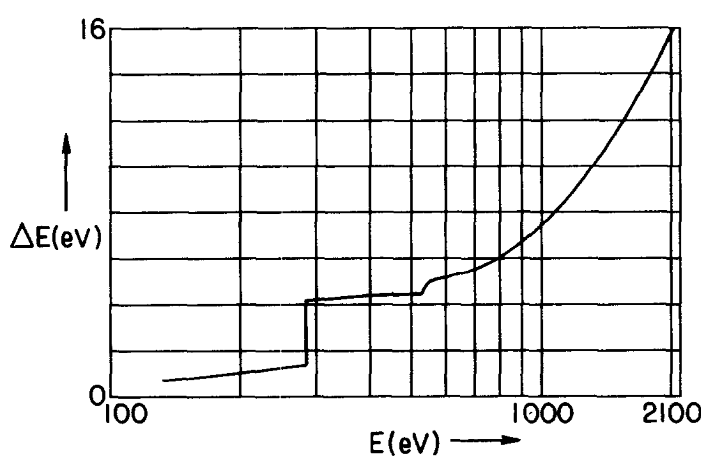
TABLE VI. BRAGG REFLECTION CHARACTERISTICS - THE MOLECULAR MULTILAYERS

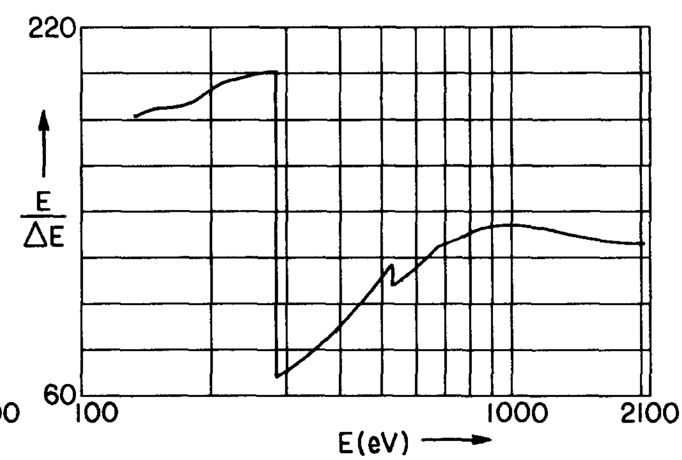
Lead Stearate N = 200 2d = 100 A

E(eV)	R_m(mr)	R_p(mr)	P(%)	ω(mr)	L/R_p	ΔE(eV)	E/ΔE	λ(A)
132.8	4.40	3.83	19.75	15.79	1.20	0.73	183	93.4
148.7	1.77	1.54	15.17	8.46	1.23	0.80	186	83.4
151.1	1.62	1.40	14.61	8.04	1.23	0.82	185	82.1
171.7	1.02	0.87	12.92	5.73	1.25	0.92	187	72.2
183.3	0.87	0.74	12.84	4.97	1.27	0.97	189	67.7
192.6	0.79	0.68	13.02	4.48	1.26	1.01	191	64.4
212.2	0.66	0.58	13.40	3.73	1.27	1.08	196	58.4
277.0	0.56	0.52	17.26	2.50	1.22	1.37	202	44.8
311.7	0.11	0.11	1.25	6.00	1.00	4.26	73	39.8
392.4	0.15	0.15	2.65	3.80	0.99	4.41	89	31.6
395.3	0.16	0.15	2.71	3.75	1.00	4.41	90	31.4
452.2	0.18	0.17	4.06	2.88	1.01	4.50	101	27.4
511.3	0.19	0.18	5.48	2.24	1.00	4.51	113	24.3
524.9	0.18	0.17	5.36	2.11	0.98	4.48	117	23.6
556.3	0.28	0.26	8.44	2.11	1.01	5.05	110	22.3
572.8	0.30	0.28	9.53	2.01	1.01	5.11	112	21.7
637.4	0.35	0.33	13.41	1.68	1.00	5.31	120	19.5
676.8	0.37	0.34	15.36	1.51	1.00	5.40	125	18.3
705.0	0.38	0.36	16.96	1.44	1.00	5.58	126	17.6
776.2	0.44	0.40	21.79	1.27	1.02	5.97	130	16.0
851.5	0.47	0.41	26.16	1.13	1.06	6.40	133	14.6
929.7	0.50	0.43	30.52	1.02	1.06	6.91	135	13.3
1011.7	0.53	0.44	35.21	0.94	1.11	7.53	134	12.3
1041.0	0.54	0.45	36.75	0.91	1.09	7.76	134	11.9
1188.0	0.58	0.45	43.70	0.80	1.14	8.93	133	10.4









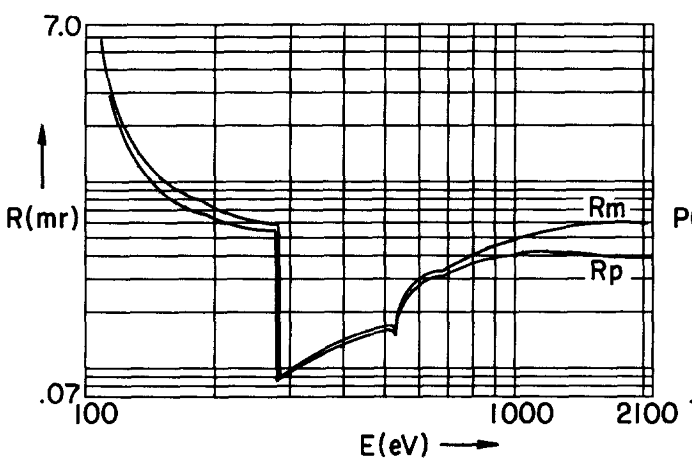
XI. Low-Energy X-Ray Interaction Coefficient Tables

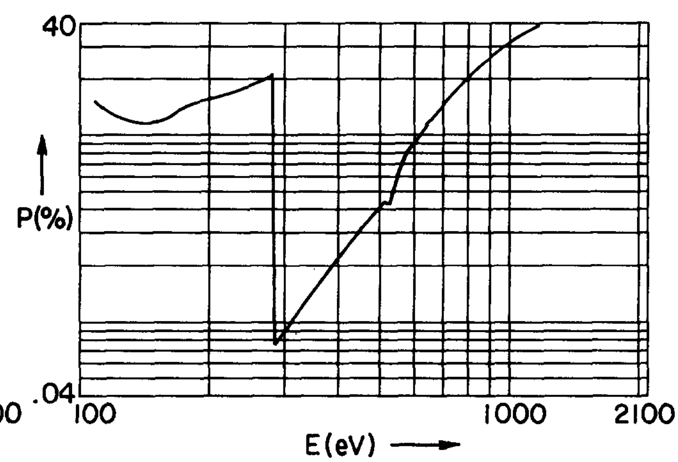
See page 19 for Explanation of Tables

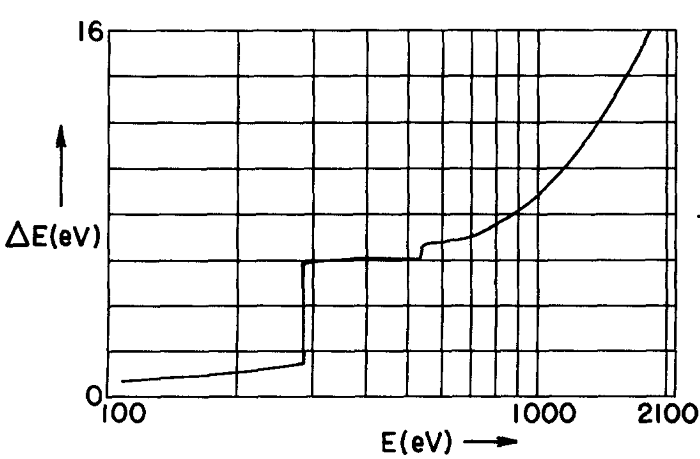
TABLE VI. BRAGG REFLECTION CHARACTERISTICS - THE MOLECULAR MULTILAYERS

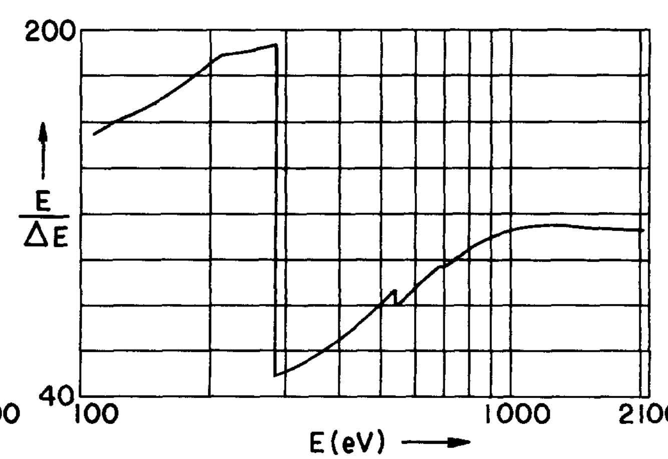
Lead Behenate N = 200 2d = 120 A

E(eV)	R_m(mr)	R_p(mr)	P(%)	ω(mr)	L/R_p	ΔE(eV)	E/ΔE	λ(A)
108.5	5.97	5.32	15.33	25.05	1.06	0.70	156	114.3
114.0	3.21	2.86	14.05	14.97	1.08	0.72	159	108.8
132.8	1.40	1.21	11.81	7.88	1.13	0.81	164	93.4
148.7	1.04	0.88	11.84	5.92	1.17	0.88	168	83.4
151.1	1.01	0.86	11.92	5.72	1.17	0.89	169	82.1
171.7	0.86	0.73	13.71	4.37	1.21	0.97	177	72.2
183.3	0.80	0.69	14.67	3.86	1.21	1.01	181	67.7
192.6	0.76	0.66	15.38	3.54	1.21	1.05	184	64.4
212.2	0.67	0.59	16.31	3.01	1.22	1.12	189	58.4
277.0	0.59	0.54	20.50	2.11	1.18	1.44	193	44.8
311.7	0.10	0.10	0.99	6.86	1.00	5.99	52	39.8
392.4	0.14	0.13	2.08	4.33	1.02	6.10	64	31.6
395.3	0.14	0.13	2.13	4.26	1.03	6.09	65	31.4
452.2	0.16	0.15	3.21	3.26	1.03	6.14	74	27.4
511.3	0.17	0.16	4.37	2.52	1.01	6.10	84	24.3
524.9	0.16	0.15	4.28	2.37	0.99	6.05	87	23.6
556.3	0.25	0.24	6.98	2.34	1.00	6.73	83	22.3
572.8	0.27	0.26	7.92	2.22	0.99	6.77	85	21.7
637.4	0.32	0.30	11.31	1.82	1.01	6.91	92	19.5
676.8	0.33	0.31	13.05	1.63	1.01	6.95	97	18.3
705.0	0.35	0.33	14.54	1.54	1.00	7.14	99	17.6
776.2	0.40	0.36	19.02	1.32	1.03	7.47	104	16.0
851.5	0.43	0.38	23.23	1.15	1.03	7.82	109	14.6
929.7	0.46	0.40	27.48	1.02	1.03	8.31	112	13.3
1011.7	0.49	0.41	32.20	0.93	1.07	8.91	114	12.3









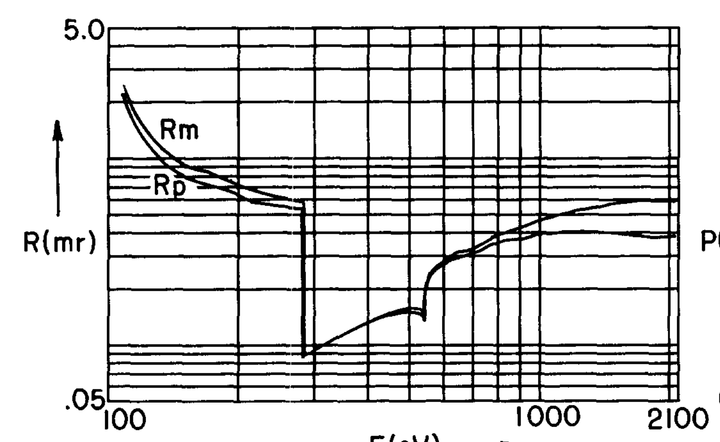
XI. Low-Energy X-Ray Interaction Coefficient Tables

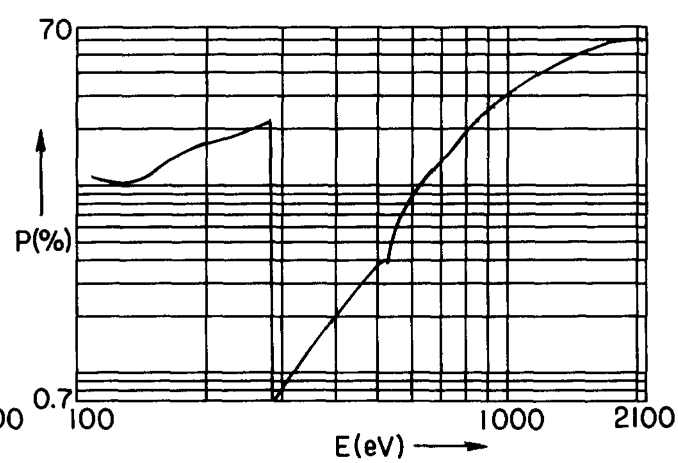
See page 19 for Explanation of Tables

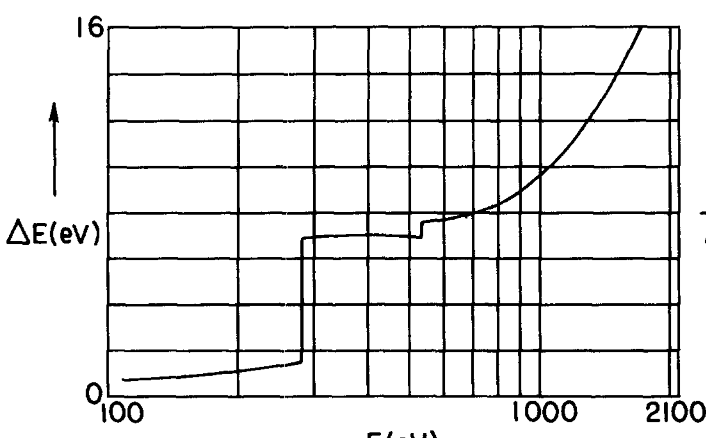
TABLE VI. BRAGG REFLECTION CHARACTERISTICS - THE MOLECULAR MULTILAYERS

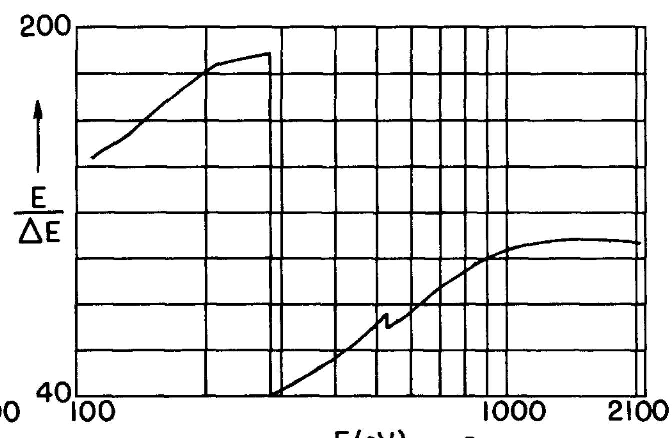
Lead Lignocerate N = 200 2d = 130 A

E(eV)	R_m(mr)	R_p(mr)	P(%)	ω(mr)	L/R_p	ΔE(eV)	E/ΔE	λ(A)
108.5	2.45	2.20	11.20	13.98	1.05	0.75	145	114.3
114.0	1.83	1.63	10.61	11.09	1.06	0.77	148	108.8
132.8	1.12	0.97	10.46	6.96	1.10	0.86	155	93.4
148.7	0.94	0.80	11.68	5.33	1.14	0.92	162	83.4
151.1	0.92	0.79	11.91	5.15	1.14	0.93	163	82.1
171.7	0.84	0.72	14.33	3.99	1.17	1.00	172	72.2
183.3	0.80	0.68	15.49	3.54	1.19	1.04	176	67.7
192.6	0.76	0.66	16.29	3.26	1.18	1.07	179	64.4
212.2	0.68	0.59	17.27	2.79	1.20	1.15	185	58.4
277.0	0.59	0.54	21.54	1.97	1.16	1.47	188	44.8
311.7	0.10	0.10	0.89	7.30	0.96	6.95	45	39.8
392.4	0.13	0.13	1.86	4.59	0.97	7.02	56	31.6
395.3	0.13	0.13	1.91	4.52	0.98	7.01	56	31.4
452.2	0.15	0.15	2.88	3.44	0.97	7.03	64	27.4
511.3	0.16	0.15	3.93	2.66	1.03	6.97	73	24.3
524.9	0.15	0.14	3.84	2.49	1.00	6.90	76	23.6
556.3	0.24	0.23	6.37	2.45	1.00	7.62	73	22.3
572.8	0.26	0.25	7.24	2.32	0.99	7.65	75	21.7
637.4	0.31	0.29	10.40	1.90	1.00	7.78	82	19.5
676.8	0.32	0.30	12.04	1.69	1.00	7.81	87	18.3
705.0	0.33	0.31	13.47	1.59	1.02	8.01	88	17.6
776.2	0.38	0.35	17.73	1.37	1.02	8.33	93	16.0
851.5	0.41	0.37	21.82	1.18	1.02	8.65	98	14.6
929.7	0.44	0.38	26.01	1.04	1.05	9.12	102	13.3
1011.7	0.47	0.40	30.66	0.93	1.05	9.70	104	12.3









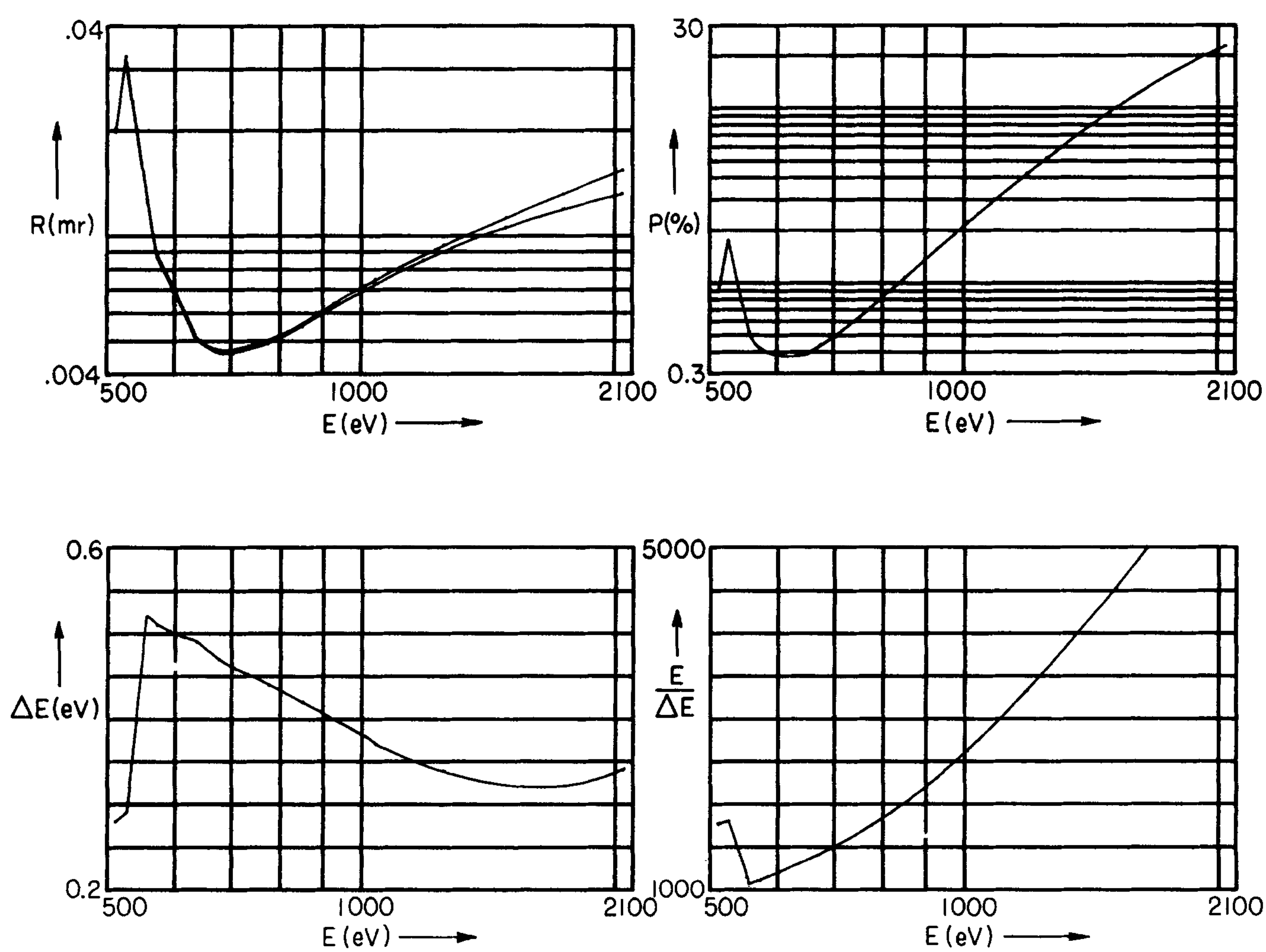
XI. Low-Energy X-Ray Interaction Coefficient Tables

See page 19 for Explanation of Tables

TABLE VI. BRAGG REFLECTION CHARACTERISTICS - THE ACID PHTHALATES

Ammonium Acid Phthalate (NH_4AP) 2d = 26.19 A

E(eV)	R_m(mr)	R_p(mr)	P(%)	ω(mr)	L/R_p	ΔE(eV)	E/ΔE	λ(A)
511.3	.0203	.0199	0.91	1.42	0.96	0.29	1768	24.3
524.9	.0327	.0319	1.76	1.18	0.96	0.29	1798	23.6
556.3	.0127	.0126	0.52	1.55	0.94	0.53	1055	22.3
572.8	.0088	.0087	0.42	1.34	0.95	0.52	1107	21.7
637.4	.0051	.0050	0.38	0.86	0.96	0.49	1301	19.5
676.8	.0047	.0046	0.44	0.69	0.97	0.47	1435	18.3
705.0	.0047	.0046	0.49	0.60	0.94	0.47	1510	17.6
776.2	.0050	.0049	0.72	0.44	0.95	0.44	1750	16.0
851.5	.0056	.0055	1.08	0.33	0.95	0.42	2024	14.6
929.7	.0064	.0063	1.58	0.26	0.96	0.40	2306	13.3
1011.7	.0072	.0070	2.25	0.20	0.95	0.39	2626	12.3
1041.0	.0075	.0073	2.53	0.19	0.97	0.38	2740	11.9
1188.0	.0088	.0085	4.27	0.13	0.96	0.36	3325	10.4
1253.6	.0094	.0090	5.22	0.11	0.94	0.35	3587	9.89
1486.7	.0113	.0106	9.41	0.08	1.04	0.33	4439	8.34
1740.0	.0132	.0120	15.38	0.05	0.94	0.33	5276	7.13
2042.4	.0154	.0132	23.11	0.04	1.03	0.34	5924	6.07



XI. Low-Energy X-Ray Interaction Coefficient Tables

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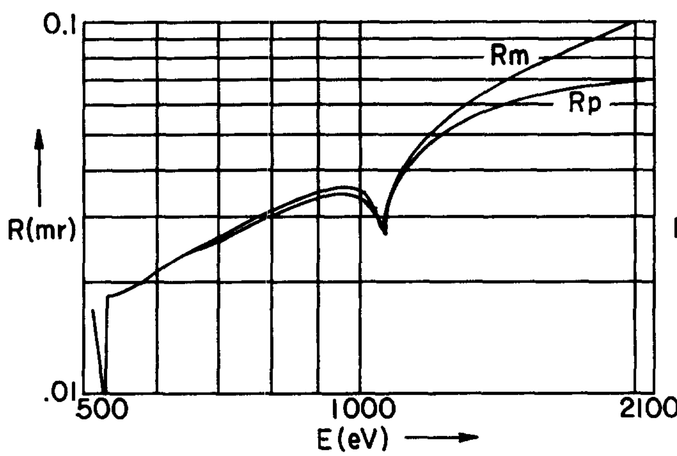
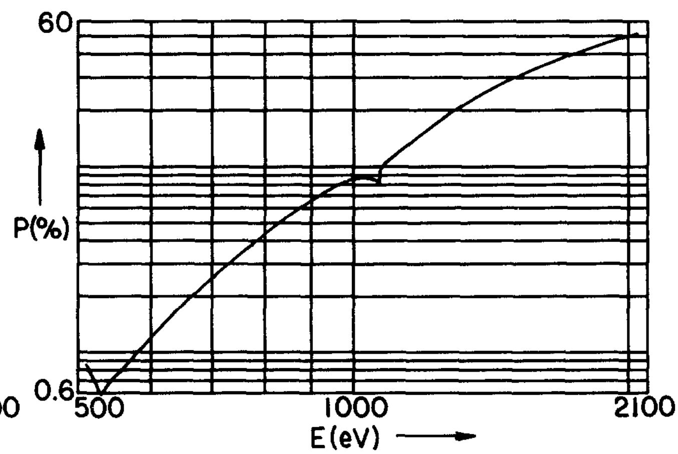
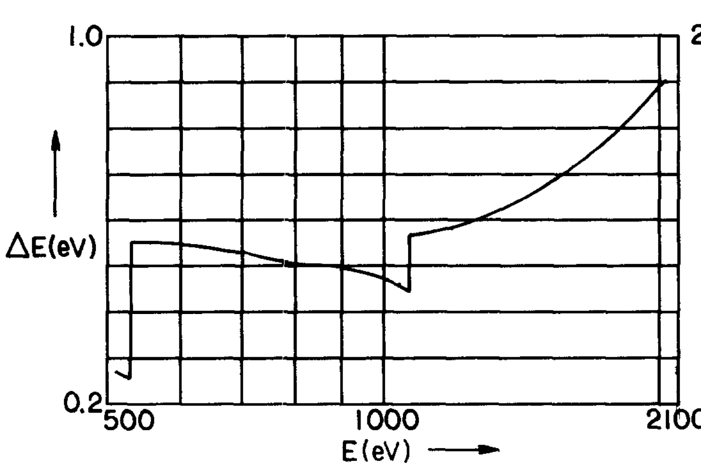
TABLE VI. BRAGG REFLECTION CHARACTERISTICS - THE ACID PHTHALATES

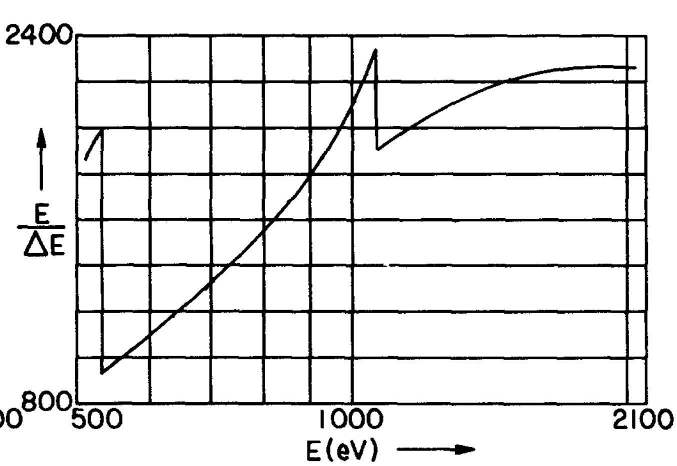
Sodium Acid Phthalate (NaAP) 2d = 26.42 A

E(eV)	R'_m(mr)	R_p(mr)	P(%)	ω(mr)	L/R_p	ΔE(eV)	E/ΔE	λ(A)
511.3	.0168	.0167	0.90	1.19	0.94	0.27	1869	24.3
524.9	.0100	.0100	0.64	0.99	0.93	0.27	1954	23.6
556.3	.0191	.0191	0.79	1.55	0.94	0.56	994	22.3
572.8	.0199	.0198	0.93	1.36	0.94	0.55	1033	21.7
637.4	.0237	.0235	1.65	0.91	0.94	0.54	1176	19.5
676.8	.0253	.0249	2.15	0.75	0.95	0.53	1271	18.3
705.0	.0265	.0260	2.54	0.66	0.95	0.53	1330	17.6
776.2	.0299	.0291	3.79	0.50	0.96	0.52	1498	16.0
851.5	.0335	.0322	5.46	0.39	0.97	0.51	1682	14.6
929.7	.0358	.0342	7.31	0.31	0.97	0.50	1869	13.3
1011.7	.0349	.0330	8.95	0.25	1.00	0.48	2108	12.3
1041.0	.0316	.0300	8.89	0.23	1.00	0.47	2226	11.9
1188.0	.0493	.0467	14.79	0.21	0.98	0.59	2028	10.4
1253.6	.0555	.0515	18.07	0.19	0.98	0.60	2079	9.89
1486.7	.0722	.0618	29.26	0.15	1.04	0.67	2212	8.34
1740.0	.0865	.0669	40.20	0.12	1.06	0.77	2260	7.13
2042.4	.1017	.0689	51.11	0.10	1.09	0.90	2262	6.07









XI. Low-Energy X-Ray Interaction Coefficient Tables

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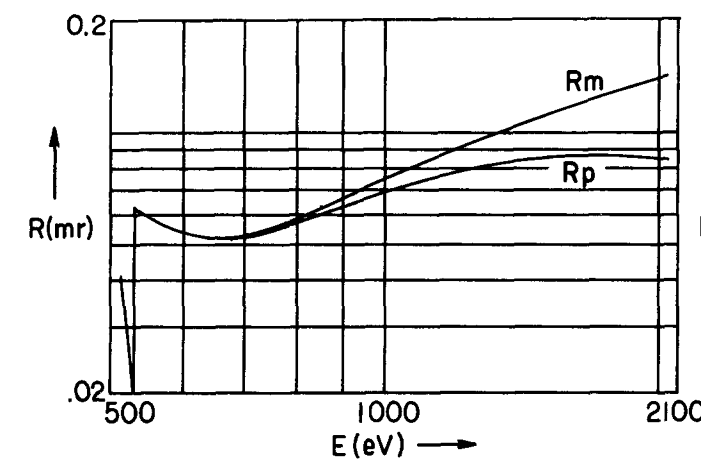
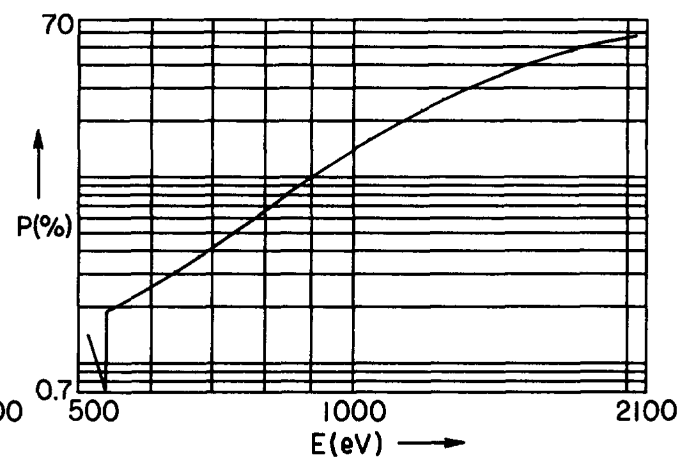
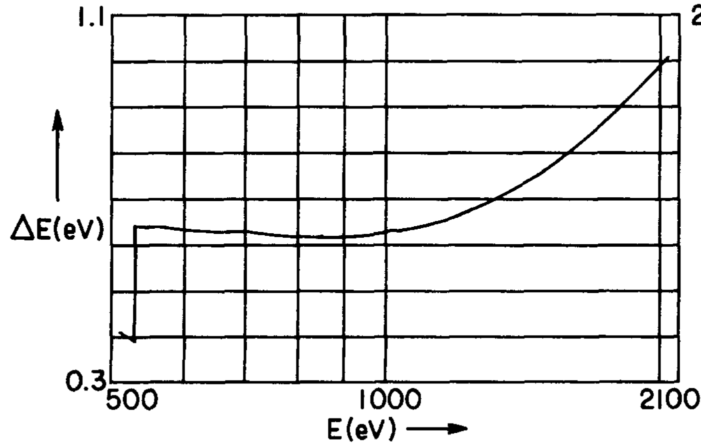
TABLE VI. BRAGG REFLECTION CHARACTERISTICS - THE ACID PHTHALATES

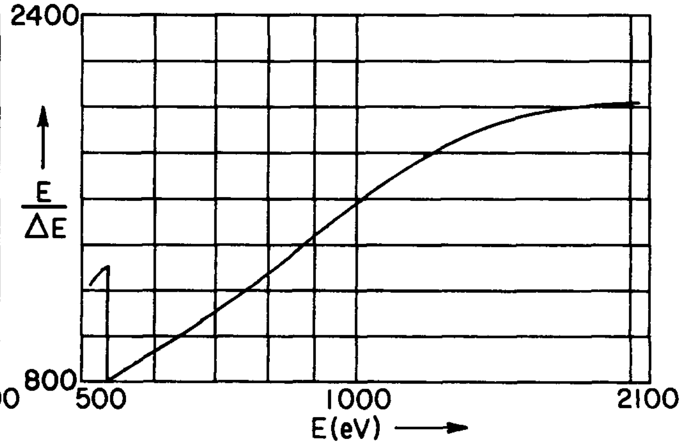
Potassium Acid Phthalate (KAP) 2d = 26.63 A

E(eV)	R_m(mr)	R_p(mr)	P(%)	ω(mr)	L/R_p	ΔE(eV)	E/ΔE	λ(A)
511.3	.0400	.0397	1.41	1.81	0.95	0.41	1232	24.3
524.9	.0212	.0211	0.90	1.49	0.93	0.41	1295	23.6
556.3	.0583	.0583	2.06	1.80	0.94	0.65	856	22.3
572.8	.0559	.0559	2.25	1.58	0.94	0.65	888	21.7
637.4	.0524	.0519	3.11	1.07	0.94	0.64	1001	19.5
676.8	.0523	.0514	3.75	0.89	0.96	0.63	1074	18.3
705.0	.0533	.0522	4.29	0.79	0.96	0.63	1118	17.6
776.2	.0573	.0554	5.97	0.61	0.97	0.63	1235	16.0
851.5	.0633	.0603	8.32	0.48	0.97	0.63	1362	14.6
929.7	.0695	.0651	11.15	0.39	0.98	0.63	1479	13.3
1011.7	.0760	.0699	14.57	0.33	1.01	0.64	1591	12.3
1041.0	.0784	.0715	15.89	0.31	1.01	0.64	1629	11.9
1188.0	.0897	.0783	22.96	0.24	1.04	0.67	1786	10.4
1253.6	.0945	.0806	26.19	0.22	1.05	0.68	1835	9.89
1486.7	.1105	.0856	37.24	0.17	1.09	0.76	1949	8.34
1740.0	.1259	.0868	47.54	0.14	1.13	0.87	1997	7.13
2042.4	.1424	.0849	57.30	0.12	1.19	1.01	2017	6.07









XI. Low-Energy X-Ray Interaction Coefficient Tables

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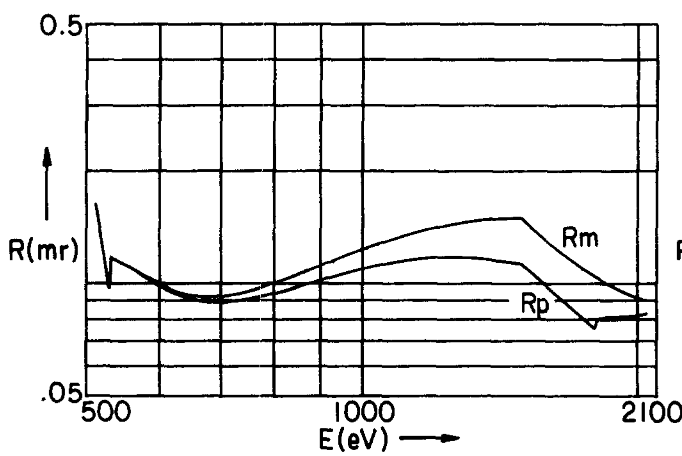
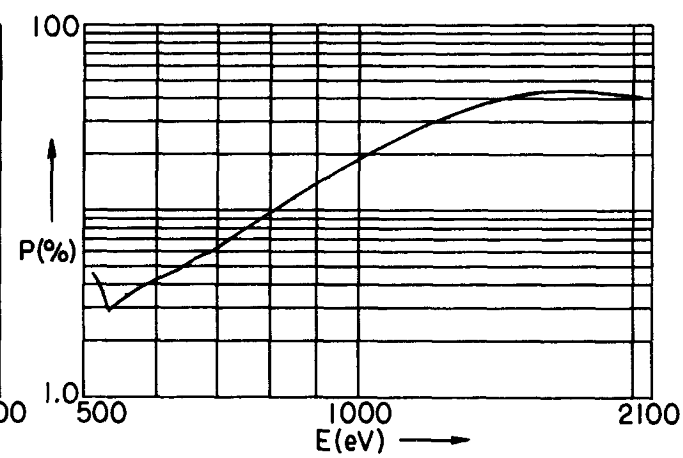
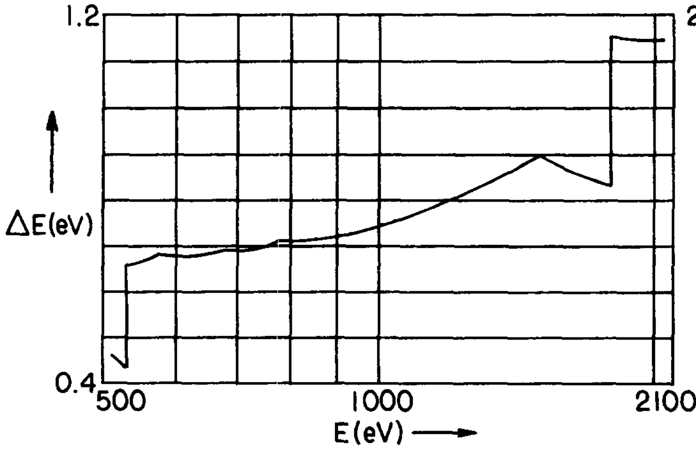
TABLE VI. BRAGG REFLECTION CHARACTERISTICS - THE ACID PHTHALATES

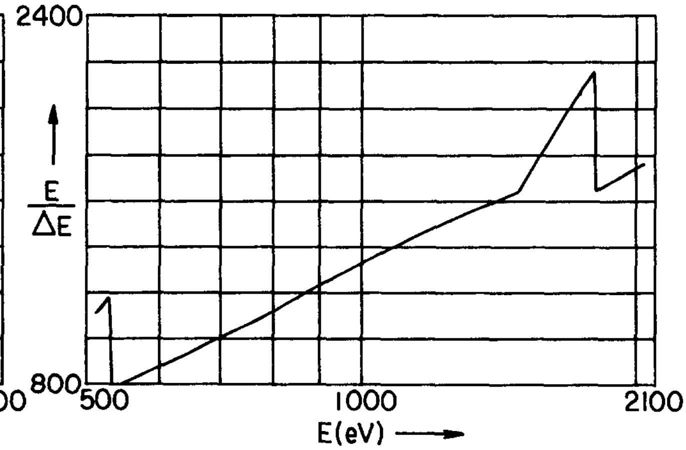
Rubidium Acid Phthalate (RbAP) 2d = 26.12 A

E(eV)	R_m(mr)	R_p(mr)	P(%)	ω(mr)	L/R_p	ΔE(eV)	E/ΔE	λ(A)
511.3	.1630	.1602	4.57	2.27	0.95	0.46	1110	24.3
524.9	.1048	.1034	3.65	1.82	0.95	0.45	1168	23.6
556.3	.1110	.1105	3.52	2.01	0.94	0.68	819	22.3
572.8	.1057	.1048	3.81	1.76	0.94	0.68	842	21.7
637.4	.0940	.0918	4.93	1.21	0.96	0.69	925	19.5
676.8	.0919	.0888	5.77	1.01	0.97	0.69	978	18.3
705.0	.0922	.0887	6.44	0.91	0.97	0.70	1008	17.6
776.2	.0973	.0921	8.64	0.71	0.98	0.71	1090	16.0
851.5	.1058	.0982	11.61	0.57	0.99	0.72	1177	14.6
929.7	.1145	.1043	15.11	0.47	1.00	0.74	1260	13.3
1011.7	.1237	.1100	19.26	0.40	1.03	0.75	1342	12.3
1041.0	.1267	.1117	20.77	0.38	1.04	0.76	1368	11.9
1188.0	.1398	.1172	28.32	0.30	1.07	0.81	1475	10.4
1253.6	.1442	.1180	31.52	0.27	1.06	0.83	1514	9.89
1486.7	.1499	.1130	41.00	0.20	1.07	0.90	1646	8.34
1740.0	.1090	.0805	43.80	0.14	1.12	0.84	2062	7.13
2042.4	.0903	.0830	40.59	0.14	1.01	1.16	1763	6.07









XI. Low-Energy X-Ray Interaction Coefficient Tables

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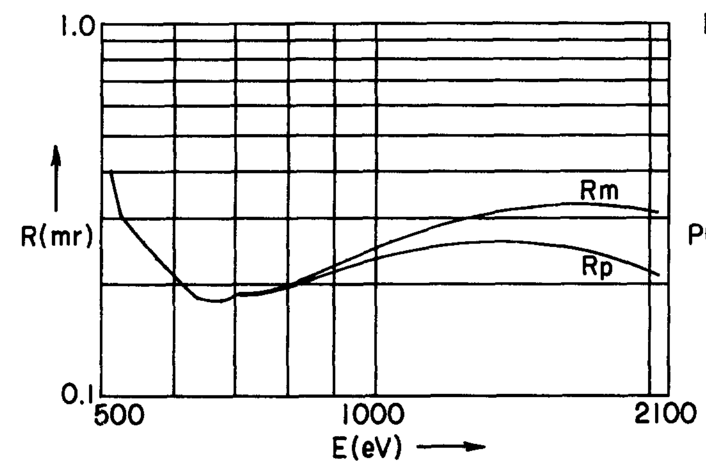
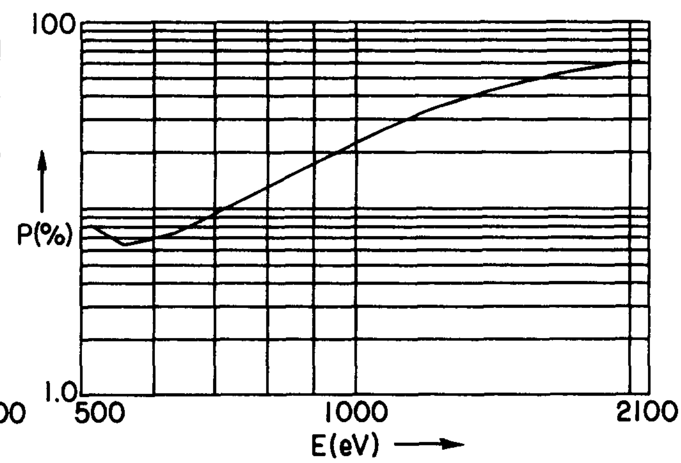
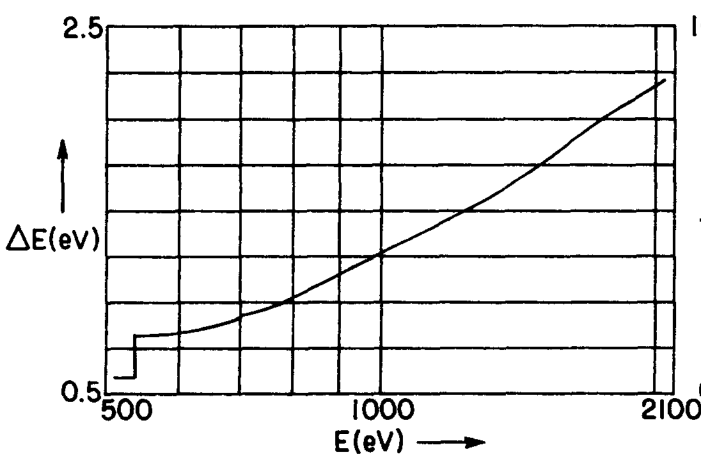
TABLE VI. BRAGG REFLECTION CHARACTERISTICS - THE ACID PHTHALATES

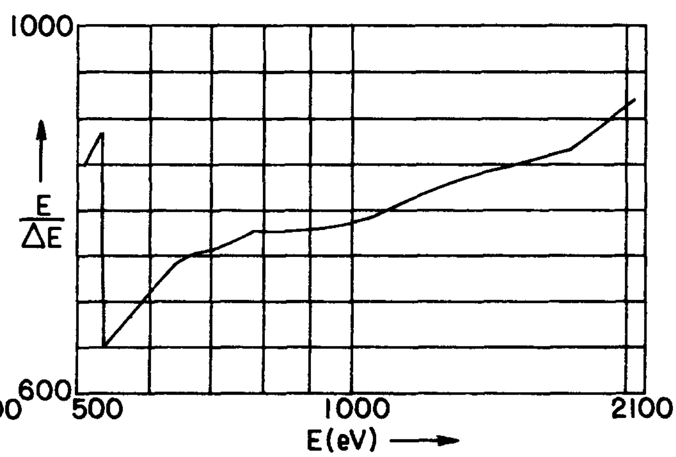
Thallium Acid Phthalate (TlAP) 2d = 25.76 A

E(eV)	R_m(mr)	R_p(mr)	P(%)	ω(mr)	L/R_p	ΔE(eV)	E/ΔE	λ(A)
511.3	.4010	.4052	8.06	3.16	0.92	0.60	855	24.3
524.9	.3028	.3067	7.50	2.56	0.92	0.60	875	23.6
556.3	.2573	.2608	6.45	2.53	0.92	0.83	671	22.3
572.8	.2344	.2372	6.65	2.24	0.92	0.84	684	21.7
637.4	.1834	.1846	7.52	1.54	0.92	0.86	741	19.5
676.8	.1816	.1794	8.59	1.33	0.94	0.90	754	18.3
705.0	.1873	.1875	9.61	1.23	0.93	0.93	756	17.6
776.2	.1948	.1920	12.14	1.01	0.94	1.00	777	16.0
851.5	.2117	.2062	15.23	0.88	0.96	1.10	777	14.6
929.7	.2326	.2219	18.98	0.77	0.97	1.19	781	13.3
1011.7	.2527	.2360	23.12	0.68	0.98	1.28	788	12.3
1041.0	.2609	.2412	24.76	0.66	1.00	1.32	791	11.9
1188.0	.2895	.2552	32.69	0.54	1.02	1.46	816	10.4
1253.6	.2992	.2580	36.06	0.50	1.03	1.52	826	9.89
1486.7	.3227	.2573	46.41	0.40	1.06	1.75	849	8.34
1740.0	.3313	.2433	54.91	0.33	1.10	2.01	867	7.13
2042.4	.3115	.2118	61.62	0.26	1.11	2.22	921	6.07









XII. REFERENCES FOR PHOTOABSORPTION DATA (FOR $E < 300$ eV)

1. For the high atomic number elements for which there were insufficient experimental or theoretical photoionization cross section data below approximately 300 eV, the associated f_2 data were interpolated or extrapolated through atomic number from that of nearby elements for which adequate experimental data were available. The f_2 values at the same proportionate positions between absorption thresholds were set to vary regularly with atomic number, Z, from the known f_2 curves. Regions that have been interpolated and extrapolated in this manner are indicated here as dashed lines.
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