DEUTSCHES ELEKTRONEN-SYNCHROTRON DESY

DESY SR-74/7
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The transmissivity of the light metals Mg and Al, the noble metals Cu, Ag and Au, the semimetal Bi, evaporated Carbon and of Aluminumoxid has been determined in the photon energy range from 13 eV to 150 eV. The experiments were performed using the DESY electron synchrotron as a light source and a special monochromator in combination with a two-beam optical densitometer. The data cover the critical region around 40 eV where ordinary monochromators show weak performance. The results were combined with excisting data in the adjacent energy region. A consistent set of optical constants between 10^{-3} eV and 10^{6} eV was obtained by Kramers-Kronig-analysis. Five different sum rules were applied to each set of data.

This is a compilation of optical data on a few standard substances. It was direcly stimulated by three technical achievements at the DESY synchrotron radiation[58] laboratory. We have developed (1) a two beam optical densitometer[59] which in combination with a fixed-exit-slit grazing incidence monochromator[60] allowed for an accurate measurement of the transmissivity of thin films between 13 and 150 eV photon energy with one instrument. This energy range covers the critical region from 30 to 50 eV where normal incidence monochromators are low in intensity and ordinary grazing incidence monochromators suffer from the superposition of higher order radiation. We have developed (2) a method to prepare very thin films down to below 100 Å. This was necessary because of the high absorption coefficients in this energy range. And (3) an on-line data processing system[61] with a digitizer and a curve-plotter enabled us to handle measured spectra and spectra taken from the literature in an easy way. Especially the rapid Kramers-Kronig transformation routine[62,63] was very important for this project.

With our measurements we were able to close a gap in the spectrum of optical constants (o.c.) in a region where a large number of electrons contribute to the optical behaviour. Interpolations in this region of the spectrum can be misleading. This becomes especially clear from the pioneering paper of Philipp and Ehrenreich[64] who calculated the optical constants of Al over an extended energy range for the first time using experimental results together with interpolations. Their sum rule check revealed a serious lack of oscillator strength. This was corrected for by a subsequent measurement in the region of the Al 2p transitions[1,30].

In the wavelength region from the infrared down to the ultraviolet accurate measurements of the normal incidence reflectance can be performed while at even shorter wavelengths due to the rapid decrease of the reflectivity and due to the increasing importance of surface roughness only transmission measurements are feasible.

In order to join optical constants obtained from reflectivity measurements to those obtained from transmission measurements a repeated Kramers-Kronig-analysis has to be applied. It was frequently necessary to join the two regions by a smooth interpolation. We have stated in all cases in the text which manipulations were made. We have attempted to consider all the relevant data found in the literature. Although we have tried to make a careful selection of the data used for our final curve we are aware of the arbitrariness of our choice in several instances.

We are especially worried about the very large peak values of the absorption coefficient of several substances which we obtain from our measurements. The values are higher than those found in the literature in the overlapping regions. We were unable to find any systematic errors in our measurements which could explain this behaviour, especially since most errors as from stray light and from higher order radiation tend to diminish the apparent absorption coefficients. We therefore fitted the final curve to our data in this region and only by doing so we obtained the correct number of electrons from the sum rules.

In the case of gold, however, this set of optical data leads to a normal incidence reflectivity of 26 % at 22.5 eV while it is 16 % according to apparently reliable measurements[10]. This is the most serious discrepancy which shows up in our data and which we cannot explain satisfactorily. Because of the large technical importance of gold as a reflecting coating we have constructed an alternative set of optical constants which fits better to the reflectivity results. Clearly such discrepancies have to be clarified by further experiments.

Even with these remarks of precaution we feel that a set of Kramers-Kronig consistent optical constants could be very useful in several respects. There are the technical applications as for example optical coatings for reflectors in the normal and grazing incidence regions, reflecting polarizers, the use as filter materials and substrates for thin samples. It is generally interesting to see the interpendence of various optical quantities like R, μ, ε_1, ε_2, n, k, $-\mathrm{Im}\frac{1}{\tilde{\varepsilon}}$ for real materials. Further we have evaluated several sum rules[65] with the help of these optical functions because they are a good test of the quality of the data and also because some of them like the sum rules on n-1 and on μ(n-1) have not yet been tested on realistic optical functions over such a wide energy range. Finally, since the complex dielectric constant contains information on the electronic structure of the materials, the data can serve for a qualitative and quantitative comparison with theories. As for an example noteworthy structures which are not yet explained show up in the spectra of the three noble metals Cu, Ag and Au in the energy range 10 - 40 eV. In this paper we limit ourselves to presenting the optical data.

In the following Section 2 we describe details of the film preparation and the measuring technique. Section 3 gives a general description of the Kramers-Kronig transformation used and finally Section 4 containes in a standarized presentation the origin and the way of composing the data as they were used in the Kramers-Kronig-analysis. This is followed by the list of references which because of technical reasons is not arranged in the usual order. Then we give a section of tables of the optical functions which will be useful if precise data are needed for secondary calculations. The last table gives a survey on the tests of the sum rules. Finally all optical functions are presented as graphs together with results of measurements. Three figures at the beginning of the figure section deal with the experimental procedure while the last nine figures show the evaluation of the sum rules. In all sections of this paper the order of presentation of the different materials is according to the order given in the title.

2. Experimental method

2.1 Film preparation

Because of the generally large absorption coefficients in the spectral region investigated the film thickness ranged from below 100 Å to 600 Å. The films were prepared by vacuum evaporation from resistance heated boats (Mg, Cu, Ag, Au, Bi) or from an e-gun (Al, C, Al_2O_3). The vacuum during evaporation was around $5 \cdot 10^{-7}$ Torr. The evaporation rate (10 - 50 Å/sec) and the thickness of the sample were controlled by an oscillating quartz monitor and recorded automatically as a function of time. The shutter protecting the sample was opened only after an equilibrium rate was attained.

The quartz oscillator was calibrated with a Tolanski interferometer by evaporating films of thicknesses in the order of $\sim$2800 Å. This gives an nominal error of the thickness measurement of $\sim$1.5 %. Because of the discrepancies with the results on Au, mentioned already in the introduction, we applied in this case also the weighing method and transmittance measurements in the visible. Within the errors of each method all results were in agreement.

The films were supported by a copper screen with a separation of the holes of 34μ and 75 % transmissivity. The mesh was smeared with a solution of 2.5 % collodium in amylacetate. After drying, the collodion forms a thin continuous substrate. The evaporant was condensed onto this substrate. Afterwards the collodion was dissolved thoroughly. When preparing very thin films or when using materials which tend to oxidize we have protected and supported the films by evaporating a three layered sandwich without breaking the vacuum: the material investigated was covered by 50 Å thick carbon layers on both sides. The efficiency of this protection was proved[45] with Pr, which is an easily oxidizing material. The measuring method allowed for a cancellation of the effect of the copper screen and the carbon layers by using a carbon sample of equivalent thickness in the second beam of the two-beam optical densitometer (see below). Further details of the film preparation can be found in Ref. 45.

In the case of Al it was necessary to perform an additional measurement with Al evaporated onto carbon substrates in situ in an ultra-high vacuum system. The pressure was about 10^{-9} Torr during evaporation. In this case the film thickness could not be reliably measured and the absorption coefficient had to be fitted to a general curve at one photon energy.

2.2 Measuring procedure

The monochromator used is a complicated instrument which is described in great detail elsewhere[60]. Here we only mention those of its features which are important for the present experiments. The monochromator gives off a light beam in a fixed direction which has a point focus at the fixed exit slit. Higher order radiation is efficiently suppressed over the whole energy range of operation. A thin surface layer of carbon develops on the optical components because of the action of synchrotron light. This proved to be favorable for the suppression of higher order radiation when the instrument was used in the so called "non-parallel mode". A deviation from parallelity of premirror and grating[60] of 1^{o} was used for photon energies in the range 21 eV - 150 eV and a deviation of 2.7^{o} was used in the range 13 eV - 21 eV. The calibration was good to 0.3 eV over the whole range of energies the resolution was in the order of 1:500.

Figure 1 shows the arrangement of the two beam optical densitometer behind the exit slit of the monochromator. After passing a filter (see below and

Fig. 2a) the beam hits a rotating mirror M1 at a grazing angle of 4°. The reflected beam passes through sample 1 and hits the cathode of an open photomultiplier at a grazing angle of 15°. The cathode is coated with a thin layer of KCl which has a high yield in the low energy region of the spectrum. When the mirror is rotated to the open segment the beam is reflected by a fixed mirror M2 and transmits a reference sample 2 (in our application an empty mesh or a mesh covered with a carbon film). The signals of the two detectors D_1 and D_2 are electronically divided. The instrument is described in detail elsewhere.[59]

Figure 2b shows in its bottom part the spectrum with empty sample positions. The central part shows as an example an original spectrum of a VAl_3 alloy film compared with a vanadium film of equivalent vanadium density. The upper part gives the 'reciprocal transmittance' of this VAl_3 film (actually the 'reciprocal transmittance of Al in the VAl_3') as it was corrected for the apparative characteristics (bottom curve). The upper curve has a calibrated linear energy scale. The example is taken from an application of this method to the measurement of alloys.[45]

Figure 2a shows the result of inserting different filters into the primary beam (Fig. 1). The Al filter reduces stray light and higher orders between 36 and 72 eV which results in a reduced apparent transmissivity. Pr is a quite good filter material between 60 eV and 100 eV. Due to its very strong absorption peak setting in above 120 eV, the primary intensity is decreased with this filter by several orders of magnitude. This explains the deviation around 130 eV of the curve measured with filter from that measured without filter. Sb has a high transmissivity at low photon energies. The agreement of the curves with and without the Sb filter is a good indication of low stray-light and low higher-order contributions in this energy region.

3. Kramers-Kronig-analysis

The Kramers-Kronig-relations connect the real and imaginary part of certain complex functions describing the optical behaviour of solids[64-66]. The relation most useful for evaluating reflectance measurements in the low energy region connects the phase angle $\Theta(\omega_o)$ with an integral over the reflectance $R(\omega)$

$$\Theta(\omega_o) = -\frac{\omega_o}{\pi} P \int_0^\infty d\omega \frac{\ln R(\omega)}{\omega^2-\omega_o^2} \qquad (1)$$

where P denotes the Cauchy principal value of the integral and ω the angular frequency of the radiation. If the polarization and the incident angle of the radiation are known the dielectric functions can be calculated elementarily[63,67].

While reflection measurements are used in the infrared visible and near vacuum ultraviolet regions absorption is usually measured from the far vacuum ultraviolet down to the x-ray region. As long as the reflectivity of the samples used is small (more accurately[68]: $R \ll 1$, $k^2 \ll n^2$) the absorption coefficient μ can simply be calculated from the transmittance T and the thickness d of the sample by applying:

$$\mu(\omega_o) = -\frac{1}{d} \ln T(\omega_o) = \frac{2\omega_o}{c} k(\omega_o), \qquad (2)$$

The real part n of the complex refractive index $\hat{n} = n+ik$ is obtained by the Kramers-Kronig-relation

$$n(\omega_o) = 1 + \frac{c}{\pi} P \int_0^\infty d\omega \frac{\mu(\omega)}{\omega^2-\omega_o^2} \qquad (3)$$

If the transmittance of a thin foil is measured in a region where reflectance is still important, the relation

$$\Theta_T(\omega_o) = -\frac{\omega_o}{\pi} P \int_0^\infty d\omega \frac{\ln T(\omega)}{\omega^2-\omega_o^2} + \frac{\omega_o}{c} d \qquad (4)$$

holds[63,69] (the sign convention used here is different from that in Ref. 69. $\hat{n}$ is determined from T and Θ_T by the iterative solution of an implicit system of equations[63,70]:

$$T_{EX} - T(n,k) = 0$$
$$\Theta_T - \Theta(n,k) = 0$$

with[71]

$$T(n,k) = 16 \cdot \frac{n^2+k^2}{C^2+D^2}$$

$$\Theta(n,k) = \arc\tan\left(\frac{kC+nd}{kD-nC}\right) \tag{5}$$

$$C = e^{M}\{((n+1)^2+k^2)\cos N + 2k(n+1)\sin N\}$$
$$-e^{-M}\{((n-1)^2-k^2)\cos N - 2k(n-1)\sin N\}$$

$$D = -e^{M}\{((n+1)^2-k^2)\sin N - 2k(n+1)\cos N\}$$
$$+e^{-M}\{((n-1)^2-k^2)\sin N + 2k(n-1)\cos N\}$$

$$M = \frac{\omega}{c}\cdot k\cdot d \qquad N = \frac{\omega}{c}\cdot n\cdot d$$

T_{EX} is the experimentally determined transmittance and c the speed of light. The Kramers-Kronig-relations (1), (3) and (4) are valie for insulators as well as for metals[65].

In order to obtain a complete set of optical constants for the entire energy range the following procedures were applied:

If the directly measured absorption coefficient could be matched to μ-values which were available from other experiments in the low energy region, Kramers-Kronig-analysis was performed with the total absorption spectrum (Eq. 3).

If the infrared, the visible- and near UV-region only measured reflectivities were available, first the Kramers-Kronig-relation Eq. (1) was used with these data, extrapolated to higher energies. Together with the measured absorption in the high energy region a total absorption spectrum was constructed with some interpolations.

If the reflectance is high - as for Au and Ag in the intermediate range between 13 eV and 50 eV - a total transmittance spectrum was constructed and the Kramers-Kronig-relation Eq. 4 was applied. In this case an alternative method was tested which did not make use of Eq. 4. In the first step μ_o and k_o is calculated from the measured transmittance T_{EX}(Eq. 2) neglecting the reflectance[72]. Then n_o was calculated from Eq. 3 and the transmittance $T(n_o,k_o)$ of a thin absorbing and reflecting layer[71,75] was determined according to Eq. 5. A better approximation of the absorption coefficient is then given by

$$\mu_1 = 2\mu_o + \frac{1}{d} \ln T(n_o,k_o)$$

This procedure was repeated until T_{EX} and the calculated $T(n,k)$ coincided. In all cases this was achieved with sufficient accuracy by the first corrected μ and the n was determined from it by Eq. 3.

The analysis of the data was carried through by using the interactive online data processing system at DESY[61-63] consisting of a PDP 8e as an intelligent terminal with several convenient input-output and storing features connected to an IBM-computer 360/75.

4. Results

In this section the results of our measurements and calculations of the optical constants (o.c.) are given. Figures 3-34 show graphs of the absolute values of the o.c. on a logarithmic energy scale. The o.c. are tabulated in the Tables 1-9. The abbreviations used in the description of the way in which we have composed the data from different sources are as follows:

a (B) "a" type of data given in publication, "B" method (in most cases measuring technique) used to obtain "a"

Especially:

Type of data "a"

R	reflectance in percent or absolute values
k	imaginary part of the refractive index
μ	absorption coefficient, $\mu=\frac{2\omega}{c}k$
μ/ρ	absorption coefficient divided by the density of the material
σ	photon attenuation cross section in barn/atom
$\hat{\varepsilon}=\varepsilon_1+i\varepsilon_2$	complex dielectric constant

Method "B"

DrP	Drude parameters of the material in the free electron approximation obtained from reflectivity measurements; we have calculated μ from the elementary Drude formulas
R	reflectivity measurements at near normal incidence
T	transmissivity measurements at normal incidence
KrKr	published results of Kramers-Kronig-analysis (calculated from reflectance spectra)
$R(\alpha_i)$	reflectivity measurements at various angles α_i
cp	compilation of total attenuation cross sections by J.H. Hubbell[4]. The contributions from compton effect and pair production have been subtracted by a linear extrapolation of the logarithmic plots at the highest energies

Ell	ellipsometry
EL	characteristic energy-loss of electrons
$T(\alpha_i,P)$	transmissivity at various angles with polarized light

During the evaluation of the spectra it turned out that for some substances the μ-values calculated from our transmission measurements were somewhat higher (between 5 % and 20 %) compared with previous reliable results in the high energy tail of our present measurements around 130 eV. The source of this error was located as a long-time energy independent shift of the relative detector efficiencies due to frequent floating of the vacuum chamber and short pumping times. This resulted in a constant factor by which the transmittance was measured too low, i.e. an additive constant error for μ. The absolute value $X \cdot 10^5$ cm^{-1} of this correction could be determined from former absorption values considered to be reliable in the overlapping energy range between 120 eV and 150 eV. If a correction of this type was applied it is designated in the description of the absorption curves as "μ(T)-X".

Magnesium (Figs. 2-6, Table 1)

a) Construction of μ-spectrum

E (eV)	Origin of the data, reference no.	
10^{-3}-0.2	μ(DrP)	15
-12	R	39, 40, 15; we applied Kramers-Kronig-analysis with extrapolation obtained from transmittance data
-45	μ(T)	14
-154	μ(T)-1.0	present work, absolute value fitted at 45 eV
-530	-	no experimental data, interpolated segment
>530	μ/ρ(T)	41, 42, 43

b) Remarks

The dip in the reflectivity at 7.1 eV is assigned to a nonradiative surface plasmon[15], which can be excited by electromagnetic radiation only at a rough surface. Referring to the method of sample preparation[14] it has to be admitted that the shape and the absolute value of μ between 12 eV and the onset of the $L_{2,3}$-absorption at 49.5 eV could be influenced by MgO-impurities. If the situation is similar to that with Al in the respective energy range μ could be considerably increased by oxigen impurities. A UHV measurement would be necessary to clarify this point. The absolute value of μ between 50 eV and 160 eV given by Townsend[13] is low by at least a factor of 3 compared to our results. The expected value of the number of electrons n_{eff} = 12 however is obtained only with the high μ-values measured by us. The few experimental values above 160 eV do not allow statements on possible structure of the spectra in this range.

<u>Aluminum (Figs. 7-10, Table 2)</u>

a) Construction of μ-spectrum

E (eV)	Origin of the data, reference no.	
10^{-3}-0.155	μ(DrP)	44
-0.8	-	interpolated according to 44
-2.0	$\hat{\varepsilon}$(Ell)	20 (UHV)
-13.5	$\sim\mu$(DrP)	estimated according to 44
-36	$k(R(\alpha_i),T)$	19
-74	μ(T)	present work (UHV, see b and section 2.1), absolute values fitted at 74 eV
-150	μ(T)	45, experimental procedure similar to present work
-300	μ(T)	shape from 29 and 30, absolute values fitted to 28 (see also Ref. 1)
300	(cp)	

b) Remarks

The reflectivity as calculated by Kramers-Kronig-analysis is in good agreement with the measured normal-incidence reflectivity[31]. The maximum position of $-\mathrm{Im}\frac{1}{\varepsilon}$ at 15.0 eV coincides within 1 % with the measured position of the plasmon energy loss at 14.9 eV as determined from the characteristic energy loss of fast electrons[32]. In the region of low absorption between the plasma frequency at 15 eV and the onset of the $L_{2,3}$-absorption at 72.6 eV the transmittance of the Al samples varied with preparation conditions like base-pressure and evaporation rate. This was recognized earlier, compare e.g. Ref. 54. We have attributed this variation to Aluminumoxid implanted in the foils during evaporation and therefore remeasured the absorption coefficient in this energy range with Al-films prepared in situ under UHV conditions. The extremely low μ-values obtained this way are consistent with those from Hunter[46] in the region of overlap. The experimental results of different authors[1,28-30] are deviating between 73 eV and 150 eV by 8 % at most. The μ-spectrum chosen here[45] shows the largest differences between peaks and minima. From 200 eV to 500 eV the values may be less accurate which could be responsible for the overestimation of n_{eff} by 0.5 electrons as compared to the theoretical limit of 13.

Copper (Figs. 11-14, Table 3)

a) Construction of the μ-spectrum

E (eV)	Origin of the data, reference no.		
10^{-3}-0.5	μ(DrP)	5	
-6.5	k(R,T)	5	
-13	k(R,Kr)	12)	) interpolated curve, absolute values
	k(R(α_i))	11)	fitted to Ref. 11
-150	μ(T)-0.8	present work	
-450	μ(T)	47, compare also Ref. 9	
>450	σ(cp)		

b) Remarks

A reasonable interpolation between existing results (e.g. Ref. 11, 12) from 6.5 eV to 13 eV could be found without running into discrepancies, which in a quite natural way joins the results from reflectance measurements at long wavelengths to those of our absorption measurements at shorter wavelengths. The o.c. for Cu calculated here are no longer in contradiction to electron-loss spectra[6,55]. The remaining deviations might be due to the difficulties with separating multiple losses in electron energy-loss experiments. There are large deviations from the results of Haensel et al.[9] in the vicinity of the onset of the $M_{2,3}$-absorption (73.6 eV) which could be attributed to errors in those measurements induced by the use of Al-filters.

Silver (Figs. 15-18, Table 4)

a) Construction of the μ-spectrum

E (eV)	Origin of the data, reference no.	
10^{-3}-0.5	μ(DrP)	5
-3.5	k(R,T)	5
-11	k(R,Kr)	18 (UHV)
-16	-	interpolated segment, interpolation facilitated by results from Ref. 11, 12 and from present work
-110	μ(T)-0.7	present work (calculated from Eq. 4,5, compare b)
-300	μ(T)	9
>300	σ(cp)	

b) Remarks

Up to an energy of 3.5 eV the k-values from Ref. 5 have been taken for the construction of the absorption spectrum. On the basis of the total absorption curve chosen the n-data given in Ref. 5 are not Kramers-Kronig-consistent (see Fig. 17).

The peaks of the calculated $-\mathrm{Im}\frac{1}{\hat{\varepsilon}}$ at 19 eV, 27.5 eV, and 35 eV come to lie at higher energies than the corresponding peaks in the energy-loss-spectra as determined in Ref. 6 and 38, whereas the structures in $-\mathrm{Im}\frac{1}{\hat{\varepsilon}}$ from optical data above 40 eV have not been found in energy loss experiments[6]. Because of the high reflectance in the soft x-ray range (16.5 % at 23.5 eV) it is not permissible to determine μ from the simplified Eq. 2, instead the Kramers-Kronig-relation Eq. 4 and the procedures described in the section following Eq. 3 have been applied in this energy range.

Gold (Figs. 19-22, Tables 5, 6)

a) Construction of the μ-spectrum

E (eV)	Origin of the data, reference no.	
10^{-3}-0.6	μ(DrP)	5
-2.4	k(R,T)	5
-10.5	k(R,Kr)	18 (UHV)
-20	-	fitted segment, shape from Ref. 10 (reflecti measurements)
-117	μ(T)-1.4	present work (calculated from Eq. 4,5, compare Ag (b))
-300	μ(T)	48
>300	μ(T) σ(cp)	shape up to 500 eV interpolated from Ref. 9, absolute values fitted in such a way that a smooth connection at 300 eV and 500 eV is achieved

b) Remarks

The remarks on n of silver as given in Ref. 5 apply here as well. For Au the joining of the results from reflection measurements[10] to the transmission resul (present work) was not possible without appreciable arbitrariness between 12 eV and 40 eV. Au is the element exhibiting the highest reflectance in this energy range in comparison to all other materials investigated here. At 22.5 eV it is 16 % from the direct reflection measurements and 26 % on the basis of a Kramers-Kronig-analysis of the transmission spectrum. Such discrepancies have been found by several experimentalists for a number of substances: Lukirskii et al.[17] obtained the absorption coefficient of Al, Ag and Au from reflection and penetration between 113 Å and 23 Å, the reflectivity results give only 50 - 60 % of the penetration results. Similar deviations have been measured by Parratt[56] for copper with radiation with a few Ångström wavelength, and by Römer[57] for rhenium and plantinum between 30 eV und 130 eV photon energy. The authors assume that this is caused in part by the lower surface density of evaporated films compared to the density of bulk material. Furthermore due to surface roughness part of the light may not be specularly reflected from the sample. Another possibility is the reduction of the measured reflectance in the vacuum-ultraviolet by impurity atoms adherent to the surface, an effect that was observed by Platzöder and Steinmann[3] for gold.

Therefore we give two alternative versions of the o.c. of gold: the first one (Table 5) follows from fitting the adjacent values to our transmission results, the second one (Table 6) from extrapolating the measured reflectance data. The first alternative is leading to the correct value of 79 effectiv electrons, the second one reproduces the energy-loss-spectra[6,38] more closely.

Corresponding discrepancies did not show up so severely with other substances. Also in several cases measured reflectances extending up to 40 eV - 50 eV were not available.

Bismuth (Figs. 23-26, Table 7)

a) Construction of the μ-spectrum

E (eV)	Origin of the data,	reference no.
0.2-0.6	$\hat{\varepsilon}(R(\alpha_i))$	22, 75
-15	$\mu(T(\alpha_i,P))$	49, 22, present work:
	$\hat{\varepsilon}(EL,Kr)$	interpolated between the
	$\mu(T)$	different results
-150	$\mu(T)$	present work
-500	$\mu(T)$	synthesized curve from Refs. 9, 25
-1000	-	interpolated segment
>1000	$\sigma(cp)$	

b) Remarks

The reflectivity as measured by Cardona and Greenaway[27] exhibits additional structure when compared to the result of the Kramers-Kronig-analysis, probably because the measurements were made with Bi-single-crystals (Bi is a non-cubic crystal). The absolute value and the slope of the absorption curve as determined from our work joins in a natural way with the low energy data by Hunter et al.[24] in the vicinity of the onset of the $O_{IV,V}$-absorption at 24 eV and with the data by Haensel et al.[9] near the 57 eV-peak. The splitting of the dominant peak between 50 eV and 80 eV in our measurements is not as pronounced as in Ref. 29, no splitting was observed, however, in Ref. 26. We feel that our measurements are more accurate than the others in this respect since the two-beam technique is especially accurate in the measurement of relative intensities.

Glassy carbon (Figs. 27-30, Table 8)

a) Construction of the μ-spectrum

E (eV)	Origin of the data, reference no.	
10^{-2}-0.5	R	21, 50; we applied Kramers-Kronig-analysis with extrapolation obtained from transmittance data
-80	$k(R(\alpha_i))$	51
-700	μ(T)	52, the absolute values have been reduced by a factor of 0.75 (density correction) to obtain the correct value of 2 effective K-electrons
>700	σ(cp)	

b) Remarks

In this case our values have not been used for constructing the universal curve. The results by Carter et al.[37] for n and k have been obtained from multiangle reflectance measurements with graphite. When comparing values by Klucker[53] (not shown here) on graphite (to be averaged over the crystal orientations for this purpose), the results on glassy carbon[51] and our results from amorphous evaporated carbon we come to the conclusion that oscillator strength from the 5 eV ($\pi \to \pi$ transitions) to the 15 eV ($\sigma \to \sigma$ transitions) peak in ε_2 must be transferred along with the changes of structure. Great care has to be applied in assessing absolute μ-values since the density of carbon samples depends crucially on the conditions of preparation. The values reported here are given on the basis of $\rho = 1.5$ g cm^{-3}.

Al_2O_3 (Figs. 31-34, Table 9)

a) Construction of the μ-spectrum

E (eV)	Origin of the data, reference no.	
5.5-10	$k(R(\alpha_i))$	36, interpolated between 2 experimental points
-20	$k(R(\alpha_i))$	46; shape interpolated by means of our transmission measurements
-150	μ(T)-0.6	present work
-500	μ(T)	33 (12 measured points)
500	σ(cp)	calculated by superposition of Aluminum- and oxygen-data

b) Remarks

Here the o.c. of evaporated amorphous Al_2O_3 are reported, which are important in estimating errors due to oxydation of Al and Al-alloys. The only results obtained with a continuum light source are those between 15 eV and 180 eV (our measurements and Ref. 1) and more structure of the spectra may be hidden between the few measured points. The overall absolute values however seem to be reasonable since no serious discrepancies between different experimental result have been detected and n_{eff} is exceeding the number of 50 electrons theoretically expected only little. The absorption coefficient in the vicinity of the oxygen k-edge obtained by superposition of Hubbell's data[4] is probably overestimating the oscillator strength (tested by sum-rules) in this region. This is not the case with the values measured by Fomichev and Parobets[33], but with these values the continuation of μ to higher photon energies is problematic.

5. Sum rules

The optical constants of materials in the region of linear response fulfil various sum rules[2]. Alterelli et al.[65] have given a systematic derivation of these sum rules. We have applied several of them to check on the accuracy and consistency of the o.c. given here:

$$B \int_0^{\omega_0} \omega \, \varepsilon_2(\omega) d\omega = n_{eff}(\omega_0) \tag{6}$$

$$c \cdot B \int_0^{\omega_0} \mu(\omega) d\omega = n_{eff}(\omega_0) \tag{7}$$

$$-B \int_0^{\omega_0} \omega \, \mathrm{Im}\left(\hat{\varepsilon}^{-1}(\omega)\right) d\omega = n_{eff}(\omega_0) \tag{8}$$

$$\lim_{\omega_0 \to \infty} cB \int_0^{\omega_0} \mu(\omega) \left(n(\omega)-1\right) d\omega = 0 \tag{9}$$

$$\lim_{\omega_0 \to \infty} \int_0^{\omega_0} \left(n(\omega)-1\right) d\omega = 0 \tag{10}$$

$$B = \frac{m}{2\pi^2 e^2} \; \frac{A}{\rho \cdot L}$$

c	vacuum speed of light
$n_{eff}(\omega_0)$	effective number of electrons per atom (molecule) contributing to the optical transitions in the frequency range up to ω_0
m	electron rest mass
e	electron charge
L	Avogadro's number
A	atomic weight of the substance
ρ	density of the substance

The results for n_{eff} as a function of $E = \hbar\omega_0$ as given in Tables 1-9 have been calculated from Eq. 6. Figures 35-42 are showing the values of the integrals as a function of E according to Eqs. 6-8. An evaluation of the results of the numerical integrations (Eqs. 6-8) and a comparison with the theoretically expected number of electrons for the substances investigated is listed in Table 10. Quite generally, the agreement is very good. An example of the behaviour of the integrals Eqs. 9 and 10 is given in Fig. 43 for Ag. The integration of $\mu(n-1)$ (Eq. 9) is approaching zero within the limits of accuracy of the computation proving the correct distribution of n around 1 in the energy region below 10^3 eV. A quantitative test of Eq. 10 could not be achieved because the integration routine used on the computer was not suitable for integrating values very close to zero over a large energy range. This results in the rapid oscillations at the high energy end of Fig. 43. However, the general trend is clearly recognized in Fig. 43. The large deviations from zero of the value of the integral between 10^3 and 10^5 eV are clearly associated with the oscillators in the K-shell. In testing the o.c. of the other materials with Eqs. 9 and 10 we obtained similar results which are not shown.

It can be extracted from Figs. 35-42 that for most of the substances an analysis of partial sum rules with the aim of obtaining the number of the effective electrons from a single atomic inner shell (or subshell) does not make much sense. For most inner electrons, oscillator strength is shifted away from the onset of a particular transition to higher energies, and frequently the contribution of a shell is by far not exhausted at the onset of transitions from the next shell.

The x-ray absorption coefficient from the onset of K-transitions should contribute 2 electrons per atom corresponding to the number of electrons, the contribution to the sum rules in this region, however, appears to be low by 30 % on the average (cf. Table 10, for C compare Section 4, "glassy carbon", a). Such a deficiency was noted previously for a number of materials[73]. This transfer of oscillator strength from more tightly bound to less tightly bound shells can be understood on a qualitative basis.[74]

Acknowledgments

The cooperation of U. Nielsen in extending the on-line computer software to the Kramers-Kronig transformation of absorption and transmission data is gratefully acknowledged. We also wish to thank H. Zeiger for his help in the preparation of the samples. Thanks are due to V. Budde and W. Knaut for skilful drafting the many figures and to K. Koehler, J. Schmidt and D. Stanusch for the excellent photographic work. We thank E. Thumann for her careful typing of the manuscript.

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Figure Captions

Fig. 1: Grazing incidence beam splitter. A puls (duration 10 msec) of monochromatized radiation is reflected either by the rotating mirror M1 and continues on the path marked "1", or it passes the open segment of the mirror holder, is reflected by the static mirror M2, and continues as beam "2". The beams hit the KCl-coated cathodes of the open photomultiplier D1 and D2 at a grazing angle of 15^{o}. Path "2" serves as the reference channel. The signals of the 2 detectors are electronically divided.

Fig. 2: a) Transmissivity of Ag: example of inserting different filters into the primary beam (see Fig. 1). The agreement of the curves at low photon energies with and without Sb-filter indicates low stray-light and low higher-order contributions in this region. The Al-filter reduces second order radiation between 36 eV and 72 eV, which simultates higher Ag-transmissivity when measured without filter. Possessing a transmittance window between 60 eV and 120 eV, Pr is an efficient filter material in this region. Above 120 eV, however, it is totally inadaquate as a filter due to a giant absorption peak around 130 eV which reduces the primary intensity by several orders of magnitude. The different segments of the curves can be joined smoothly to give the correct Ag-transmissivity.

b) Bottom part: unprocessed spectrum ("apparative characteristics") without samples in positions 1 and 2 (cf. Fig. 1), central part: raw data of a VAl_3 alloy film (position 2) when compared with a V-film (position 1) of equivalent V optical density. Upper part: This spectrum after correction for the apparative characteristics, plotted with a calibrated linear energy scale.

Figs. 3 - 34: Symbols of the <u>optical functions</u>:

R % = normal incidence reflectivity

= absorption coefficient in 10^5 cm^{-1}

= real part)
) of the dielectric constant
= imaginary part)

n = real part)
) of the refractive index
k = imaginary part)

$-\mathrm{Im}\hat{\varepsilon}^{-1} = \frac{\varepsilon_2}{\varepsilon_1^2+\varepsilon_2^2}$, energy loss function

<u>Scaling factors:</u>

e.g. "x3": values taken from the graphs for this section have to be multiplied by a factor of three.

If there is a break in the curves without a factor the left respective right scale applies to the adjacent individual sections.

<u>Drafting of the curves:</u>

Full lines: final absorption spectra as they were composed from the different measurements and results from the Kramers-Kronig-analysis. For measurements which have been used for the full line curves see text. For Mg there is an important spectral range where no measurements were available, the solid line is interrupted here (Fig. 3). Representative additional experimental results are drawn into those graphs which show the optical functions that were measured.

The materials are given in the following order: Mg, Al, Cu, Ag, Au, Bi, C, Al_2O_3.

Figs. 35 - 43: Test of the sum rules according to the integrals given in the figures (see also Eqs. 6-10). The lower boundary is 0 while the upper boundary of the integrals corresponds to the photon energy given. N_{eff} is the effective number of electrons/atom or molecule contributing to the respective optical function between these boundaries. The left scale in Fig. 43 is given in units of 10^5 cm^{-1} while the right scale is given in units of eV.

<u>scaling factors:</u>

e.g. "10 x": This curve section has been enhanced in the graph by a factor of ten.

Table Captions

Tables 1 - 9: Numerical values of the optical functions from the Kramers-Kronig-analysis of absorption data, N-EFF according to Eq. 6. Table 6 gives in addition the results of the Kramers-Kronig-analysis of the measured reflectivity of Au which has been extrapolated to higher energies.

Tables 10: Summary of the numerical evaluation of the sum rules according to Eqs. 6 - 8.

OPTICAL CONSTANTS OF MG

ENERGY	EPSILON1	EPSILON2	N	K	ABSCOEFF	REFLECT%	ENERGYLOSS	N-EFF
7.00E-02	-2.73E 03	3.69E 03	3.03E 01	6.02E 01	4.19E 05	97.354	1.82E-04	0.023
1.00E-01	-1.83E 03	2.34E 03	2.38E 01	4.88E 01	4.91E 05	96.808	2.72E-04	0.097
1.50E-01	-1.06E 03	1.42E 03	1.89E 01	3.76E 01	5.70E 05	95.822	4.55E-04	0.212
2.00E-01	-8.33E 02	9.58E 02	1.52E 01	3.26E 01	6.54E 05	95.415	5.99E-04	0.314
2.50E-01	-6.86E 02	7.34E 02	1.23E 01	2.88E 01	7.10E 05	95.143	7.57E-04	0.392
3.00E-01	-5.42E 02	4.80E 02	9.516	2.51E 01	7.63E 05	94.877	9.19E-04	0.468
3.50E-01	-4.36E 02	3.36E 02	7.519	2.22E 01	7.82E 05	94.676	1.12E-03	0.527
4.00E-01	-3.44E 02	2.38E 02	6.069	1.95E 01	7.85E 05	94.338	1.38E-03	0.576
4.50E-01	-2.58E 02	1.70E 02	5.056	1.68E 01	7.66E 05	93.663	1.80E-03	0.618
5.00E-01	-1.96E 02	1.33E 02	4.509	1.47E 01	7.45E 05	92.683	2.37E-03	0.654
5.50E-01	-1.30E 02	1.02E 02	4.194	1.22E 01	6.77E 05	90.358	3.76E-03	0.685
6.00E-01	-5.02E 01	1.12E 02	6.056	9.33E 00	5.67E 05	82.346	7.31E-03	0.719
6.50E-01	-2.703	1.58E 02	8.809	8.98E 00	5.92E 05	80.103	6.34E-03	0.767
7.00E-01	2.13E 01	2.29E 02	1.12E 01	1.02E 01	7.25E 05	82.320	4.32E-03	0.844
8.00E-01	-1.71E 02	2.56E 02	8.269	1.55E 01	1.26E 06	89.885	2.68E-03	1.073
9.00E-01	-1.87E 02	1.41E 02	4.776	1.45E 01	1.32E 06	92.382	2.46E-03	1.208
1.00E 00	-1.56E 02	7.77E 01	2.977	1.28E 01	1.30E 06	93.530	2.49E-03	1.287
1.50E 00	-6.32E 01	1.28E 01	0.791	7.96E 00	1.20E 06	95.308	3.05E-03	1.440
2.00E 00	-3.30E 01	4.41E 00	0.382	5.74E 00	1.16E 06	95.634	4.01E-03	1.496
3.00E 00	-1.33E 01	1.34E 00	0.184	3.66E 00	1.11E 06	95.023	7.49E-03	1.552
4.00E 00	-6.894	6.54E-01	0.132	2.63E 00	1.07E 06	93.556	1.45E-02	1.586
5.00E 00	-3.976	4.41E-01	0.111	2.00E 00	1.01E 06	91.504	2.79E-02	1.611
5.50E 00	-3.019	3.90E-01	0.112	1.74E 00	9.70E 05	89.470	4.25E-02	1.623
5.70E 00	-2.689	3.56E-01	0.121	1.64E 00	9.50E 05	87.707	5.39E-02	1.627
5.90E 00	-2.405	4.36E-01	0.140	1.56E 00	9.31E 05	84.942	7.32E-02	1.633
6.10E 00	-2.182	4.55E-01	0.166	1.49E 00	9.19E 05	81.353	9.89E-02	1.639
6.30E 00	-2.025	5.36E-01	0.187	1.44E 00	9.16E 05	78.446	1.22E-01	1.646
6.50E 00	-1.893	5.50E-01	0.197	1.39E 00	9.17E 05	76.563	1.41E-01	1.654
6.70E 00	-1.789	5.38E-01	0.199	1.35E 00	9.18E 05	75.628	1.54E-01	1.661
6.90E 00	-1.686	5.08E-01	0.194	1.31E 00	9.18E 05	75.412	1.64E-01	1.669
7.10E 00	-1.585	4.68E-01	0.184	1.27E 00	9.15E 05	75.658	1.71E-01	1.676
7.30E 00	-1.485	4.21E-01	0.171	1.23E 00	9.10E 05	76.322	1.77E-01	1.683
7.50E 00	-1.384	3.68E-01	0.155	1.19E 00	9.02E 05	77.411	1.79E-01	1.689
8.00E 00	-1.115	2.44E-01	0.115	1.06E 00	8.61E 05	80.635	1.87E-01	1.700
8.50E 00	-0.850	1.59E-01	8.58E-02	9.26E-01	7.97E 05	83.148	2.13E-01	1.708
9.00E 00	-0.614	1.13E-01	7.17E-02	7.87E-01	7.18E 05	83.774	2.90E-01	1.714
9.50E 00	-0.415	8.94E-02	6.91E-02	6.47E-01	6.23E 05	82.304	5.02E-01	1.719
1.00E 01	-0.245	7.21E-02	7.23E-02	4.99E-01	5.06E 05	79.320	1.14E 00	1.723
1.05E 01	-7.55E-02	6.50E-02	0.110	2.96E-01	3.15E 05	66.651	6.60E 00	1.727
1.10E 01	5.53E-02	1.03E-01	0.293	1.76E-01	1.96E 05	31.183	7.57E 00	1.731
1.15E 01	0.138	1.27E-01	0.404	1.58E-01	1.84E 05	19.073	3.62E 00	1.739
1.20E 01	0.207	1.39E-01	0.477	1.45E-01	1.77E 05	13.370	2.24E 00	1.747
1.30E 01	0.317	1.47E-01	0.577	1.27E-01	1.68E 05	7.816	1.21E 00	1.767
1.40E 01	0.402	1.43E-01	0.644	1.11E-01	1.57E 05	5.134	7.85E-01	1.788
1.50E 01	0.470	1.27E-01	0.692	9.16E-02	1.39E 05	3.604	5.35E-01	1.809
1.60E 01	0.543	1.17E-01	0.741	7.92E-02	1.28E 05	2.417	3.81E-01	1.829
1.80E 01	0.632	1.17E-01	0.798	7.31E-02	1.33E 05	1.419	2.82E-01	1.873
2.00E 01	0.691	5.86E-02	0.833	5.92E-02	1.20E 05	0.932	2.03E-01	1.917
2.20E 01	0.739	7.81E-02	0.861	4.54E-02	1.01E 05	0.621	1.42E-01	1.956
2.40E 01	0.782	5.84E-02	0.885	3.30E-02	8.03E 04	0.404	9.51E-02	1.989

OPTICAL CONSTANTS OF MG

ENERGY	EPSILON1	EPSILON2	N	K	ABSCOEFF	REFLECT%	ENERGYLOSS	N-EFF
2.60E 01	0.823	4.56E-02	0.906	2.52E-02	6.63E 04	0.261	6.76E-02	2.015
2.80E 01	0.853	3.63E-02	0.924	1.96E-02	5.57E 04	0.167	4.98E-02	2.038
3.00E 01	0.882	3.17E-02	0.939	1.69E-02	5.12E 04	0.106	4.07E-02	2.059
3.20E 01	0.903	2.92E-02	0.950	1.54E-02	4.98E 04	0.071	3.58E-02	2.079
3.40E 01	0.919	2.70E-02	0.959	1.41E-02	4.85E 04	0.049	3.19E-02	2.099
3.60E 01	0.936	2.22E-02	0.967	1.14E-02	4.18E 04	0.031	2.53E-02	2.117
3.80E 01	0.951	1.98E-02	0.975	1.02E-02	3.91E 04	0.018	2.19E-02	2.134
4.00E 01	0.964	1.74E-02	0.982	8.84E-03	3.58E 04	0.010	1.87E-02	2.149
4.20E 01	0.978	1.45E-02	0.989	7.36E-03	3.13E 04	0.005	1.52E-02	2.163
4.40E 01	0.994	1.37E-02	0.997	6.86E-03	3.06E 04	0.001	1.38E-02	2.175
4.60E 01	1.009	1.20E-02	1.004	5.97E-03	2.78E 04	0.001	1.18E-02	2.188
4.80E 01	1.036	1.02E-02	1.018	5.02E-03	2.44E 04	0.008	9.53E-03	2.199
4.85E 01	1.046	1.02E-02	1.023	4.96E-03	2.44E 04	0.013	9.28E-03	2.201
4.90E 01	1.067	1.02E-02	1.033	4.92E-03	2.45E 04	0.027	8.94E-03	2.204
4.92E 01	1.081	1.02E-02	1.040	4.92E-03	2.46E 04	0.039	8.76E-03	2.205
4.94E 01	1.109	2.23E-02	1.053	1.06E-02	5.29E 04	0.072	1.80E-02	2.207
4.96E 01	1.101	7.09E-02	1.050	3.38E-02	1.70E 05	0.087	5.84E-02	2.214
4.98E 01	1.079	8.68E-02	1.040	4.18E-02	2.11E 05	0.080	7.41E-02	2.223
5.00E 01	1.060	9.60E-02	1.030	4.17E-02	2.11E 05	0.065	7.60E-02	2.232
5.05E 01	1.045	7.75E-02	1.023	3.79E-02	1.94E 05	0.049	7.06E-02	2.254
5.10E 01	1.042	7.31E-02	1.021	3.58E-02	1.85E 05	0.042	6.70E-02	2.274
5.15E 01	1.039	7.60E-02	1.020	3.72E-02	1.94E 05	0.044	7.00E-02	2.295
5.20E 01	1.037	7.67E-02	1.019	3.76E-02	1.98E 05	0.044	7.10E-02	2.316
5.25E 01	1.035	7.91E-02	1.018	3.88E-02	2.07E 05	0.045	7.33E-02	2.338
5.30E 01	1.033	8.00E-02	1.017	3.93E-02	2.11E 05	0.045	7.46E-02	2.361
5.35E 01	1.029	8.26E-02	1.015	4.07E-02	2.21E 05	0.046	7.75E-02	2.384
5.40E 01	1.027	8.14E-02	1.014	4.01E-02	2.20E 05	0.045	7.68E-02	2.408
5.45E 01	1.026	8.08E-02	1.013	3.98E-02	2.20E 05	0.044	7.63E-02	2.431
5.50E 01	1.025	8.22E-02	1.013	4.06E-02	2.26E 05	0.045	7.77E-02	2.455
5.55E 01	1.023	8.34E-02	1.012	4.12E-02	2.32E 05	0.046	7.91E-02	2.480
5.60E 01	1.021	8.46E-02	1.011	4.18E-02	2.37E 05	0.046	8.06E-02	2.505
5.70E 01	1.018	8.26E-02	1.010	4.09E-02	2.36E 05	0.044	7.92E-02	2.555
5.80E 01	1.017	8.24E-02	1.009	4.08E-02	2.40E 05	0.043	7.92E-02	2.606
5.90E 01	1.015	8.27E-02	1.008	4.10E-02	2.45E 05	0.043	7.97E-02	2.659
6.00E 01	1.015	8.25E-02	1.008	4.09E-02	2.49E 05	0.043	7.96E-02	2.711
6.20E 01	1.015	8.35E-02	1.008	4.14E-02	2.60E 05	0.044	8.05E-02	2.820
6.40E 01	1.014	8.71E-02	1.008	4.32E-02	2.80E 05	0.048	8.40E-02	2.936
6.60E 01	1.014	9.23E-02	1.008	4.58E-02	3.06E 05	0.054	8.99E-02	3.062
6.80E 01	1.008	1.01E-01	1.005	5.03E-02	3.47E 05	0.064	9.86E-02	3.204
7.00E 01	0.996	1.07E-01	1.000	5.33E-02	3.78E 05	0.071	1.06E-01	3.360
7.20E 01	0.981	1.04E-01	0.992	5.26E-02	3.84E 05	0.071	1.07E-01	3.522
7.40E 01	0.970	9.37E-02	0.986	4.75E-02	3.57E 05	0.062	9.88E-02	3.675
7.60E 01	0.967	8.15E-02	0.984	4.14E-02	3.19E 05	0.050	8.65E-02	3.814
7.80E 01	0.971	7.38E-02	0.986	3.74E-02	2.96E 05	0.040	7.79E-02	3.940
8.00E 01	0.973	7.10E-02	0.987	3.60E-02	2.92E 05	0.037	7.46E-02	4.062
8.20E 01	0.974	6.95E-02	0.988	3.52E-02	2.93E 05	0.035	7.29E-02	4.184
8.40E 01	0.974	6.82E-02	0.988	3.45E-02	2.94E 05	0.034	7.16E-02	4.307
8.60E 01	0.974	6.64E-02	0.987	3.36E-02	2.93E 05	0.033	6.99E-02	4.430
8.70E 01	0.973	6.60E-02	0.987	3.34E-02	2.95E 05	0.032	6.93E-02	4.491
8.80E 01	0.974	6.59E-02	0.987	3.34E-02	2.93E 05	0.032	6.92E-02	4.553

OPTICAL CONSTANTS OF MG

ENERGY	1.-EPSL1	EPSILON2	1.-N	K	ABSCOEFF	REFLECT%	ENERGYLOSS	N-EFF
8.50E 01	2.76E-02	6.65E-02	1.33E-02	3.37E-02	3.04E 05	0.033	7.00E-02	4.617
9.00E 01	2.89E-02	6.51E-02	1.40E-02	3.30E-02	3.01E 05	0.033	6.87E-02	4.679
9.50E 01	3.31E-02	6.09E-02	1.62E-02	3.10E-02	2.98E 05	0.031	6.49E-02	4.991
1.00E 02	3.75E-02	5.25E-02	1.85E-02	2.68E-02	2.71E 05	0.027	5.65E-02	5.297
1.05E 02	3.72E-02	4.41E-02	1.85E-02	2.25E-02	2.39E 05	0.022	4.75E-02	5.547
1.10E 02	3.42E-02	3.79E-02	1.71E-02	1.93E-02	2.15E 05	0.017	4.06E-02	5.779
1.15E 02	3.19E-02	3.48E-02	1.59E-02	1.77E-02	2.06E 05	0.014	3.71E-02	5.995
1.20E 02	3.08E-02	3.26E-02	1.54E-02	1.66E-02	2.01E 05	0.013	3.47E-02	6.209
1.25E 02	3.06E-02	3.00E-02	1.53E-02	1.52E-02	1.93E 05	0.012	3.19E-02	6.413
1.30E 02	3.08E-02	2.66E-02	1.54E-02	1.35E-02	1.78E 05	0.011	2.83E-02	6.605
1.35E 02	3.00E-02	2.29E-02	1.51E-02	1.16E-02	1.59E 05	0.009	2.43E-02	6.777
1.40E 02	2.80E-02	1.98E-02	1.40E-02	1.00E-02	1.42E 05	0.008	2.09E-02	6.932
1.45E 02	2.58E-02	1.75E-02	1.29E-02	8.85E-03	1.30E 05	0.006	1.84E-02	7.072
1.50E 02	2.37E-02	1.61E-02	1.19E-02	8.16E-03	1.24E 05	0.005	1.69E-02	7.204
1.60E 02	2.17E-02	1.41E-02	1.09E-02	7.11E-03	1.15E 05	0.004	1.47E-02	7.451
1.80E 02	1.78E-02	1.05E-02	8.92E-03	5.30E-03	9.66E 04	0.003	1.09E-02	7.881
2.00E 02	1.54E-02	9.08E-03	7.73E-03	4.07E-03	8.25E 04	0.002	8.34E-03	8.245
2.50E 02	1.04E-02	4.27E-03	5.21E-03	2.15E-03	5.43E 04	0.001	4.36E-03	8.915
3.00E 02	7.34E-03	2.48E-03	3.67E-03	1.25E-03	3.78E 04	0.000	2.52E-03	9.365
3.50E 02	5.19E-03	1.62E-03	2.60E-03	8.11E-04	2.86E 04	0.000	1.63E-03	9.638
4.00E 02	4.58E-03	1.08E-03	2.29E-03	5.42E-04	2.20E 04	0.000	1.09E-03	9.938
4.50E 02	3.24E-03	7.48E-04	1.62E-03	3.75E-04	1.71E 04	0.000	7.53E-04	10.131
5.00E 02	2.61E-03	5.32E-04	1.31E-03	2.66E-04	1.35E 04	0.000	5.35E-04	10.282
6.00E 02	2.03E-03	2.78E-04	1.02E-03	1.39E-04	8.45E 03	0.000	2.79E-04	10.495
8.00E 02	8.07E-04	8.83E-05	4.04E-04	4.41E-05	3.56E 03	0.0	8.84E-05	10.701
1.00E 03	2.25E-04	3.72E-05	1.13E-04	1.86E-05	1.86E 03	0.0	3.72E-05	10.797
1.20E 03	7.06E-05	1.79E-05	3.53E-05	8.94E-06	1.06E 03	0.0	1.79E-05	10.840
1.25E 03	1.10E-04	1.42E-05	5.50E-05	7.09E-06	8.95E 02	0.0	1.42E-05	10.850
1.26E 03	8.83E-05	1.63E-05	4.42E-05	8.15E-06	1.07E 03	0.0	1.63E-05	10.861
1.30E 03	-5.15E-05	3.01E-05	-2.57E-05	1.50E-05	2.14E 03	0.0	3.00E-05	10.923
1.50E 03	-7.02E-04	9.52E-05	-3.51E-04	4.76E-05	7.22E 03	0.0	9.51E-05	11.227
2.00E 03	2.71E-04	3.49E-05	1.36E-04	1.75E-05	3.46E 03	0.0	3.50E-05	11.632
4.00E 03	4.11E-04	2.37E-06	2.06E-04	1.19E-06	4.70E 02	0.0	2.37E-06	12.051
6.00E 03	2.08E-04	5.50E-07	1.04E-04	2.75E-07	1.54E 02	0.0	5.50E-07	12.118
8.00E 03	4.57E-05	1.65E-07	2.28E-05	8.27E-08	6.36E 01	0.0	1.66E-07	12.146
1.00E 04	-1.70E-04	6.67E-08	-8.49E-05	3.33E-08	3.22E 01	0.0	6.67E-08	12.159
2.00E 04	-1.09E-03	4.08E-09	-5.47E-04	2.04E-09	4.01E 00	0.0	4.07E-09	12.176
3.00E 04	-7.18E-04	9.61E-10	-3.59E-04	4.80E-10	1.34E 00	0.0	9.59E-10	12.179
4.00E 04	-3.24E-05	2.70E-10	-1.62E-05	1.35E-10	5.26E-01	0.0	2.70E-10	12.180
5.00E 04	-1.26E-04	1.08E-10	-6.29E-05	5.38E-11	2.67E-01	0.0	1.09E-10	12.191

OPTICAL CONSTANTS OF AL

ENERGY	EPSILON1	EPSILON2	N	K	ABSCOEFF	REFLECT%	ENERGYLOSS	N-EFF
1.00E-03	-7.27E 04	2.60E 06	1.12E 03	1.16E 03	1.17E 05	99.827	3.85E-07	0.0
5.00E-03	-4.49E 04	5.11E 05	4.84E 02	5.28E 02	2.68E 05	99.624	1.94E-06	0.077
1.00E-02	-3.61E 04	2.55E 05	3.32E 02	3.83E 02	3.88E 05	99.484	3.85E-06	0.175
5.00E-02	-2.51E 04	3.54E 04	9.57E 01	1.85E 02	9.37E 05	99.121	1.88E-05	0.821
1.00E-01	-1.31E 04	7.78E 03	3.24E 01	1.19E 02	1.20E 06	99.156	3.34E-05	1.251
2.00E-01	-3.78E 03	1.09E 03	8.732	6.20E 01	1.25E 06	99.115	7.06E-05	1.527
3.00E-01	-1.73E 03	3.63E 02	4.311	4.18E 01	1.27E 06	99.029	1.16E-04	1.631
4.00E-01	-9.74E 02	1.68E 02	2.684	3.13E 01	1.27E 06	98.921	1.72E-04	1.690
5.00E-01	-6.25E 02	9.76E 01	1.946	2.51E 01	1.27E 06	98.778	2.44E-04	1.731
7.00E-01	-3.17E 02	4.55E 01	1.274	1.78E 01	1.26E 06	98.423	4.45E-04	1.787
9.00E-01	-1.87E 02	2.78E 01	1.015	1.37E 01	1.25E 06	97.884	7.81E-04	1.828
1.00E 00	-1.48E 02	2.32E 01	0.949	1.22E 01	1.24E 06	97.517	1.03E-03	1.847
1.10E 00	-1.18E 02	2.02E 01	0.926	1.09E 01	1.22E 06	96.980	1.41E-03	1.864
1.20E 00	-9.37E 01	1.93E 01	0.994	9.73E 00	1.18E 06	95.968	2.12E-03	1.881
1.30E 00	-7.38E 01	2.17E 01	1.250	8.68E 00	1.14E 06	93.779	3.67E-03	1.901
1.40E 00	-5.64E 01	2.97E 01	1.916	7.75E 00	1.10E 06	88.822	7.31E-03	1.927
1.50E 00	-5.20E 01	4.38E 01	2.829	7.75E 00	1.18E 06	84.856	9.47E-03	1.970
1.60E 00	-6.64E 01	4.43E 01	2.588	8.55E 00	1.39E 06	87.959	6.95E-03	2.026
1.70E 00	-6.53E 01	3.47E 01	2.082	8.34E 00	1.44E 06	89.470	6.36E-03	2.073
1.80E 00	-6.03E 01	2.76E 01	1.731	7.96E 00	1.45E 06	90.261	6.23E-03	2.108
2.00E 00	-5.13E 01	1.88E 01	1.292	7.28E 00	1.48E 06	91.135	6.29E-03	2.168
2.50E 00	-3.45E 01	9.21E 00	0.771	5.91E 00	1.49E 06	91.972	7.17E-03	2.261
3.00E 00	-2.51E 01	5.68E 00	0.548	5.00E 00	1.49E 06	92.165	8.56E-03	2.313
4.00E 00	-1.38E 01	2.27E 00	0.298	3.70E 00	1.48E 06	92.349	1.16E-02	2.383
5.00E 00	-8.328	1.07E 00	0.183	2.88E 00	1.45E 06	92.524	1.51E-02	2.425
7.00E 00	-3.709	3.79E-01	0.098	1.93E 00	1.36E 06	92.049	2.75E-02	2.475
9.00E 00	-1.830	1.98E-01	0.073	1.35E 00	1.23E 06	90.209	5.91E-02	2.506
1.10E 01	-0.894	1.15E-01	0.061	9.46E-01	1.05E 06	87.960	1.45E-01	2.527
1.20E 01	-0.586	9.29E-02	0.061	7.67E-01	9.32E 05	85.832	2.72E-01	2.536
1.30E 01	-0.347	7.71E-02	0.065	5.93E-01	7.81E 05	82.476	6.13E-01	2.544
1.40E 01	-0.157	6.75E-02	0.084	4.04E-01	5.73E 05	74.932	2.43E 00	2.551
1.45E 01	-0.079	6.40E-02	0.107	3.01E-01	4.42E 05	67.549	6.27E 00	2.555
1.50E 01	-0.012	5.66E-02	0.152	1.87E-01	2.84E 05	55.376	1.66E 01	2.558
1.55E 01	0.054	5.01E-02	0.252	9.97E-02	1.57E 05	36.105	9.32E 00	2.561
1.60E 01	0.117	4.43E-02	0.346	6.48E-02	1.05E 05	24.056	3.14E 00	2.564
1.80E 01	0.317	4.01E-02	0.564	3.55E-02	6.48E 04	7.810	3.92E-01	2.575
2.00E 01	0.453	3.59E-02	0.673	2.67E-02	5.41E 04	3.834	1.74E-01	2.586
3.00E 01	0.778	2.20E-02	0.882	1.25E-02	3.80E 04	0.398	3.64E-02	2.638
4.00E 01	0.891	1.63E-02	0.944	8.64E-03	3.50E 04	0.086	2.05E-02	2.688
5.00E 01	0.948	1.14E-02	0.974	5.84E-03	2.96E 04	0.019	1.27E-02	2.736
6.00E 01	0.984	9.55E-03	0.992	4.51E-03	2.74E 04	0.002	9.25E-03	2.778
6.50E 01	1.001	8.55E-03	1.001	4.27E-03	2.81E 04	0.000	8.53E-03	2.799
6.70E 01	1.009	8.70E-03	1.005	4.33E-03	2.94E 04	0.001	8.54E-03	2.807
6.90E 01	1.017	8.88E-03	1.009	4.40E-03	3.08E 04	0.002	8.58E-03	2.817
7.00E 01	1.023	9.00E-03	1.012	4.45E-03	3.16E 04	0.004	8.59E-03	2.821
7.10E 01	1.029	9.14E-03	1.015	4.50E-03	3.24E 04	0.006	8.63E-03	2.826
7.20E 01	1.042	9.41E-03	1.021	4.61E-03	3.37E 04	0.011	8.67E-03	2.832
7.25E 01	1.053	9.83E-03	1.026	4.79E-03	3.52E 04	0.017	8.87E-03	2.834
7.27E 01	1.063	1.25E-02	1.031	6.06E-03	4.47E 04	0.024	1.11E-02	2.835
7.29E 01	1.073	3.61E-02	1.036	1.74E-02	1.46E 05	0.039	3.50E-02	2.838

Table 3, page 1

OPTICAL CONSTANTS OF AL

ENERGY	EPSILON1	EPSILON2	N	K	ABSCOEFF	REFLECT%	ENERGYLOSS	N-EFF
7.31E 01	1.060	4.03E-02	1.030	1.96E-02	1.44E 05	0.031	3.57E-02	2.843
7.33E 01	1.056	4.89E-02	1.028	2.38E-02	1.78E 05	0.033	4.40E-02	2.848
7.35E 01	1.049	4.92E-02	1.025	2.40E-02	1.80E 05	0.029	4.46E-02	2.853
7.40E 01	1.041	4.81E-02	1.021	2.36E-02	1.76E 05	0.024	4.25E-02	2.867
7.50E 01	1.035	4.88E-02	1.018	2.40E-02	1.78E 05	0.022	4.44E-02	2.895
7.60E 01	1.031	4.88E-02	1.016	2.40E-02	1.77E 05	0.020	4.39E-02	2.923
7.70E 01	1.030	4.97E-02	1.015	2.45E-02	1.77E 05	0.020	4.34E-02	2.952
7.80E 01	1.030	4.82E-02	1.014	2.38E-02	1.78E 05	0.019	4.31E-02	2.981
7.90E 01	1.031	4.83E-02	1.015	2.38E-02	1.80E 05	0.019	4.30E-02	3.010
8.00E 01	1.033	4.94E-02	1.016	2.43E-02	1.88E 05	0.021	4.42E-02	3.040
8.10E 01	1.032	5.09E-02	1.016	2.50E-02	2.06E 05	0.022	4.72E-02	3.071
8.20E 01	1.033	5.47E-02	1.017	2.69E-02	2.23E 05	0.025	5.09E-02	3.104
8.30E 01	1.033	5.88E-02	1.017	2.89E-02	2.43E 05	0.027	5.49E-02	3.141
8.40E 01	1.030	6.21E-02	1.016	3.06E-02	2.60E 05	0.029	5.83E-02	3.180
8.50E 01	1.027	6.34E-02	1.014	3.12E-02	2.69E 05	0.029	5.99E-02	3.221
8.60E 01	1.027	6.38E-02	1.014	3.15E-02	2.74E 05	0.029	6.02E-02	3.263
8.70E 01	1.028	6.51E-02	1.014	3.21E-02	2.83E 05	0.030	6.13E-02	3.306
8.80E 01	1.027	6.79E-02	1.014	3.35E-02	2.99E 05	0.033	6.41E-02	3.350
8.90E 01	1.027	7.11E-02	1.014	3.51E-02	3.16E 05	0.035	6.72E-02	3.399
9.00E 01	1.026	7.43E-02	1.013	3.66E-02	3.34E 05	0.038	7.02E-02	3.449
9.10E 01	1.023	7.81E-02	1.012	3.86E-02	3.56E 05	0.040	7.42E-02	3.501
9.20E 01	1.020	8.05E-02	1.011	3.98E-02	3.72E 05	0.042	7.69E-02	3.557
9.30E 01	1.016	8.30E-02	1.009	4.11E-02	3.88E 05	0.044	7.99E-02	3.616
9.40E 01	1.012	8.58E-02	1.007	4.26E-02	4.06E 05	0.046	8.31E-02	3.677
9.50E 01	1.007	8.81E-02	1.005	4.39E-02	4.22E 05	0.048	8.62E-02	3.740
9.60E 01	1.000	8.86E-02	1.001	4.42E-02	4.30E 05	0.049	8.78E-02	3.804
9.70E 01	0.994	8.82E-02	0.998	4.42E-02	4.35E 05	0.049	8.87E-02	3.870
9.80E 01	0.985	8.49E-02	0.994	4.27E-02	4.24E 05	0.047	8.68E-02	3.935
9.90E 01	0.980	7.85E-02	0.991	3.96E-02	3.98E 05	0.042	8.13E-02	3.997
1.00E 02	0.977	7.18E-02	0.989	3.63E-02	3.68E 05	0.036	7.49E-02	4.054
1.01E 02	0.977	6.41E-02	0.989	3.24E-02	3.32E 05	0.030	6.69E-02	4.106
1.02E 02	0.983	5.93E-02	0.992	2.99E-02	3.09E 05	0.024	6.12E-02	4.153
1.03E 02	0.984	5.67E-02	0.992	2.86E-02	2.98E 05	0.022	5.84E-02	4.199
1.04E 02	0.988	5.58E-02	0.994	2.81E-02	2.96E 05	0.021	5.70E-02	4.243
1.05E 02	0.990	5.60E-02	0.996	2.81E-02	2.99E 05	0.020	5.69E-02	4.288
1.06E 02	0.992	5.69E-02	0.996	2.86E-02	3.07E 05	0.021	5.77E-02	4.334
1.07E 02	0.994	5.84E-02	0.997	2.93E-02	3.18E 05	0.022	5.89E-02	4.381
1.08E 02	0.993	5.97E-02	0.997	2.99E-02	3.28E 05	0.023	6.04E-02	4.430
1.09E 02	0.992	6.07E-02	0.997	3.05E-02	3.36E 05	0.024	6.14E-02	4.481
1.10E 02	0.991	6.11E-02	0.996	3.07E-02	3.42E 05	0.024	6.20E-02	4.532
1.11E 02	0.990	6.16E-02	0.995	3.09E-02	3.48E 05	0.025	6.26E-02	4.584
1.12E 02	0.989	6.14E-02	0.995	3.09E-02	3.51E 05	0.025	6.26E-02	4.637
1.13E 02	0.988	6.12E-02	0.995	3.07E-02	3.52E 05	0.025	6.24E-02	4.690
1.14E 02	0.987	6.08E-02	0.994	3.06E-02	3.53E 05	0.024	6.22E-02	4.743
1.15E 02	0.986	6.04E-02	0.994	3.04E-02	3.54E 05	0.024	6.18E-02	4.796
1.16E 02	0.985	5.98E-02	0.993	3.01E-02	3.54E 05	0.024	6.14E-02	4.849
1.17E 02	0.985	6.02E-02	0.993	3.03E-02	3.60E 05	0.024	6.18E-02	4.903
1.18E 02	0.983	5.95E-02	0.992	3.00E-02	3.59E 05	0.024	6.13E-02	4.957
1.19E 02	0.982	5.88E-02	0.992	2.97E-02	3.58E 05	0.024	6.07E-02	5.011
1.20E 02	0.983	5.84E-02	0.992	2.94E-02	3.58E 05	0.024	6.03E-02	5.064

Table 2, page 2

OPTICAL CONSTANTS OF AL

ENERGY	1.-EPSL1	EPSILON2	1.-N	K	ABSCOEFF	REFLECT%	ENERGYLOSS	N-EFF
1.22E 02	0.019	5.79E-02	0.009	2.92E-02	3.62E 05	0.024	6.00E-02	5.173
1.24E 02	0.023	5.70E-02	0.011	2.88E-02	3.62E 05	0.024	5.95E-02	5.281
1.26E 02	0.025	5.47E-02	0.012	2.77E-02	3.53E 05	0.023	5.73E-02	5.388
1.28E 02	0.027	5.15E-02	0.013	2.61E-02	3.39E 05	0.022	5.43E-02	5.491
1.30E 02	0.028	4.82E-02	0.014	2.44E-02	3.22E 05	0.020	5.09E-02	5.589
1.32E 02	0.028	4.46E-02	0.014	2.26E-02	3.03E 05	0.018	4.71E-02	5.681
1.34E 02	0.027	4.20E-02	0.013	2.13E-02	2.89E 05	0.016	4.43E-02	5.769
1.36E 02	0.026	4.03E-02	0.013	2.04E-02	2.82E 05	0.015	4.25E-02	5.854
1.38E 02	0.025	3.89E-02	0.012	1.97E-02	2.76E 05	0.014	4.09E-02	5.936
1.40E 02	0.024	3.78E-02	0.012	1.91E-02	2.72E 05	0.013	3.96E-02	6.018
1.45E 02	0.023	3.57E-02	0.012	1.81E-02	2.65E 05	0.012	3.74E-02	6.217
1.50E 02	0.023	3.43E-02	0.011	1.73E-02	2.64E 05	0.011	3.59E-02	6.415
1.60E 02	0.023	3.16E-02	0.012	1.60E-02	2.60E 05	0.010	3.31E-02	6.806
1.70E 02	0.025	2.71E-02	0.012	1.37E-02	2.37E 05	0.009	2.85E-02	7.180
1.80E 02	0.023	2.20E-02	0.011	1.11E-02	2.03E 05	0.006	2.31E-02	7.499
1.90E 02	0.022	1.95E-02	0.011	9.87E-03	1.90E 05	0.005	2.04E-02	7.790
2.00E 02	0.018	1.74E-02	0.009	8.76E-03	1.78E 05	0.004	1.80E-02	8.062
2.20E 02	0.014	1.38E-02	0.007	6.96E-03	1.55E 05	0.003	1.42E-02	8.554
2.40E 02	0.013	1.08E-02	0.007	5.46E-03	1.33E 05	0.002	1.11E-02	8.977
2.60E 02	0.015	8.46E-03	0.008	4.26E-03	1.12E 05	0.002	8.73E-03	9.335
2.80E 02	0.009	6.58E-03	0.004	3.31E-03	9.38E 04	0.001	6.70E-03	9.634
3.00E 02	0.008	5.12E-03	0.004	2.57E-03	7.81E 04	0.001	5.20E-03	9.879
3.50E 02	0.007	3.07E-03	0.004	1.54E-03	5.46E 04	0.000	3.11E-03	10.343
4.00E 02	0.004	2.02E-03	0.002	1.01E-03	4.10E 04	0.000	2.04E-03	10.694
5.00E 02	0.002	9.32E-04	0.001	4.66E-04	2.36E 04	0.000	9.36E-04	11.136
6.00E 02	0.002	4.54E-04	0.001	2.27E-04	1.38E 04	0.000	4.56E-04	11.382
8.00E 02	0.000	1.50E-04	0.000	7.52E-05	6.08E 03	0.0	1.50E-04	11.636
1.00E 03	-0.001	6.21E-05	-0.000	3.10E-05	3.15E 03	0.0	6.20E-05	11.755
1.50E 03	-0.001	1.43E-05	-0.000	7.14E-06	1.08E 03	0.0	1.43E-05	11.886
1.55E 03	-0.001	1.29E-05	-0.000	6.43E-06	1.01E 03	0.0	1.28E-05	11.894
1.60E 03	-0.001	4.64E-05	-0.000	2.32E-05	3.91E 03	0.0	4.63E-05	11.956
1.65E 03	-0.000	9.23E-05	-0.000	4.62E-05	7.87E 03	0.0	9.23E-05	12.037
1.70E 03	-0.000	1.23E-04	-0.000	6.13E-05	1.06E 04	0.0	1.23E-04	12.116
2.00E 03	0.000	6.47E-05	0.000	3.24E-05	6.55E 03	0.0	6.47E-05	12.457
3.00E 03	-0.002	1.50E-05	-0.001	7.51E-06	2.27E 03	0.000	1.50E-05	12.985
5.00E 03	-0.003	2.10E-06	-0.002	1.05E-06	5.30E 02	0.000	2.08E-06	13.298
7.00E 03	-0.005	5.96E-07	-0.003	2.97E-07	2.11E 02	0.000	5.90E-07	13.391
9.00E 03	-0.000	2.25E-07	-0.000	1.12E-07	1.02E 02	0.000	2.24E-07	13.432
1.10E 04	-0.004	1.03E-07	-0.002	5.14E-08	5.72E 01	0.000	1.02E-07	13.452
1.50E 04	-0.000	2.93E-08	-0.000	1.46E-08	2.20E 01	0.0	2.92E-08	13.471
2.00E 04	-0.001	9.38E-09	-0.001	4.68E-09	9.46E 00	0.0	9.35E-09	13.481
3.00E 04	-0.003	2.13E-09	-0.002	1.06E-09	3.21E 00	0.000	2.11E-09	13.489
4.00E 04	-0.003	7.54E-10	-0.002	3.77E-10	1.52E 00	0.000	7.50E-10	13.492
5.00E 04	-0.001	2.99E-10	-0.001	1.50E-10	7.51E-01	0.000	2.99E-10	13.493
6.00E 04	-0.003	1.62E-10	-0.001	8.09E-11	4.85E-01	0.000	1.61E-10	13.494
8.00E 04	0.001	4.95E-11	0.000	2.47E-11	2.00E-01	0.000	4.96E-11	13.494
1.00E 05	-0.003	1.98E-11	-0.001	9.88E-12	1.00E-01	0.000	1.97E-11	13.495
1.20E 05	0.002	1.65E-11	0.001	8.24E-12	1.00E-01	0.000	1.65E-11	13.495

OPTICAL CONSTANTS OF CL

ENERGY	EPSILON1	EPSILON2	N	K	ABSCOEFF	REFLECT%	ENERGYLOSS	N-EFF
2.00E-03		6.13E 05		5.11E 02	8.99E 04	99.582	2.40E-06	0.004
5.00E-03	-1.37E 04	1.59E 05	2.70E 02	2.94E 02	1.49E 05	99.325	6.25E-06	0.017
1.00E-02	-1.06E 04	7.92E 04	1.86E 02	2.13E 02	2.16E 05	99.072	1.24E-05	0.039
5.00E-02	-6.74E 03	1.30E 04	6.28E 01	1.03E 02	5.24E 05	98.298	6.07E-05	0.191
1.00E-01	-4.24E 03	4.25E 03	2.91E 01	7.11E 01	7.02E 05	98.067	1.21E-04	0.310
5.00E-01	-3.08E 02	6.04E 01	1.692	1.76E 01	8.83E 05	97.878	6.11E-04	0.506
1.00E 00	-7.18E 01	7.39E 00	0.433	8.46E 00	8.55E 05	97.650	1.43E-03	0.539
1.50E 00	-2.76E 01	2.73E 00	0.260	5.26E 00	7.99E 05	96.439	3.58E-03	0.552
1.70E 00	-1.96E 01	1.98E 00	0.223	4.43E 00	7.64E 05	95.778	5.11E-03	0.556
1.75E 00	-1.80E 01	1.82E 00	0.214	4.24E 00	7.53E 05	95.601	5.59E-03	0.556
1.80E 00	-1.63E 01	1.72E 00	0.213	4.05E 00	7.38E 05	95.212	6.43E-03	0.557
1.85E 00	-1.48E 01	1.66E 00	0.215	3.86E 00	7.23E 05	94.729	7.48E-03	0.558
1.90E 00	-1.34E 01	1.57E 00	0.214	3.67E 00	7.06E 05	94.251	8.66E-03	0.559
2.00E 00	-1.04E 01	1.76E 00	0.272	3.24E 00	6.56E 05	91.006	1.58E-02	0.561
2.10E 00	-7.673	2.63E 00	0.468	2.81E 00	5.98E 05	81.350	4.01E-02	0.563
2.20E 00	-6.086	4.30E 00	0.826	2.60E 00	5.80E 05	67.307	7.74E-02	0.567
2.30E 00	-5.643	5.38E 00	1.037	2.59E 00	6.04E 05	61.838	8.85E-02	0.574
2.40E 00	-5.519	5.83E 00	1.121	2.60E 00	6.33E 05	60.232	9.05E-02	0.581
2.60E 00	-4.938	5.77E 00	1.152	2.50E 00	6.60E 05	57.703	1.00E-01	0.597
2.80E 00	-4.216	5.52E 00	1.169	2.36E 00	6.70E 05	54.535	1.14E-01	0.614
3.00E 00	-3.475	5.23E 00	1.184	2.21E 00	6.71E 05	50.910	1.33E-01	0.631
3.20E 00	-2.757	5.09E 00	1.232	2.07E 00	6.71E 05	46.759	1.52E-01	0.648
3.40E 00	-2.204	4.96E 00	1.270	1.95E 00	6.73E 05	43.365	1.68E-01	0.666
3.60E 00	-1.789	4.90E 00	1.310	1.87E 00	6.83E 05	40.730	1.80E-01	0.685
3.80E 00	-1.475	4.82E 00	1.336	1.81E 00	6.95E 05	38.700	1.90E-01	0.705
4.00E 00	-1.146	4.62E 00	1.344	1.72E 00	6.97E 05	36.359	2.04E-01	0.725
4.20E 00	-0.679	4.66E 00	1.419	1.64E 00	6.98E 05	33.569	2.10E-01	0.746
4.40E 00	-0.467	4.87E 00	1.487	1.64E 00	7.30E 05	32.897	2.04E-01	0.769
4.60E 00	-0.474	5.07E 00	1.520	1.67E 00	7.78E 05	33.441	1.95E-01	0.793
4.80E 00	-0.586	5.26E 00	1.533	1.71E 00	8.34E 05	34.437	1.88E-01	0.820
5.00E 00	-1.010	5.23E 00	1.470	1.78E 00	9.02E 05	36.583	1.84E-01	0.848
5.20E 00	-1.334	4.95E 00	1.378	1.80E 00	9.48E 05	37.991	1.88E-01	0.876
5.40E 00	-1.550	4.55E 00	1.276	1.78E 00	9.76E 05	38.951	1.97E-01	0.903
5.60E 00	-1.611	4.11E 00	1.183	1.74E 00	9.85E 05	39.156	2.11E-01	0.929
5.80E 00	-1.581	3.69E 00	1.102	1.67E 00	9.83E 05	38.837	2.29E-01	0.952
6.00E 00	-1.464	3.30E 00	1.036	1.59E 00	9.69E 05	37.984	2.53E-01	0.974
6.50E 00	-0.958	2.62E 00	0.958	1.37E 00	9.02E 05	32.883	3.36E-01	1.023
7.00E 00	-0.497	2.34E 00	0.972	1.20E 00	8.52E 05	27.063	4.10E-01	1.068
7.50E 00	-0.188	2.20E 00	1.005	1.09E 00	8.32E 05	22.955	4.51E-01	1.113
8.00E 00	-0.007	2.12E 00	1.029	1.03E 00	8.37E 05	20.576	4.71E-01	1.159
8.50E 00	0.100	2.02E 00	1.029	9.79E-01	8.44E 05	18.905	4.95E-01	1.205
9.00E 00	0.205	1.89E 00	1.027	9.21E-01	8.40E 05	17.143	5.22E-01	1.251
9.50E 00	0.306	1.78E 00	1.029	8.67E-01	8.35E 05	15.460	5.44E-01	1.298
1.00E 01	0.407	1.70E 00	1.038	8.18E-01	8.29E 05	13.909	5.57E-01	1.344
1.10E 01	0.587	1.62E 00	1.074	7.54E-01	8.40E 05	11.772	5.46E-01	1.438
1.20E 01	0.656	1.60E 00	1.091	7.31E-01	8.90E 05	11.068	5.36E-01	1.539
1.30E 01	0.651	1.57E 00	1.084	7.24E-01	9.54E 05	10.907	5.44E-01	1.648
1.40E 01	0.589	1.53E 00	1.055	7.24E-01	1.03E 06	11.095	5.70E-01	1.763
1.45E 01	0.555	1.48E 00	1.034	7.17E-01	1.05E 06	11.084	5.91E-01	1.821
1.50E 01	0.518	1.43E 00	1.009	7.07E-01	1.07E 06	11.016	6.20E-01	1.879

Table 3, page 1

ENERGY	EPSILON1	EPSILON2	N	K	ABSCOEFF	REFLECT%	ENERGYLOSS	N-EFF
1.55E 01	0.479	1.36E 00	0.981	6.95E-01	1.09E 06	10.971	6.53E-01	1.937
1.60E 01	0.458	1.28E 00	0.954	6.73E-01	1.09E 06	10.651	6.91E-01	1.993
1.70E 01	0.449	1.13E 00	0.913	6.20E-01	1.07E 06	9.699	7.63E-01	2.100
1.80E 01	0.477	9.58E-01	0.890	5.61E-01	1.02E 06	8.409	8.16E-01	2.200
1.90E 01	0.523	8.56E-01	0.883	5.07E-01	9.76E 05	7.121	8.32E-01	2.294
2.00E 01	0.571	8.02E-01	0.882	4.55E-01	9.22E 05	5.894	8.28E-01	2.383
2.10E 01	0.635	7.36E-01	0.897	4.11E-01	8.74E 05	4.764	7.79E-01	2.468
2.20E 01	0.695	6.98E-01	0.917	3.81E-01	8.49E 05	3.978	7.19E-01	2.552
2.30E 01	0.756	6.90E-01	0.943	3.66E-01	8.52E 05	3.502	6.59E-01	2.636
2.40E 01	0.785	7.16E-01	0.961	3.73E-01	9.06E 05	3.521	6.34E-01	2.727
2.50E 01	0.765	7.61E-01	0.960	3.96E-01	1.00E 06	3.963	6.54E-01	2.825
2.60E 01	0.685	7.42E-01	0.921	4.03E-01	1.06E 06	4.378	7.27E-01	2.930
2.70E 01	0.634	6.76E-01	0.884	3.82E-01	1.05E 06	4.329	7.87E-01	3.032
2.80E 01	0.624	5.97E-01	0.862	3.46E-01	9.82E 05	3.864	8.00E-01	3.125
2.90E 01	0.630	5.13E-01	0.849	3.02E-01	8.88E 05	3.247	7.77E-01	3.211
3.00E 01	0.664	4.48E-01	0.856	2.62E-01	7.95E 05	2.540	6.98E-01	3.287
3.10E 01	0.711	4.19E-01	0.876	2.39E-01	7.51E 05	2.025	6.15E-01	3.359
3.20E 01	0.743	3.58E-01	0.891	2.23E-01	7.24E 05	1.707	5.60E-01	3.429
3.30E 01	0.767	3.85E-01	0.901	2.14E-01	7.15E 05	1.513	5.23E-01	3.497
3.40E 01	0.786	3.73E-01	0.910	2.05E-01	7.06E 05	1.359	4.93E-01	3.566
3.50E 01	0.801	3.64E-01	0.917	1.98E-01	7.04E 05	1.247	4.70E-01	3.635
3.60E 01	0.812	3.55E-01	0.922	1.93E-01	7.03E 05	1.162	4.52E-01	3.705
3.70E 01	0.820	3.46E-01	0.925	1.87E-01	7.02E 05	1.088	4.37E-01	3.774
3.80E 01	0.827	3.34E-01	0.927	1.80E-01	6.93E 05	1.006	4.19E-01	3.844
3.90E 01	0.835	3.23E-01	0.930	1.74E-01	6.86E 05	0.932	4.03E-01	3.917
4.00E 01	0.845	3.12E-01	0.934	1.67E-01	6.76E 05	0.854	3.84E-01	3.980
4.10E 01	0.854	3.02E-01	0.938	1.61E-01	6.70E 05	0.790	3.69E-01	4.048
4.20E 01	0.862	2.96E-01	0.942	1.57E-01	6.69E 05	0.740	3.56E-01	4.115
4.30E 01	0.869	2.91E-01	0.945	1.54E-01	6.71E 05	0.701	3.46E-01	4.183
4.40E 01	0.876	2.67E-01	0.948	1.51E-01	6.74E 05	0.670	3.38E-01	4.252
4.50E 01	0.879	2.82E-01	0.949	1.48E-01	6.77E 05	0.644	3.31E-01	4.321
4.60E 01	0.882	2.77E-01	0.951	1.46E-01	6.80E 05	0.620	3.24E-01	4.390
4.70E 01	0.885	2.72E-01	0.951	1.43E-01	6.81E 05	0.596	3.18E-01	4.459
4.80E 01	0.886	2.67E-01	0.952	1.40E-01	6.81E 05	0.573	3.11E-01	4.529
4.90E 01	0.888	2.61E-01	0.952	1.37E-01	6.80E 05	0.549	3.05E-01	4.599
5.00E 01	0.890	2.55E-01	0.953	1.34E-01	6.77E 05	0.524	2.97E-01	4.668
5.10E 01	0.892	2.48E-01	0.953	1.30E-01	6.72E 05	0.498	2.89E-01	4.736
5.20E 01	0.895	2.41E-01	0.954	1.26E-01	6.65E 05	0.469	2.80E-01	4.804
5.30E 01	0.898	2.35E-01	0.956	1.23E-01	6.61E 05	0.446	2.73E-01	4.872
5.40E 01	0.901	2.29E-01	0.957	1.20E-01	6.55E 05	0.421	2.65E-01	4.939
5.50E 01	0.905	2.23E-01	0.958	1.17E-01	6.50E 05	0.398	2.57E-01	5.006
5.60E 01	0.909	2.18E-01	0.960	1.14E-01	6.46E 05	0.377	2.50E-01	5.073
5.70E 01	0.913	2.15E-01	0.962	1.12E-01	6.45E 05	0.360	2.44E-01	5.139
5.80E 01	0.917	2.12E-01	0.964	1.10E-01	6.47E 05	0.347	2.39E-01	5.206
5.90E 01	0.921	2.10E-01	0.966	1.09E-01	6.50E 05	0.335	2.35E-01	5.273
6.00E 01	0.922	2.10E-01	0.966	1.09E-01	6.62E 05	0.335	2.35E-01	5.342
6.10E 01	0.922	2.08E-01	0.966	1.08E-01	6.67E 05	0.329	2.33E-01	5.411
6.20E 01	0.920	2.06E-01	0.965	1.07E-01	6.71E 05	0.325	2.32E-01	5.480
6.30E 01	0.920	2.01E-01	0.965	1.04E-01	6.66E 05	0.313	2.27E-01	5.549
6.40E 01	0.921	1.96E-01	0.965	1.02E-01	6.60E 05	0.299	2.22E-01	5.618

Table 3, page 2

OPTICAL CONSTANTS OF CU
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ENERGY	1.-EPSL1	EPSILON2	1.-N	K	ABSCOEFF	REFLECT%	ENERGYLOSS	N-EFF
6.50E 01	0.077	1.91E-01	0.034	9.90E-02	6.52E 05	0.283	2.15E-01	5.685
6.60E 01	0.075	1.86E-01	0.033	9.63E-02	6.44E 05	0.268	2.09E-01	5.752
6.70E 01	0.072	1.83E-01	0.032	9.45E-02	6.42E 05	0.257	2.05E-01	5.819
6.80E 01	0.071	1.80E-01	0.032	9.27E-02	6.39E 05	0.247	2.00E-01	5.895
6.90E 01	0.067	1.76E-01	0.030	9.08E-02	6.35E 05	0.235	1.96E-01	5.951
7.00E 01	0.063	1.74E-01	0.028	8.93E-02	6.34E 05	0.225	1.91E-01	6.017
7.10E 01	0.060	1.71E-01	0.026	8.81E-02	6.34E 05	0.217	1.88E-01	6.084
7.20E 01	0.057	1.69E-01	0.025	8.68E-02	6.33E 05	0.209	1.84E-01	6.150
7.30E 01	0.053	1.67E-01	0.023	8.57E-02	6.34E 05	0.202	1.81E-01	6.216
7.40E 01	0.048	1.67E-01	0.021	8.50E-02	6.38E 05	0.195	1.78E-01	6.283
7.50E 01	0.041	1.71E-01	0.017	8.72E-02	6.63E 05	0.200	1.81E-01	6.352
7.60E 01	0.041	1.79E-01	0.016	9.10E-02	7.01E 05	0.217	1.88E-01	6.424
7.70E 01	0.045	1.81E-01	0.018	9.21E-02	7.19E 05	0.224	1.91E-01	6.500
7.80E 01	0.043	1.84E-01	0.020	9.36E-02	7.40E 05	0.233	1.95E-01	6.577
7.90E 01	0.051	1.84E-01	0.021	9.41E-02	7.53E 05	0.237	1.97E-01	6.656
8.00E 01	0.055	1.85E-01	0.023	9.46E-02	7.67E 05	0.243	1.99E-01	6.736
8.10E 01	0.060	1.84E-01	0.026	9.43E-02	7.74E 05	0.244	2.00E-01	6.817
8.20E 01	0.063	1.82E-01	0.027	9.34E-02	7.76E 05	0.243	1.99E-01	6.898
8.30E 01	0.066	1.79E-01	0.029	9.23E-02	7.77E 05	0.241	1.98E-01	6.979
8.40E 01	0.070	1.77E-01	0.031	9.11E-02	7.76E 05	0.239	1.97E-01	7.059
8.60E 01	0.075	1.69E-01	0.034	8.77E-02	7.64E 05	0.229	1.91E-01	7.219
8.80E 01	0.079	1.61E-01	0.037	8.34E-02	7.44E 05	0.215	1.84E-01	7.374
9.00E 01	0.079	1.52E-01	0.037	7.88E-02	7.19E 05	0.197	1.74E-01	7.524
9.20E 01	0.079	1.43E-01	0.037	7.44E-02	6.93E 05	0.179	1.65E-01	7.670
9.50E 01	0.074	1.34E-01	0.035	6.93E-02	6.68E 05	0.156	1.53E-01	7.879
1.00E 02	0.069	1.26E-01	0.033	6.53E-02	6.61E 05	0.138	1.43E-01	8.223
1.05E 02	0.067	1.21E-01	0.032	6.25E-02	6.65E 05	0.127	1.37E-01	8.569
1.10E 02	0.067	1.16E-01	0.032	5.99E-02	6.68E 05	0.119	1.31E-01	8.913
1.20E 02	0.072	1.04E-01	0.035	5.40E-02	6.57E 05	0.108	1.20E-01	9.605
1.50E 02	0.062	6.01E-02	0.031	3.10E-02	4.71E 05	0.050	6.80E-02	11.302
2.00E 02	0.044	3.12E-02	0.022	1.59E-02	3.23E 05	0.019	3.41E-02	13.325
3.00E 02	0.023	1.01E-02	0.012	5.13E-03	1.56E 05	0.004	1.06E-02	15.625
4.00E 02	0.014	4.87E-03	0.007	2.45E-03	9.93E 04	0.001	5.00E-03	16.931
5.00E 02	0.007	2.21E-03	0.003	1.11E-03	5.61E 04	0.000	2.24E-03	17.706
6.00E 02	0.005	1.30E-03	0.003	6.51E-04	3.96E 04	0.000	1.31E-03	18.202
7.00E 02	0.003	7.89E-04	0.002	3.95E-04	2.80E 04	0.000	7.94E-04	18.547
8.00E 02	0.002	5.26E-04	0.001	2.63E-04	2.13E 04	0.000	5.28E-04	18.798
9.00E 02	-0.000	3.45E-04	-0.000	1.74E-04	1.59E 04	0.0	3.49E-04	18.987
1.00E 03	0.001	1.70E-03	0.001	8.51E-04	8.60E 04	0.000	1.71E-03	19.840
1.10E 03	0.001	1.65E-03	0.001	8.23E-04	9.17E 04	0.000	1.65E-03	20.662
1.20E 03	0.001	1.25E-03	0.001	6.24E-04	7.55E 04	0.000	1.25E-03	21.473
1.50E 03	0.000	5.45E-04	0.000	2.73E-04	4.14E 04	0.0	5.46E-04	23.080
2.00E 03	0.000	1.90E-04	0.000	9.49E-05	1.90E 04	0.0	1.90E-04	24.379
4.00E 03	0.000	1.32E-05	0.000	6.62E-06	2.68E 03	0.0	1.33E-05	25.881
8.00E 03	-0.001	1.08E-06	-0.001	5.38E-07	4.37E 02	0.0	1.07E-06	26.321
8.90E 03	-0.001	7.12E-07	-0.001	3.56E-07	3.21E 02	0.0	7.10E-07	26.355
9.00E 03	-0.002	7.30E-07	-0.001	3.65E-07	3.34E 02	0.0	7.28E-07	26.359
1.50E 04	-0.001	8.12E-07	-0.000	4.06E-07	6.13E 02	0.0	8.12E-07	27.078
3.00E 04	-0.000	6.15E-08	-0.000	3.09E-08	9.37E 01	0.0	6.18E-08	27.419
5.00E 04	0.000	8.89E-09	0.000	4.45E-09	2.23E 01	0.0	8.89E-09	27.505

OPTICAL CONSTANTS OF AG

ENERGY	EPSILON1	EPSILON2	N	K	ABSCOEFF	REFLECT%	ENERGYLOSS	N-EFF
5.00E-03	-1.93E 05	7.31E 05	5.31E 02	6.89E 02	3.49E 05	99.720	1.28E-06	0.116
1.00E-02	-1.60E 05	3.13E 05	3.09E 02	5.06E 02	5.13E 05	99.649	2.53E-06	0.245
2.50E-02	-8.03E 04	7.54E 04	1.18E 02	3.06E 02	7.54E 05	99.570	6.33E-06	0.465
5.00E-02	-2.84E 04	1.27E 04	3.67E 01	1.73E 02	8.74E 05	99.529	1.31E-05	0.617
1.00E-01	-8.05E 03	1.79E 03	9.936	9.02E 01	9.15E 05	99.519	2.64E-05	0.715
2.00E-01	-2.08E 03	2.60E 02	2.842	4.57E 01	9.26E 05	99.459	5.92E-05	0.756
3.00E-01	-9.29E 02	8.61E 01	1.411	3.05E 01	9.28E 05	99.397	9.89E-05	0.776
4.00E-01	-5.23E 02	4.16E 01	0.909	2.29E 01	9.28E 05	99.311	1.51E-04	0.789
5.00E-01	-3.35E 02	2.45E 01	0.669	1.83E 01	9.28E 05	99.208	2.17E-04	0.799
1.00E 00	-8.15E 01	5.04E 00	0.278	9.02E 00	9.12E 05	98.654	7.64E-04	0.825
1.50E 00	-3.35E 01	3.14E 00	0.271	5.80E 00	8.81E 05	96.915	2.78E-03	0.844
2.00E 00	-1.74E 01	2.25E 00	0.269	4.18E 00	8.47E 05	94.352	7.33E-03	0.862
2.50E 00	-9.514	1.47E 00	0.237	3.09E 00	7.84E 05	91.443	1.59E-02	0.877
3.00E 00	-5.126	1.03E 00	0.226	2.28E 00	6.92E 05	86.455	3.77E-02	0.891
3.25E 00	-3.423	8.53E-01	0.229	1.86E 00	6.14E 05	81.637	6.86E-02	0.896
3.50E 00	-1.969	5.95E-01	0.211	1.42E 00	5.03E 05	75.740	1.41E-01	0.901
3.60E 00	-1.218	5.17E-01	0.230	1.13E 00	4.11E 05	66.882	3.02E-01	0.902
3.70E 00	-0.497	4.58E-01	0.300	7.65E-01	2.87E 05	47.199	1.03E 00	0.904
3.77E 00	0.119	4.20E-01	0.527	3.99E-01	1.52E 05	15.374	2.20E 00	0.904
3.80E 00	0.440	4.38E-01	0.727	3.04E-01	1.17E 05	5.857	1.17E 00	0.905
3.90E 00	1.549	9.35E-01	1.295	3.60E-01	1.42E 05	4.042	2.87E-01	0.907
4.00E 00	2.246	1.94E 00	1.615	5.99E-01	2.43E 05	10.261	2.18E-01	0.912
4.10E 00	2.260	2.92E 00	1.729	8.45E-01	3.52E 05	15.333	2.10E-01	0.922
4.20E 00	1.942	3.72E 00	1.752	1.06E 00	4.52E 05	19.437	2.11E-01	0.934
4.30E 00	1.700	3.92E 00	1.729	1.13E 00	4.95E 05	20.826	2.15E-01	0.948
4.50E 00	1.234	4.33E 00	1.654	1.28E 00	5.83E 05	23.809	2.13E-01	0.977
4.75E 00	0.804	4.32E 00	1.612	1.34E 00	6.45E 05	25.177	2.24E-01	1.017
5.00E 00	0.564	4.20E 00	1.549	1.35E 00	6.87E 05	25.648	2.34E-01	1.059
5.50E 00	0.290	3.88E 00	1.446	1.34E 00	7.48E 05	25.695	2.56E-01	1.142
6.00E 00	0.164	3.42E 00	1.339	1.28E 00	7.76E 05	24.566	2.92E-01	1.224
6.50E 00	0.183	2.96E 00	1.254	1.18E 00	7.76E 05	22.468	3.37E-01	1.302
7.00E 00	0.269	2.49E 00	1.178	1.06E 00	7.50E 05	19.624	3.97E-01	1.373
7.50E 00	0.475	2.08E 00	1.142	9.11E-01	6.92E 05	15.680	4.57E-01	1.437
8.00E 00	0.777	1.75E 00	1.160	7.53E-01	6.11E 05	11.341	4.77E-01	1.494
9.00E 00	1.444	1.49E 00	1.326	5.62E-01	5.12E 05	7.381	3.46E-01	1.600
1.00E 01	1.826	1.63E 00	1.462	5.57E-01	5.64E 05	8.214	2.72E-01	1.719
1.10E 01	2.080	1.71E 00	1.545	5.53E-01	6.16E 05	8.879	2.36E-01	1.858
1.20E 01	2.243	1.89E 00	1.608	5.87E-01	7.14E 05	9.994	2.20E-01	2.025
1.30E 01	2.329	2.12E 00	1.655	6.40E-01	8.43E 05	11.240	2.14E-01	2.227
1.40E 01	2.346	2.69E 00	1.720	7.83E-01	1.11E 06	14.124	2.11E-01	2.484
1.45E 01	1.936	2.88E 00	1.644	8.75E-01	1.29E 06	15.211	2.39E-01	2.644
1.50E 01	1.592	2.86E 00	1.560	9.18E-01	1.40E 06	15.631	2.67E-01	2.812
1.60E 01	1.190	2.59E 00	1.421	9.10E-01	1.48E 06	15.037	3.19E-01	3.143
1.70E 01	1.022	2.30E 00	1.330	8.64E-01	1.49E 06	13.844	3.63E-01	3.457
1.80E 01	0.993	2.06E 00	1.281	8.05E-01	1.47E 06	12.435	3.93E-01	3.753
1.90E 01	1.039	1.90E 00	1.266	7.52E-01	1.45E 06	11.157	4.05E-01	4.039
2.00E 01	1.154	1.84E 00	1.290	7.14E-01	1.45E 06	10.315	3.90E-01	4.326
2.10E 01	1.256	2.01E 00	1.346	7.45E-01	1.59E 06	11.146	3.58E-01	4.638
2.15E 01	1.237	2.19E 00	1.368	8.01E-01	1.75E 06	12.443	3.47E-01	4.815
2.20E 01	1.025	2.34E 00	1.338	8.74E-01	1.95E 06	14.107	3.58E-01	5.011

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OPTICAL CONSTANTS OF AG

ENERGY	EPSILON1	EPSILON2	N	K	ABSCOEFF	REFLECT%	ENERGYLOSS	N-EFF
2.25E 01	0.721	2.36E 00	1.262	9.35E-01	2.13E 06	15.727	3.89E-01	5.219
2.30E 01	0.491	2.21E 00	1.175	9.43E-01	2.20E 06	16.365	4.30E-01	5.423
2.35E 01	0.355	2.05E 00	1.104	9.30E-01	2.21E 06	16.538	4.73E-01	5.616
2.40E 01	0.263	1.88E 00	1.039	9.04E-01	2.20E 06	16.444	5.22E-01	5.797
2.45E 01	0.223	1.72E 00	0.989	8.68E-01	2.15E 06	15.995	5.73E-01	5.965
2.50E 01	0.212	1.57E 00	0.947	8.28E-01	2.10E 06	15.363	6.27E-01	6.123
2.55E 01	0.229	1.42E 00	0.913	7.78E-01	2.01E 06	14.367	6.86E-01	6.270
2.60E 01	0.266	1.32E 00	0.897	7.34E-01	1.94E 06	13.232	7.29E-01	6.407
2.65E 01	0.312	1.23E 00	0.889	6.91E-01	1.86E 06	12.110	7.65E-01	6.537
2.70E 01	0.362	1.15E 00	0.886	6.50E-01	1.78E 06	10.948	7.90E-01	6.662
2.75E 01	0.416	1.10E 00	0.891	6.16E-01	1.72E 06	9.877	7.97E-01	6.781
2.80E 01	0.466	1.06E 00	0.902	5.90E-01	1.67E 06	9.015	7.88E-01	6.899
2.85E 01	0.503	1.04E 00	0.911	5.72E-01	1.65E 06	8.410	7.78E-01	7.016
2.90E 01	0.535	1.02E 00	0.919	5.57E-01	1.64E 06	7.921	7.67E-01	7.133
3.00E 01	0.575	1.01E 00	0.931	5.41E-01	1.65E 06	7.397	7.49E-01	7.369
3.10E 01	0.583	9.56E-01	0.932	5.34E-01	1.68E 06	7.224	7.48E-01	7.611
3.20E 01	0.569	9.71E-01	0.921	5.28E-01	1.71E 06	7.176	7.66E-01	7.856
3.30E 01	0.544	9.25E-01	0.899	5.14E-01	1.72E 06	7.091	8.03E-01	8.098
3.40E 01	0.533	8.60E-01	0.879	4.89E-01	1.69E 06	6.733	8.40E-01	8.332
3.50E 01	0.541	7.85E-01	0.865	4.54E-01	1.61E 06	6.091	8.63E-01	8.553
3.60E 01	0.592	7.32E-01	0.876	4.18E-01	1.53E 06	5.149	8.25E-01	8.763
3.70E 01	0.623	7.08E-01	0.885	4.00E-01	1.50E 06	4.667	7.95E-01	8.969
3.80E 01	0.645	6.92E-01	0.892	3.88E-01	1.49E 06	4.346	7.73E-01	9.176
3.90E 01	0.659	6.77E-01	0.895	3.78E-01	1.49E 06	4.117	7.59E-01	9.384
4.00E 01	0.667	6.60E-01	0.896	3.68E-01	1.49E 06	3.925	7.50E-01	9.592
4.20E 01	0.682	6.27E-01	0.897	3.49E-01	1.49E 06	3.567	7.30E-01	10.007
4.40E 01	0.695	6.00E-01	0.899	3.34E-01	1.49E 06	3.275	7.10E-01	10.421
4.60E 01	0.699	5.80E-01	0.896	3.23E-01	1.51E 06	3.114	7.03E-01	10.840
4.70E 01	0.697	5.67E-01	0.893	3.17E-01	1.51E 06	3.044	7.03E-01	11.050
4.80E 01	0.693	5.49E-01	0.888	3.09E-01	1.50E 06	2.953	7.02E-01	11.258
4.90E 01	0.694	5.30E-01	0.885	3.00E-01	1.49E 06	2.824	6.95E-01	11.463
5.00E 01	0.698	5.12E-01	0.884	2.90E-01	1.47E 06	2.675	6.83E-01	11.665
5.10E 01	0.706	4.99E-01	0.886	2.81E-01	1.45E 06	2.532	6.67E-01	11.866
5.20E 01	0.714	4.91E-01	0.889	2.76E-01	1.46E 06	2.431	6.54E-01	12.067
5.30E 01	0.716	4.90E-01	0.890	2.75E-01	1.48E 06	2.409	6.51E-01	12.265
5.40E 01	0.708	4.85E-01	0.885	2.74E-01	1.50E 06	2.432	6.58E-01	12.475
5.60E 01	0.691	4.52E-01	0.871	2.59E-01	1.47E 06	2.352	6.62E-01	12.879
5.80E 01	0.698	4.11E-01	0.868	2.37E-01	1.39E 06	2.070	6.27E-01	13.262
6.00E 01	0.713	3.85E-01	0.873	2.21E-01	1.34E 06	1.823	5.86E-01	13.629
6.20E 01	0.731	3.71E-01	0.881	2.11E-01	1.32E 06	1.638	5.52E-01	13.991
6.40E 01	0.738	3.71E-01	0.885	2.10E-01	1.36E 06	1.596	5.44E-01	14.362
6.60E 01	0.735	3.73E-01	0.883	2.11E-01	1.41E 06	1.625	5.49E-01	14.745
6.80E 01	0.715	3.63E-01	0.871	2.08E-01	1.44E 06	1.695	5.64E-01	15.134
7.00E 01	0.698	3.38E-01	0.859	1.97E-01	1.40E 06	1.681	5.61E-01	15.513
7.20E 01	0.691	3.08E-01	0.851	1.81E-01	1.32E 06	1.591	5.38E-01	15.872
7.40E 01	0.700	2.83E-01	0.853	1.66E-01	1.25E 06	1.424	4.97E-01	16.208
7.60E 01	0.703	2.69E-01	0.853	1.58E-01	1.21E 06	1.343	4.75E-01	16.533
7.80E 01	0.702	2.54E-01	0.851	1.49E-01	1.18E 06	1.287	4.55E-01	16.847
8.00E 01	0.700	2.35E-01	0.848	1.39E-01	1.12E 06	1.229	4.31E-01	17.146
8.50E 01	0.703	1.88E-01	0.846	1.11E-01	9.55E 05	1.056	3.54E-01	17.816

OPTICAL CONSTANTS OF AG

ENERGY	1.-EPSL1	EPSILON2	1.-N	K	ABSCOEFF	REFLECT%	ENERGYLOSS	N-EFF
9.00E 01	0.287	1.40E-01	0.151	8.24E-02	7.52E 05	0.867	2.65E-01	18.365
9.50E 01	0.262	9.72E-02	0.139	5.65E-02	5.43E 05	0.650	1.75E-01	18.769
1.00E 02	0.234	6.70E-02	0.124	3.82E-02	3.87E 05	0.478	1.13E-01	19.064
1.05E 02	0.209	4.64E-02	0.110	2.61E-02	2.78E 05	0.359	7.40E-02	19.277
1.10E 02	0.186	3.11E-02	0.098	1.72E-02	1.92E 05	0.271	4.69E-02	19.428
1.20E 02	0.143	1.15E-02	0.074	6.22E-03	7.55E 04	0.150	1.57E-02	19.586
1.30E 02	0.110	6.91E-03	0.057	3.66E-03	4.83E 04	0.085	8.73E-03	19.662
1.40E 02	0.089	6.77E-03	0.045	3.54E-03	5.03E 04	0.054	6.15E-03	19.735
1.50E 02	0.073	7.85E-03	0.037	4.07E-03	6.19E 04	0.036	9.13E-03	19.823
1.60E 02	0.062	8.49E-03	0.032	4.38E-03	7.10E 04	0.026	9.65E-03	19.927
1.70E 02	0.054	8.55E-03	0.027	4.42E-03	7.61E 04	0.020	9.60E-03	20.041
1.80E 02	0.044	8.43E-03	0.022	4.31E-03	7.86E 04	0.013	9.22E-03	20.160
2.00E 02	0.036	7.40E-03	0.018	3.77E-03	7.63E 04	0.009	7.95E-03	20.397
2.20E 02	0.026	6.61E-03	0.013	3.45E-03	7.70E 04	0.005	7.19E-03	20.630
2.40E 02	0.021	6.92E-03	0.011	3.50E-03	8.49E 04	0.003	7.22E-03	20.879
2.60E 02	0.015	6.17E-03	0.008	3.11E-03	8.19E 04	0.002	6.36E-03	21.131
2.80E 02	0.011	5.37E-03	0.006	2.70E-03	7.61E 04	0.001	5.50E-03	21.355
3.00E 02	0.008	4.63E-03	0.004	2.32E-03	7.05E 04	0.001	4.71E-03	21.573
3.50E 02	-0.002	3.36E-03	-0.001	1.68E-03	5.94E 04	0.000	3.34E-03	22.056
3.70E 02	-0.014	1.66E-02	-0.007	3.23E-03	3.09E 05	0.003	1.61E-02	22.373
4.00E 02	0.003	1.76E-02	0.002	8.82E-03	3.56E 05	0.002	1.77E-02	24.025
5.00E 02	0.006	9.10E-03	0.003	4.57E-03	2.31E 05	0.001	9.22E-03	28.114
6.00E 02	0.007	5.37E-03	0.003	2.69E-03	1.63E 05	0.000	5.44E-03	30.814
7.40E 02	0.003	2.83E-03	0.002	1.42E-03	1.06E 05	0.000	2.85E-03	33.325
8.00E 02	0.006	2.16E-03	0.003	1.03E-03	8.78E 04	0.000	2.18E-03	34.170
1.00E 03	0.003	1.04E-03	0.002	5.23E-04	5.27E 04	0.000	1.05E-03	36.064
1.50E 03	0.002	2.41E-04	0.001	1.21E-04	1.83E 04	0.000	2.42E-04	38.202
2.00E 03	-0.001	9.45E-05	-0.001	4.72E-05	9.55E 03	0.000	9.42E-05	39.195
2.50E 03	-0.001	4.79E-05	-0.001	2.40E-05	6.05E 03	0.0	4.73E-05	39.741
3.00E 03	-0.002	2.86E-05	-0.001	1.43E-05	4.34E 03	0.000	2.85E-05	40.116
3.50E 03	-0.007	3.44E-05	-0.003	1.72E-05	6.14E 03	0.000	3.40E-05	40.445
3.60E 03	-0.006	6.50E-05	-0.003	3.24E-05	1.18E 04	0.000	6.43E-05	40.629
4.00E 03	-0.007	7.17E-05	-0.003	3.57E-05	1.44E 04	0.000	7.07E-05	41.513
4.50E 03	-0.002	4.42E-05	-0.001	2.21E-05	1.01E 04	0.000	4.40E-05	42.366
5.00E 03	-0.003	3.05E-05	-0.001	1.52E-05	7.68E 03	0.000	3.03E-05	42.975
6.00E 03	-0.004	1.68E-05	-0.002	8.36E-06	5.07E 03	0.000	1.66E-05	43.863
8.00E 03	0.000	5.85E-06	0.000	2.92E-06	2.36E 03	0.0	5.85E-06	44.847
1.00E 04	0.002	2.57E-06	0.001	1.29E-06	1.30E 03	0.000	2.56E-06	45.319
2.00E 04	0.002	1.91E-07	0.001	9.57E-08	1.94E 02	0.0	1.92E-07	46.051
2.50E 04	-0.003	7.26E-08	-0.001	3.63E-08	9.21E 01	0.000	7.24E-08	46.181
2.60E 04	-0.002	4.22E-07	-0.001	2.11E-07	5.54E 02	0.000	4.20E-07	46.241
3.00E 04	-0.001	2.64E-07	-0.000	1.32E-07	3.99E 02	0.0	2.63E-07	46.540
4.00E 04	-0.006	9.31E-08	-0.003	4.64E-08	1.87E 02	0.000	9.21E-08	46.907
5.00E 04	-0.006	3.86E-08	-0.003	1.92E-08	9.73E 01	0.000	3.82E-08	47.102
7.50E 04	-0.000	8.67E-09	-0.000	4.33E-09	3.29E 01	0.0	8.67E-09	47.307
1.00E 05	0.001	2.97E-09	0.001	1.49E-09	1.51E 01	0.000	2.98E-09	47.387
2.00E 05	0.003	2.29E-10	0.002	1.15E-10	2.32E 00	0.000	2.30E-10	47.475
5.00E 05	-0.006	7.94E-12	-0.003	3.96E-12	2.00E-01	0.000	7.89E-12	47.506

Table A, page 3

OPTICAL CONSTANTS OF AL

ENERGY	EPSILON1	EPSILON2	N	K	ABSCOEFF	REFLECT%	ENERGYLOSS	N-EFF
1.00E-03		1.17E 06		7.68E 02	7.78E 04	99.740	8.57E-07	0.0
5.00E-03	-2.80E 04	2.77E 05	3.45E 02	3.79E 02	1.75E 05	99.449	4.32E-06	0.035
1.00E-02	-1.62E 04	1.14E 05	2.22E 02	2.56E 02	2.60E 05	99.230	8.61E-06	0.090
5.00E-02	-1.10E 04	1.66E 04	6.55E 01	1.24E 02	6.14E 05	98.685	4.30E-05	0.364
1.00E-01	-5.90E 03	4.47E 03	2.69E 01	8.07E 01	7.80E 05	98.542	8.70E-05	0.530
5.00E-01	-3.29E 02	4.74E 01	1.273	1.81E 01	9.08E 05	98.499	4.20E-04	0.742
1.00E 00	-7.00E 01	6.27E 00	0.375	8.36E 00	8.45E 05	97.894	1.30E-03	0.774
1.50E 00	-2.62E 01	4.30E 00	0.418	5.13E 00	7.80E 05	94.086	6.14E-03	0.800
2.00E 00	-1.07E 01	3.22E 00	0.487	3.31E 00	6.70E 05	85.122	2.60E-02	0.825
2.20E 00	-6.651	3.22E 00	0.613	2.64E 00	5.88E 05	74.097	6.22E-02	0.836
2.40E 00	-3.265	3.52E 00	0.878	2.01E 00	4.89E 05	53.565	1.53E-01	0.848
2.60E 00	-0.548	5.27E 00	1.541	1.71E 00	4.51E 05	34.294	1.88E-01	0.866
2.80E 00	0.041	6.63E 00	1.826	1.81E 00	5.15E 05	35.244	1.51E-01	0.893
3.00E 00	0.327	7.27E 00	1.950	1.86E 00	5.67E 05	35.943	1.37E-01	0.925
3.15E 00	0.271	7.41E 00	1.960	1.89E 00	6.03E 05	36.428	1.35E-01	0.952
3.30E 00	0.309	7.36E 00	1.960	1.88E 00	6.29E 05	36.222	1.36E-01	0.981
3.45E 00	0.500	7.22E 00	1.967	1.84E 00	6.42E 05	35.357	1.38E-01	1.010
3.60E 00	0.825	7.32E 00	2.024	1.81E 00	6.60E 05	34.787	1.35E-01	1.040
3.80E 00	0.703	7.58E 00	2.039	1.86E 00	7.16E 05	35.720	1.31E-01	1.084
4.00E 00	0.434	7.52E 00	1.995	1.88E 00	7.64E 05	36.251	1.33E-01	1.131
4.20E 00	0.154	7.28E 00	1.927	1.89E 00	8.03E 05	36.453	1.37E-01	1.179
4.40E 00	-0.076	6.90E 00	1.848	1.87E 00	8.33E 05	36.288	1.45E-01	1.226
4.75E 00	-0.236	6.03E 00	1.702	1.77E 00	8.52E 05	34.756	1.66E-01	1.306
5.00E 00	-0.055	5.42E 00	1.638	1.65E 00	8.38E 05	32.420	1.85E-01	1.360
5.50E 00	0.456	4.66E 00	1.603	1.45E 00	8.10E 05	27.859	2.13E-01	1.462
6.00E 00	0.932	4.20E 00	1.618	1.30E 00	7.89E 05	24.211	2.27E-01	1.560
6.50E 00	1.355	3.97E 00	1.665	1.19E 00	7.84E 05	21.837	2.26E-01	1.660
7.00E 00	1.701	3.92E 00	1.728	1.13E 00	8.04E 05	20.800	2.15E-01	1.765
7.50E 00	1.864	4.12E 00	1.786	1.15E 00	8.76E 05	21.397	2.02E-01	1.881
8.00E 00	1.500	4.21E 00	1.727	1.22E 00	9.88E 05	22.560	2.11E-01	2.010
8.50E 00	1.413	3.85E 00	1.666	1.17E 00	1.01E 06	21.309	2.27E-01	2.140
9.00E 00	1.311	3.67E 00	1.614	1.14E 00	1.04E 06	20.572	2.41E-01	2.269
9.50E 00	1.370	3.39E 00	1.585	1.07E 00	1.03E 06	18.976	2.54E-01	2.396
1.00E 01	1.363	3.31E 00	1.572	1.05E 00	1.07E 06	18.576	2.58E-01	2.524
1.05E 01	1.416	3.06E 00	1.548	9.90E-01	1.05E 06	17.126	2.69E-01	2.651
1.10E 01	1.527	2.94E 00	1.556	9.45E-01	1.05E 06	16.188	2.68E-01	2.777
1.15E 01	1.617	2.89E 00	1.569	9.20E-01	1.07E 06	15.712	2.64E-01	2.906
1.20E 01	1.682	2.87E 00	1.583	9.08E-01	1.10E 06	15.523	2.59E-01	3.039
1.30E 01	1.725	2.86E 00	1.592	8.99E-01	1.19E 06	15.401	2.56E-01	3.322
1.40E 01	1.682	2.93E 00	1.591	9.22E-01	1.31E 06	15.850	2.57E-01	3.631
1.50E 01	1.500	2.88E 00	1.540	9.34E-01	1.42E 06	15.899	2.73E-01	3.965
1.60E 01	1.460	2.70E 00	1.505	8.98E-01	1.46E 06	14.938	2.86E-01	4.302
1.70E 01	1.542	2.62E 00	1.513	8.65E-01	1.49E 06	14.316	2.84E-01	4.646
1.80E 01	1.700	2.71E 00	1.565	8.65E-01	1.58E 06	14.572	2.65E-01	5.011
1.90E 01	1.695	3.06E 00	1.612	9.50E-01	1.83E 06	16.527	2.50E-01	5.433
2.00E 01	1.374	3.38E 00	1.584	1.07E 00	2.16E 06	18.911	2.54E-01	5.933
2.10E 01	0.775	3.64E 00	1.499	1.21E 00	2.58E 06	22.309	2.63E-01	6.504
2.15E 01	0.366	3.57E 00	1.406	1.27E 00	2.77E 06	24.009	2.77E-01	6.805
2.20E 01	-0.002	3.34E 00	1.292	1.29E 00	2.88E 06	25.375	2.99E-01	7.097
2.25E 01	-0.240	3.03E 00	1.183	1.28E 00	2.92E 06	26.142	3.28E-01	7.359

OPTICAL CONSTANTS OF AL

ENERGY	EPSILON1	EPSILON2	N	K	ABSCOEFF	REFLECT%	ENERGYLOSS	N-EFF
2.30E 01	-0.384	2.69E 00	1.080	1.24E 00	2.90E 06	26.485	3.65E-01	7.621
2.35E 01	-0.386	2.38E 00	1.005	1.18E 00	2.81E 06	25.775	4.10E-01	7.848
2.40E 01	-0.345	2.13E 00	0.953	1.12E 00	2.72E 06	24.769	4.57E-01	8.054
2.50E 01	-0.191	1.82E 00	0.905	1.00E 00	2.55E 06	21.963	5.44E-01	8.424
2.60E 01	-0.056	1.63E 00	0.886	9.17E-01	2.42E 06	19.425	6.14E-01	8.763
2.70E 01	0.052	1.51E 00	0.885	8.55E-01	2.34E 06	17.363	6.61E-01	9.085
2.80E 01	0.133	1.45E 00	0.892	8.14E-01	2.31E 06	15.888	6.83E-01	9.403
2.90E 01	0.159	1.44E 00	0.896	8.02E-01	2.36E 06	15.439	6.88E-01	9.725
2.95E 01	0.142	1.43E 00	0.887	8.03E-01	2.40E 06	15.639	6.94E-01	9.889
3.00E 01	0.108	1.40E 00	0.868	8.04E-01	2.44E 06	16.041	7.12E-01	10.053
3.05E 01	0.075	1.35E 00	0.844	7.99E-01	2.47E 06	16.391	7.39E-01	10.215
3.10E 01	0.047	1.29E 00	0.818	7.88E-01	2.48E 06	16.682	7.75E-01	10.372
3.20E 01	0.015	1.13E 00	0.757	7.47E-01	2.42E 06	16.939	8.84E-01	10.668
3.30E 01	0.080	9.81E-01	0.730	6.72E-01	2.25E 06	15.249	1.01E 00	10.933
3.40E 01	0.153	9.01E-01	0.730	6.17E-01	2.12E 06	13.420	1.08E 00	11.177
3.50E 01	0.214	8.45E-01	0.737	5.73E-01	2.03E 06	11.907	1.11E 00	11.409
3.60E 01	0.258	8.01E-01	0.741	5.40E-01	1.97E 06	10.795	1.13E 00	11.636
3.70E 01	0.294	7.61E-01	0.745	5.11E-01	1.92E 06	9.870	1.14E 00	11.857
3.80E 01	0.326	7.25E-01	0.749	4.84E-01	1.87E 06	9.046	1.15E 00	12.073
3.90E 01	0.352	6.93E-01	0.751	4.61E-01	1.82E 06	8.367	1.15E 00	12.285
4.00E 01	0.377	6.60E-01	0.754	4.38E-01	1.77E 06	7.715	1.14E 00	12.492
4.10E 01	0.404	6.31E-01	0.760	4.15E-01	1.73E 06	7.052	1.12E 00	12.695
4.20E 01	0.428	6.09E-01	0.766	3.98E-01	1.69E 06	6.503	1.10E 00	12.895
4.30E 01	0.446	5.91E-01	0.770	3.84E-01	1.67E 06	6.104	1.08E 00	13.094
4.40E 01	0.455	5.72E-01	0.770	3.71E-01	1.66E 06	5.836	1.07E 00	13.291
4.50E 01	0.463	5.46E-01	0.767	3.55E-01	1.62E 06	5.553	1.07E 00	13.485
4.60E 01	0.476	5.13E-01	0.767	3.35E-01	1.56E 06	5.151	1.05E 00	13.671
4.70E 01	0.495	4.86E-01	0.771	3.15E-01	1.50E 06	4.689	1.01E 00	13.851
4.80E 01	0.516	4.64E-01	0.778	2.98E-01	1.45E 06	4.251	9.63E-01	14.026
4.90E 01	0.538	4.46E-01	0.787	2.84E-01	1.41E 06	3.851	9.13E-01	14.198
5.00E 01	0.557	4.33E-01	0.795	2.72E-01	1.38E 06	3.531	8.69E-01	14.367
5.20E 01	0.589	4.12E-01	0.808	2.55E-01	1.34E 06	3.045	7.99E-01	14.703
5.40E 01	0.614	3.95E-01	0.820	2.41E-01	1.32E 06	2.688	7.41E-01	15.036
5.60E 01	0.635	3.81E-01	0.830	2.30E-01	1.30E 06	2.408	6.95E-01	15.370
5.80E 01	0.649	3.73E-01	0.836	2.23E-01	1.31E 06	2.245	6.66E-01	15.706
6.00E 01	0.654	3.66E-01	0.838	2.19E-01	1.33E 06	2.165	6.52E-01	16.048
6.20E 01	0.649	3.52E-01	0.833	2.11E-01	1.33E 06	2.128	6.45E-01	16.391
6.40E 01	0.643	3.30E-01	0.830	1.99E-01	1.29E 06	2.027	6.23E-01	16.725
6.60E 01	0.651	3.08E-01	0.828	1.86E-01	1.24E 06	1.898	5.93E-01	17.046
6.80E 01	0.654	2.82E-01	0.827	1.71E-01	1.18E 06	1.760	5.56E-01	17.353
7.00E 01	0.662	2.57E-01	0.828	1.55E-01	1.10E 06	1.592	5.10E-01	17.642
7.20E 01	0.677	2.34E-01	0.835	1.40E-01	1.02E 06	1.388	4.56E-01	17.911
7.40E 01	0.692	2.21E-01	0.842	1.31E-01	9.84E 05	1.235	4.19E-01	18.169
7.60E 01	0.702	2.10E-01	0.847	1.24E-01	9.54E 05	1.129	3.91E-01	18.420
7.80E 01	0.709	1.99E-01	0.850	1.17E-01	9.24E 05	1.051	3.66E-01	18.664
8.00E 01	0.716	1.86E-01	0.853	1.09E-01	8.86E 05	0.971	3.40E-01	18.900
8.20E 01	0.724	1.73E-01	0.857	1.01E-01	8.37E 05	0.884	3.11E-01	19.126
8.30E 01	0.730	1.66E-01	0.860	9.63E-02	8.10E 05	0.836	2.96E-01	19.234
8.35E 01	0.733	1.62E-01	0.861	9.43E-02	7.98E 05	0.808	2.88E-01	19.287
8.40E 01	0.739	1.62E-01	0.865	9.38E-02	7.99E 05	0.775	2.83E-01	19.340

OPTICAL CONSTANTS OF AL

ENERGY	1.-EPSL1	EPSILON2	1.-N	K	ABSCOEFF	REFLECT%	ENERGYLOSS	N-EFF
8.45E 01	0.260	1.66E-01	0.135	9.62E-02	8.24E 05	0.784	2.90E-01	19.394
8.50E 01	0.262	1.65E-01	0.136	9.56E-02	8.23E 05	0.792	2.89E-01	19.449
8.60E 01	0.265	1.56E-01	0.138	9.18E-02	8.00E 05	0.789	2.80E-01	19.557
8.70E 01	0.262	1.50E-01	0.137	8.70E-02	7.67E 05	0.755	2.65E-01	19.659
8.75E 01	0.260	1.46E-01	0.135	8.44E-02	7.49E 05	0.731	2.56E-01	19.709
8.80E 01	0.257	1.45E-01	0.134	8.38E-02	7.48E 05	0.717	2.54E-01	19.759
8.90E 01	0.258	1.40E-01	0.135	8.07E-02	7.28E 05	0.708	2.45E-01	19.858
9.10E 01	0.252	1.25E-01	0.132	7.18E-02	6.62E 05	0.649	2.17E-01	20.040
9.30E 01	0.243	1.11E-01	0.128	6.36E-02	5.99E 05	0.581	1.90E-01	20.204
9.50E 01	0.234	9.99E-02	0.123	5.70E-02	5.49E 05	0.520	1.67E-01	20.356
1.00E 02	0.211	8.07E-02	0.111	4.54E-02	4.60E 05	0.402	1.29E-01	20.690
1.05E 02	0.191	6.36E-02	0.100	3.53E-02	3.76E 05	0.312	9.67E-02	20.969
1.10E 02	0.171	5.15E-02	0.089	2.83E-02	3.15E 05	0.239	7.47E-02	21.202
1.15E 02	0.155	4.12E-02	0.080	2.24E-02	2.61E 05	0.189	5.75E-02	21.400
1.20E 02	0.137	3.31E-02	0.071	1.78E-02	2.17E 05	0.144	4.45E-02	21.564
1.25E 02	0.123	2.66E-02	0.063	1.52E-02	1.93E 05	0.113	3.71E-02	21.706
1.30E 02	0.110	2.51E-02	0.056	1.33E-02	1.75E 05	0.089	3.17E-02	21.833
1.35E 02	0.099	2.25E-02	0.051	1.18E-02	1.62E 05	0.071	2.77E-02	21.952
1.40E 02	0.088	2.08E-02	0.045	1.09E-02	1.55E 05	0.056	2.50E-02	22.067
1.50E 02	0.072	1.95E-02	0.037	1.01E-02	1.54E 05	0.037	2.26E-02	22.293
1.60E 02	0.059	1.95E-02	0.030	1.01E-02	1.63E 05	0.026	2.20E-02	22.533
1.70E 02	0.050	2.01E-02	0.025	1.03E-02	1.78E 05	0.019	2.22E-02	22.793
1.80E 02	0.043	2.10E-02	0.021	1.07E-02	1.96E 05	0.015	2.29E-02	23.081
1.90E 02	0.037	2.18E-02	0.019	1.11E-02	2.14E 05	0.012	2.35E-02	23.397
2.00E 02	0.034	2.26E-02	0.017	1.15E-02	2.33E 05	0.011	2.42E-02	23.743
2.20E 02	0.029	2.32E-02	0.014	1.18E-02	2.63E 05	0.009	2.46E-02	24.513
2.40E 02	0.026	2.23E-02	0.013	1.13E-02	2.75E 05	0.007	2.35E-02	25.343
2.60E 02	0.024	2.09E-02	0.012	1.06E-02	2.79E 05	0.006	2.19E-02	26.193
2.80E 02	0.021	1.93E-02	0.011	9.76E-03	2.77E 05	0.005	2.02E-02	27.040
3.00E 02	0.018	1.77E-02	0.009	8.95E-03	2.72E 05	0.004	1.84E-02	27.875
3.50E 02	0.015	1.45E-02	0.008	7.31E-03	2.59E 05	0.003	1.50E-02	29.895
5.00E 02	0.009	9.38E-03	0.005	4.71E-03	2.38E 05	0.001	9.56E-03	35.581
6.00E 02	0.007	6.78E-03	0.004	3.40E-03	2.06E 05	0.001	6.87E-03	38.744
8.00E 02	0.005	3.25E-03	0.003	1.63E-03	1.30E 05	0.000	3.28E-03	43.359
1.00E 03	0.003	1.92E-03	0.002	9.60E-04	9.72E 04	0.000	1.93E-03	46.528
2.00E 03	0.001	2.40E-04	0.000	1.20E-04	2.43E 04	0.0	2.41E-04	53.226
2.50E 03	0.000	4.22E-04	0.000	2.11E-04	5.35E 04	0.0	4.22E-04	55.575
2.85E 03	0.001	2.90E-04	0.001	1.45E-04	4.18E 04	0.0	2.90E-04	58.113
2.90E 03	0.001	3.28E-04	0.001	1.64E-04	4.83E 04	0.0	3.29E-04	59.481
5.00E 03	-0.002	5.74E-05	-0.001	2.87E-05	1.44E 04	0.000	5.72E-05	66.716
1.00E 04	-0.001	5.07E-06	-0.000	2.53E-06	2.56E 03	0.0	5.06E-06	71.107
1.30E 04	-0.002	5.12E-06	-0.001	2.56E-06	3.37E 03	0.000	5.11E-06	72.200
1.40E 04	-0.002	3.88E-06	-0.001	1.94E-06	2.75E 03	0.000	3.87E-06	72.616
1.50E 04	-0.001	4.56E-06	-0.000	2.28E-06	3.46E 03	0.0	4.55E-06	73.133
2.00E 04	-0.001	1.77E-06	-0.000	8.83E-07	1.78E 03	0.0	1.76E-06	74.961
3.00E 04	0.000	3.65E-07	0.000	1.85E-07	5.60E 02	0.0	3.69E-07	76.446
5.00E 04	-0.001	6.10E-08	-0.000	3.05E-08	1.54E 02	0.0	6.09E-08	77.297
8.00E 04	-0.000	1.04E-08	-0.000	5.22E-09	4.22E 01	0.0	1.04E-08	77.637
8.30E 04	-0.005	3.92E-08	-0.002	1.95E-08	1.64E 02	0.000	3.88E-08	77.682
1.50E 05	-0.000	5.12E-09	-0.000	2.56E-09	3.88E 01	0.0	5.12E-09	78.465

OPTICAL CONSTANTS OF AU FROM REFLECTIVITY-DATA FITTED TO CANFIELD ET AL (10)

Table 6, page 1

ENERGY	EPSILON1	EPSILON2	N	K	ABSCOEFF	REFLECT%	ENERGYLOSS	N-EFF
1.50E 00	-2.80E 01	2.25E 00	0.212	5.28E 00	8.00E 05	97.101	2.91E-03	0.006
2.00E 00	-1.10E 01	1.63E 00	0.245	3.33E 00	6.75E 05	92.221	1.32E-02	0.018
2.20E 00	-6.803	1.90E 00	0.361	2.63E 00	5.86E 05	83.423	3.89E-02	0.024
2.40E 00	-3.137	2.66E 00	0.700	1.90E 00	4.63E 05	57.087	1.57E-01	0.033
2.60E 00	-1.073	4.75E 00	1.378	1.72E 00	4.55E 05	36.166	2.00E-01	0.048
2.80E 00	-0.637	6.04E 00	1.649	1.83E 00	5.20E 05	36.419	1.64E-01	0.072
3.00E 00	-0.585	6.54E 00	1.729	1.89E 00	5.75E 05	37.259	1.52E-01	0.102
3.15E 00	-0.535	6.64E 00	1.750	1.90E 00	6.06E 05	37.280	1.50E-01	0.126
3.30E 00	-0.450	6.58E 00	1.753	1.88E 00	6.28E 05	36.831	1.51E-01	0.152
3.45E 00	-0.217	6.48E 00	1.770	1.83E 00	6.40E 05	35.770	1.54E-01	0.178
3.60E 00	0.046	6.67E 00	1.832	1.82E 00	6.64E 05	35.321	1.50E-01	0.205
3.80E 00	-0.092	6.85E 00	1.838	1.86E 00	7.18E 05	36.206	1.46E-01	0.245
4.00E 00	-0.309	6.77E 00	1.798	1.88E 00	7.63E 05	36.760	1.47E-01	0.287
4.20E 00	-0.542	6.57E 00	1.739	1.89E 00	8.04E 05	37.167	1.51E-01	0.331
4.40E 00	-0.771	6.24E 00	1.660	1.88E 00	8.38E 05	37.384	1.58E-01	0.373
4.75E 00	-0.889	5.29E 00	1.496	1.77E 00	8.51E 05	36.044	1.64E-01	0.445
5.00E 00	-0.622	4.80E 00	1.452	1.65E 00	8.37E 05	33.557	2.05E-01	0.492
5.50E 00	-0.147	4.22E 00	1.427	1.48E 00	8.24E 05	29.295	2.37E-01	0.584
6.00E 00	0.211	3.77E 00	1.412	1.33E 00	8.12E 05	25.683	2.64E-01	0.673
6.50E 00	0.618	3.43E 00	1.433	1.20E 00	7.89E 05	22.056	2.82E-01	0.760
7.00E 00	1.014	3.43E 00	1.516	1.13E 00	8.04E 05	20.359	2.68E-01	0.852
7.50E 00	1.176	3.64E 00	1.582	1.15E 00	8.76E 05	20.836	2.49E-01	0.953
8.00E 00	0.783	3.77E 00	1.522	1.24E 00	1.00E 06	22.884	2.54E-01	1.069
8.50E 00	0.693	3.44E 00	1.449	1.19E 00	1.02E 06	21.720	2.80E-01	1.184
9.00E 00	0.569	3.26E 00	1.392	1.17E 00	1.07E 06	21.476	2.98E-01	1.299
9.50E 00	0.599	2.97E 00	1.346	1.10E 00	1.06E 06	19.841	3.24E-01	1.411
1.00E 01	0.549	2.88E 00	1.319	1.09E 00	1.11E 06	19.690	3.35E-01	1.523
1.05E 01	0.515	2.64E 00	1.267	1.04E 00	1.11E 06	18.636	3.64E-01	1.632
1.10E 01	0.536	2.41E 00	1.225	9.82E-01	1.10E 06	17.166	3.96E-01	1.738
1.15E 01	0.675	2.17E 00	1.215	8.95E-01	1.04E 06	14.841	4.19E-01	1.838
1.20E 01	0.813	2.14E 00	1.245	8.59E-01	1.04E 06	13.813	4.08E-01	1.939
1.30E 01	0.924	2.08E 00	1.265	8.23E-01	1.08E 06	12.877	4.01E-01	2.147
1.40E 01	0.929	2.01E 00	1.254	8.02E-01	1.14E 06	12.375	4.10E-01	2.366
1.50E 01	0.927	1.92E 00	1.236	7.75E-01	1.18E 06	11.717	4.23E-01	2.589
1.60E 01	0.963	1.82E 00	1.229	7.39E-01	1.20E 06	10.866	4.29E-01	2.817
1.70E 01	1.014	1.74E 00	1.231	7.07E-01	1.22E 06	10.100	4.29E-01	3.047
1.80E 01	1.115	1.71E 00	1.257	6.82E-01	1.24E 06	9.552	4.10E-01	3.295
1.90E 01	1.175	1.82E 00	1.292	7.03E-01	1.35E 06	10.091	3.88E-01	3.547
2.00E 01	1.134	2.00E 00	1.310	7.63E-01	1.55E 06	11.460	3.78E-01	3.846
2.10E 01	0.874	2.20E 00	1.274	8.65E-01	1.84E 06	13.918	3.92E-01	4.191
2.15E 01	0.653	2.20E 00	1.214	9.06E-01	1.97E 06	15.159	4.18E-01	4.375
2.20E 01	0.448	2.09E 00	1.137	9.19E-01	2.05E 06	15.972	4.57E-01	4.557
2.25E 01	0.340	1.93E 00	1.073	9.01E-01	2.06E 06	15.995	5.02E-01	4.728
2.30E 01	0.275	1.79E 00	1.021	8.77E-01	2.04E 06	15.841	5.46E-01	4.892
2.35E 01	0.244	1.65E 00	0.978	8.44E-01	2.01E 06	15.417	5.93E-01	5.047
2.40E 01	0.238	1.53E 00	0.944	8.08E-01	1.97E 06	14.814	6.40E-01	5.193
2.50E 01	0.286	1.34E 00	0.910	7.36E-01	1.87E 06	13.136	7.14E-01	5.463
2.60E 01	0.343	1.22E 00	0.856	6.79E-01	1.79E 06	11.619	7.62E-01	5.716
2.70E 01	0.397	1.14E 00	0.895	6.35E-01	1.74E 06	10.385	7.84E-01	5.958
2.80E 01	0.443	1.09E 00	0.901	6.07E-01	1.72E 06	9.502	7.86E-01	6.197

OPTICAL CONSTANTS OF AL FROM REFLECTIVITY-DATA FITTED TO CANFIELD ET AL (10)

ENERGY	1.-EPSL1	EPSILON2	1.-N	K	ABSCOEFF	REFLECT%	ENERGYLOSS	N-EFF
9.10E 01	0.208	8.10E-02	0.109	4.55E-02	4.19E 05	0.388	1.28E-01	14.344
9.30E 01	0.200	7.06E-02	0.104	3.94E-02	3.71E 05	0.347	1.09E-01	14.449
9.50E 01	0.192	6.15E-02	0.100	3.42E-02	3.29E 05	0.311	9.36E-02	14.543
1.00E 02	0.173	4.65E-02	0.090	2.56E-02	2.59E 05	0.240	6.78E-02	14.741
1.05E 02	0.156	3.33E-02	0.081	1.81E-02	1.93E 05	0.187	4.67E-02	14.893
1.10E 02	0.139	2.47E-02	0.072	1.33E-02	1.48E 05	0.143	3.32E-02	15.007
1.15E 02	0.125	1.70E-02	0.064	9.08E-03	1.06E 05	0.113	2.22E-02	15.094
1.20E 02	0.110	1.15E-02	0.057	6.08E-03	7.39E 04	0.086	1.45E-02	15.154
1.25E 02	0.098	8.74E-03	0.050	4.60E-03	5.82E 04	0.067	1.07E-02	15.198
1.30E 02	0.088	7.23E-03	0.045	3.79E-03	4.98E 04	0.053	8.70E-03	15.235
1.35E 02	0.079	5.93E-03	0.040	3.09E-03	4.22E 04	0.043	6.59E-03	15.266
1.40E 02	0.070	5.23E-03	0.036	2.71E-03	3.85E 04	0.033	6.05E-03	15.295
1.50E 02	0.058	5.95E-03	0.029	3.06E-03	4.66E 04	0.022	6.70E-03	15.360
1.60E 02	0.048	6.12E-03	0.024	3.14E-03	5.09E 04	0.015	6.76E-03	15.436
1.70E 02	0.041	7.15E-03	0.021	3.65E-03	6.29E 04	0.011	7.78E-03	15.527
1.80E 02	0.035	9.45E-03	0.017	4.81E-03	8.79E 04	0.008	1.01E-02	15.647
1.90E 02	0.031	1.08E-02	0.016	5.48E-03	1.05E 05	0.007	1.15E-02	15.803
2.00E 02	0.029	1.13E-02	0.015	5.72E-03	1.16E 05	0.006	1.20E-02	15.978
2.20E 02	0.025	1.15E-02	0.013	5.81E-03	1.30E 05	0.005	1.21E-02	16.371
2.40E 02	0.023	1.04E-02	0.011	5.28E-03	1.28E 05	0.004	1.09E-02	16.781
2.60E 02	0.022	1.09E-02	0.011	5.53E-03	1.46E 05	0.004	1.14E-02	17.226
2.80E 02	0.020	7.93E-03	0.010	4.01E-03	1.14E 05	0.003	8.26E-03	17.596
3.00E 02	0.020	6.41E-03	0.010	3.24E-03	9.84E 04	0.003	6.68E-03	17.929
3.50E 02	0.017	3.32E-03	0.009	1.67E-03	5.89E 04	0.002	3.44E-03	18.584

OPTICAL CONSTANTS OF AL FROM REFLECTIVITY-DATA FITTED TO CANFIELD ET AL. (10)

ENERGY	EPSILON1	EPSILON2	N	K	ABSCOEFF	REFLECT%	ENERGYLOSS	N-EFF
2.90E 01	0.463	1.08E 00	0.905	5.99E-01	1.76E 06	9.234	7.81E-01	6.440
2.95E 01	0.449	1.08E 00	0.900	6.01E-01	1.80E 06	9.353	7.88E-01	6.564
3.00E 01	0.423	1.07E 00	0.887	6.03E-01	1.83E 06	9.594	8.08E-01	6.689
3.05E 01	0.396	1.05E 00	0.870	6.01E-01	1.86E 06	9.803	8.36E-01	6.815
3.10E 01	0.370	1.01E 00	0.851	5.96E-01	1.87E 06	9.977	8.70E-01	6.938
3.20E 01	0.323	9.17E-01	0.805	5.70E-01	1.85E 06	10.132	9.70E-01	7.175
3.30E 01	0.345	8.05E-01	0.781	5.15E-01	1.72E 06	9.123	1.05E 00	7.392
3.40E 01	0.384	7.37E-01	0.779	4.73E-01	1.63E 06	8.027	1.07E 00	7.591
3.50E 01	0.420	6.88E-01	0.783	4.39E-01	1.56E 06	7.122	1.06E 00	7.781
3.60E 01	0.447	6.51E-01	0.786	4.14E-01	1.51E 06	6.457	1.04E 00	7.965
3.70E 01	0.469	6.17E-01	0.788	3.91E-01	1.47E 06	5.903	1.03E 00	8.145
3.80E 01	0.489	5.86E-01	0.791	3.71E-01	1.43E 06	5.410	1.01E 00	8.320
3.90E 01	0.505	5.59E-01	0.793	3.53E-01	1.39E 06	5.005	9.85E-01	8.491
4.00E 01	0.520	5.31E-01	0.795	3.34E-01	1.36E 06	4.615	9.61E-01	8.658
4.10E 01	0.538	5.06E-01	0.799	3.17E-01	1.32E 06	4.218	9.27E-01	8.820
4.20E 01	0.555	4.87E-01	0.804	3.03E-01	1.29E 06	3.890	8.94E-01	8.980
4.30E 01	0.567	4.72E-01	0.807	2.92E-01	1.27E 06	3.651	8.68E-01	9.139
4.40E 01	0.572	4.56E-01	0.807	2.82E-01	1.26E 06	3.491	8.52E-01	9.296
4.50E 01	0.576	4.35E-01	0.805	2.70E-01	1.23E 06	3.321	8.35E-01	9.450
4.60E 01	0.584	4.08E-01	0.805	2.54E-01	1.18E 06	3.081	8.05E-01	9.599
4.70E 01	0.597	3.85E-01	0.809	2.38E-01	1.13E 06	2.805	7.63E-01	9.741
4.80E 01	0.612	3.66E-01	0.814	2.25E-01	1.09E 06	2.543	7.19E-01	9.880
4.90E 01	0.629	3.50E-01	0.821	2.13E-01	1.06E 06	2.303	6.76E-01	10.014
5.00E 01	0.643	3.38E-01	0.828	2.04E-01	1.04E 06	2.112	6.40E-01	10.147
5.20E 01	0.667	3.19E-01	0.839	1.90E-01	1.00E 06	1.821	5.83E-01	10.407
5.40E 01	0.687	3.05E-01	0.848	1.80E-01	9.83E 05	1.608	5.40E-01	10.665
5.60E 01	0.703	2.93E-01	0.856	1.71E-01	9.71E 05	1.449	5.05E-01	10.921
5.80E 01	0.714	2.86E-01	0.861	1.66E-01	9.77E 05	1.343	4.84E-01	11.180
6.00E 01	0.718	2.80E-01	0.863	1.62E-01	9.88E 05	1.294	4.72E-01	11.441
6.20E 01	0.714	2.69E-01	0.859	1.56E-01	9.83E 05	1.273	4.62E-01	11.703
6.40E 01	0.712	2.51E-01	0.857	1.47E-01	9.52E 05	1.213	4.41E-01	11.958
6.60E 01	0.714	2.33E-01	0.856	1.36E-01	9.11E 05	1.135	4.13E-01	12.202
6.80E 01	0.716	2.12E-01	0.855	1.24E-01	8.56E 05	1.053	3.81E-01	12.434
7.00E 01	0.722	1.91E-01	0.857	1.12E-01	7.92E 05	0.952	3.43E-01	12.650
7.20E 01	0.734	1.72E-01	0.862	9.97E-02	7.28E 05	0.831	3.03E-01	12.849
7.40E 01	0.746	1.61E-01	0.869	9.27E-02	6.95E 05	0.738	2.77E-01	13.037
7.60E 01	0.754	1.52E-01	0.873	8.71E-02	6.71E 05	0.675	2.57E-01	13.219
7.80E 01	0.760	1.42E-01	0.875	8.13E-02	6.43E 05	0.628	2.38E-01	13.395
8.00E 01	0.765	1.32E-01	0.878	7.52E-02	6.10E 05	0.581	2.19E-01	13.563
8.20E 01	0.772	1.20E-01	0.881	6.82E-02	5.66E 05	0.528	1.97E-01	13.721
8.30E 01	0.777	1.15E-01	0.884	6.53E-02	5.49E 05	0.500	1.87E-01	13.796
8.35E 01	0.780	1.13E-01	0.885	6.37E-02	5.40E 05	0.483	1.82E-01	13.833
8.40E 01	0.784	1.12E-01	0.888	6.33E-02	5.39E 05	0.464	1.79E-01	13.870
8.45E 01	0.785	1.16E-01	0.888	6.54E-02	5.61E 05	0.469	1.85E-01	13.908
8.50E 01	0.783	1.15E-01	0.887	6.48E-02	5.58E 05	0.474	1.83E-01	13.946
8.60E 01	0.781	1.09E-01	0.886	6.13E-02	5.34E 05	0.472	1.75E-01	14.020
8.70E 01	0.783	1.02E-01	0.887	5.76E-02	5.08E 05	0.452	1.64E-01	14.090
8.75E 01	0.786	9.91E-02	0.888	5.58E-02	4.95E 05	0.438	1.58E-01	14.124
8.80E 01	0.788	9.84E-02	0.889	5.54E-02	4.94E 05	0.429	1.56E-01	14.157
8.90E 01	0.787	9.34E-02	0.889	5.26E-02	4.74E 05	0.423	1.49E-01	14.224

Table 6, page

OPTICAL CONSTANTS OF BI

ENERGY	EPSILON1	EPSILON2	N	K	ABSCOEFF	REFLECT%	ENERGYLOSS	N-EFF
2.00E-01	4.56E 01	2.03E 01	6.908	1.47E 00	2.98E 04	57.296	8.17E-03	0.003
4.00E-01	6.86E 01	3.78E 01	8.572	2.21E 00	8.95E 04	64.467	6.16E-03	0.027
6.00E-01	4.08E 01	5.77E 01	7.466	3.87E 00	2.35E 05	65.522	1.16E-02	0.117
8.00E-01	1.86E 01	5.64E 01	6.247	4.52E 00	3.66E 05	65.737	1.60E-02	0.254
1.00E 00	1.949	4.87E 01	5.036	4.84E 00	4.91E 05	66.361	2.05E-02	0.412
1.50E 00	-6.977	2.23E 01	2.861	3.89E 00	5.91E 05	61.925	4.10E-02	0.736
2.00E 00	-4.584	1.39E 01	2.244	3.10E 00	6.29E 05	55.438	6.48E-02	0.976
2.50E 00	-3.639	9.95E 00	1.865	2.67E 00	6.76E 05	51.320	8.87E-02	1.189
3.00E 00	-2.722	7.06E 00	1.556	2.27E 00	6.89E 05	46.673	1.24E-01	1.374
3.50E 00	-1.053	5.71E 00	1.541	1.85E 00	6.57E 05	37.641	1.69E-01	1.535
4.00E 00	-0.585	5.15E 00	1.517	1.70E 00	6.88E 05	34.185	1.92E-01	1.704
5.00E 00	-0.101	4.49E 00	1.482	1.52E 00	7.68E 05	29.903	2.23E-01	2.059
6.00E 00	-0.504	4.19E 00	1.364	1.54E 00	9.35E 05	31.406	2.35E-01	2.459
8.00E 00	-0.872	2.35E 00	0.904	1.30E 00	1.05E 06	31.954	3.74E-01	3.193
1.00E 01	-0.432	1.38E 00	0.710	9.68E-01	9.81E 05	26.428	6.62E-01	3.710
1.20E 01	-0.072	8.54E-01	0.627	6.81E-01	8.29E 05	19.411	1.16E 00	4.097
1.40E 01	0.202	5.83E-01	0.640	4.56E-01	6.47E 05	11.653	1.53E 00	4.394
1.60E 01	0.393	4.05E-01	0.692	2.93E-01	4.75E 05	5.135	1.27E 00	4.630
1.80E 01	0.555	2.57E-01	0.763	1.68E-01	3.07E 05	2.683	6.87E-01	4.810
2.00E 01	0.722	1.76E-01	0.856	1.03E-01	2.09E 05	0.908	3.19E-01	4.938
2.20E 01	0.872	1.34E-01	0.936	7.17E-02	1.60E 05	0.248	1.73E-01	5.042
2.30E 01	0.959	1.22E-01	0.981	6.22E-02	1.45E 05	0.108	1.31E-01	5.088
2.35E 01	1.022	1.23E-01	1.013	6.09E-02	1.45E 05	0.036	1.16E-01	5.112
2.40E 01	1.128	1.57E-01	1.065	7.39E-02	1.80E 05	0.227	1.21E-01	5.139
2.45E 01	1.112	3.92E-01	1.070	1.83E-01	4.55E 05	0.893	2.82E-01	5.195
2.50E 01	0.979	3.38E-01	1.004	1.68E-01	4.26E 05	0.700	3.15E-01	5.270
2.55E 01	0.978	3.05E-01	1.001	1.52E-01	3.94E 05	0.576	2.91E-01	5.335
2.60E 01	0.976	2.92E-01	0.999	1.46E-01	3.86E 05	0.534	2.82E-01	5.398
2.65E 01	0.978	2.75E-01	0.998	1.38E-01	3.70E 05	0.473	2.67E-01	5.458
2.70E 01	1.006	2.59E-01	1.011	1.28E-01	3.51E 05	0.407	2.40E-01	5.516
2.75E 01	1.048	3.10E-01	1.035	1.50E-01	4.17E 05	0.567	2.59E-01	5.579
2.80E 01	0.966	3.43E-01	0.998	1.72E-01	4.88E 05	0.735	3.27E-01	5.658
2.85E 01	0.953	2.94E-01	0.987	1.49E-01	4.31E 05	0.563	2.96E-01	5.730
2.90E 01	0.961	2.83E-01	0.991	1.43E-01	4.19E 05	0.514	2.82E-01	5.798
2.95E 01	0.957	2.72E-01	0.988	1.38E-01	4.12E 05	0.482	2.75E-01	5.864
3.00E 01	0.958	2.50E-01	0.987	1.27E-01	3.86E 05	0.410	2.55E-01	5.927
3.10E 01	0.981	2.29E-01	0.997	1.15E-01	3.61E 05	0.331	2.26E-01	6.046
3.20E 01	1.007	2.18E-01	1.009	1.08E-01	3.50E 05	0.290	2.05E-01	6.160
3.30E 01	1.029	2.19E-01	1.020	1.08E-01	3.60E 05	0.293	1.98E-01	6.278
3.40E 01	1.044	2.24E-01	1.027	1.09E-01	3.76E 05	0.307	1.97E-01	6.402
3.60E 01	1.065	2.36E-01	1.038	1.14E-01	4.14E 05	0.344	1.98E-01	6.671
3.80E 01	1.080	2.52E-01	1.046	1.20E-01	4.64E 05	0.396	2.05E-01	6.972
4.00E 01	1.087	2.75E-01	1.051	1.31E-01	5.30E 05	0.466	2.18E-01	7.311
4.20E 01	1.079	2.98E-01	1.048	1.42E-01	6.04E 05	0.534	2.38E-01	7.700
4.40E 01	1.063	3.01E-01	1.041	1.44E-01	6.44E 05	0.539	2.46E-01	8.127
4.60E 01	1.052	3.09E-01	1.036	1.49E-01	6.95E 05	0.565	2.57E-01	8.581
4.80E 01	1.044	3.14E-01	1.033	1.52E-01	7.40E 05	0.583	2.64E-01	9.066
5.00E 01	1.029	3.29E-01	1.027	1.60E-01	8.13E 05	0.640	2.82E-01	9.590
5.10E 01	1.016	3.41E-01	1.022	1.67E-01	8.63E 05	0.688	2.97E-01	9.869
5.20E 01	0.999	3.39E-01	1.014	1.67E-01	8.83E 05	0.691	3.05E-01	10.157

OPTICAL CONSTANTS OF BI

ENERGY	EPSILON1	EPSILON2	N	K	ABSCOEFF	REFLECT%	ENERGYLOSS	N-EFF
5.30E 01	0.985	3.38E-01	1.007	1.68E-01	9.02E 05	0.696	3.12E-01	10.451
5.40E 01	0.973	3.35E-01	1.000	1.67E-01	9.16E 05	0.695	3.16E-01	10.748
5.50E 01	0.959	3.32E-01	0.993	1.67E-01	9.31E 05	0.698	3.22E-01	11.047
5.60E 01	0.947	3.25E-01	0.987	1.65E-01	9.36E 05	0.688	3.25E-01	11.347
5.70E 01	0.936	3.19E-01	0.981	1.62E-01	9.38E 05	0.677	3.26E-01	11.645
5.80E 01	0.925	3.11E-01	0.975	1.59E-01	9.37E 05	0.663	3.26E-01	11.942
5.90E 01	0.916	3.01E-01	0.970	1.55E-01	9.27E 05	0.639	3.23E-01	12.234
6.00E 01	0.909	2.91E-01	0.966	1.51E-01	9.17E 05	0.616	3.19E-01	12.522
6.50E 01	0.894	2.51E-01	0.955	1.32E-01	8.66E 05	0.504	2.91E-01	13.895
7.00E 01	0.874	2.25E-01	0.942	1.20E-01	8.48E 05	0.464	2.77E-01	15.215
7.50E 01	0.860	1.84E-01	0.933	9.85E-02	7.48E 05	0.379	2.37E-01	16.420
8.00E 01	0.862	1.50E-01	0.932	8.07E-02	6.54E 05	0.297	1.96E-01	17.466
8.50E 01	0.866	1.25E-01	0.933	6.71E-02	5.78E 05	0.241	1.64E-01	18.389
9.00E 01	0.872	1.00E-01	0.935	5.36E-02	4.89E 05	0.188	1.30E-01	19.186
9.50E 01	0.882	8.22E-02	0.940	4.37E-02	4.21E 05	0.147	1.05E-01	19.866
1.00E 02	0.891	6.79E-02	0.945	3.59E-02	3.64E 05	0.115	8.50E-02	20.456
1.05E 02	0.900	5.69E-02	0.949	3.00E-02	3.19E 05	0.092	7.00E-02	20.974
1.10E 02	0.907	4.78E-02	0.953	2.51E-02	2.80E 05	0.075	5.79E-02	21.431
1.15E 02	0.914	3.92E-02	0.956	2.05E-02	2.39E 05	0.061	4.68E-02	21.826
1.20E 02	0.922	3.26E-02	0.960	1.70E-02	2.07E 05	0.049	3.84E-02	22.166
1.25E 02	0.929	2.76E-02	0.964	1.43E-02	1.82E 05	0.039	3.20E-02	22.463
1.30E 02	0.934	2.36E-02	0.966	1.22E-02	1.61E 05	0.033	2.70E-02	22.727
1.35E 02	0.939	2.01E-02	0.969	1.04E-02	1.42E 05	0.027	2.28E-02	22.959
1.40E 02	0.944	1.68E-02	0.972	8.67E-03	1.23E 05	0.023	1.89E-02	23.162
1.45E 02	0.949	1.41E-02	0.974	7.26E-03	1.07E 05	0.019	1.57E-02	23.338
1.50E 02	0.953	1.18E-02	0.976	6.03E-03	9.17E 04	0.015	1.30E-02	23.491
1.60E 02	0.961	3.79E-03	0.980	4.48E-03	7.27E 04	0.010	9.52E-03	23.746
1.70E 02	0.967	7.49E-03	0.984	3.81E-03	6.56E 04	0.007	8.00E-03	23.962
1.80E 02	0.972	6.54E-03	0.986	3.31E-03	6.05E 04	0.005	6.91E-03	24.160
1.90E 02	0.977	5.92E-03	0.988	2.99E-03	5.76E 04	0.004	6.20E-03	24.347
2.00E 02	0.980	5.60E-03	0.990	2.83E-03	5.74E 04	0.003	5.84E-03	24.531
2.10E 02	0.983	5.54E-03	0.991	2.79E-03	5.94E 04	0.002	5.73E-03	24.720
2.20E 02	0.985	5.55E-03	0.993	2.79E-03	6.23E 04	0.002	5.71E-03	24.918
2.30E 02	0.987	5.67E-03	0.994	2.85E-03	6.65E 04	0.001	5.82E-03	25.128
2.40E 02	0.989	5.82E-03	0.995	2.93E-03	7.12E 04	0.001	5.95E-03	25.354
2.50E 02	0.991	6.27E-03	0.996	3.15E-03	7.98E 04	0.001	6.39E-03	25.600
2.60E 02	0.993	7.26E-03	0.996	3.64E-03	9.60E 04	0.001	7.36E-03	25.886
2.70E 02	0.993	8.02E-03	0.996	4.03E-03	1.10E 05	0.001	8.14E-03	26.229
2.80E 02	0.993	8.21E-03	0.996	4.12E-03	1.17E 05	0.001	8.33E-03	26.603
2.90E 02	0.993	8.32E-03	0.997	4.17E-03	1.23E 05	0.001	8.43E-03	26.996
3.00E 02	0.993	8.34E-03	0.997	4.18E-03	1.27E 05	0.001	8.45E-03	27.407
3.10E 02	0.993	8.29E-03	0.997	4.16E-03	1.31E 05	0.001	8.40E-03	27.830
3.20E 02	0.994	8.20E-03	0.997	4.11E-03	1.33E 05	0.001	8.30E-03	28.262
3.30E 02	0.994	8.08E-03	0.997	4.05E-03	1.36E 05	0.001	8.19E-03	28.701
3.40E 02	0.994	7.94E-03	0.997	3.98E-03	1.37E 05	0.001	8.04E-03	29.144
3.50E 02	0.994	7.73E-03	0.997	3.87E-03	1.37E 05	0.001	7.82E-03	29.588
3.60E 02	0.994	7.50E-03	0.997	3.76E-03	1.37E 05	0.001	7.60E-03	30.032
3.70E 02	0.994	7.29E-03	0.997	3.65E-03	1.37E 05	0.001	7.37E-03	30.475
3.80E 02	0.994	7.08E-03	0.997	3.55E-03	1.37E 05	0.001	7.16E-03	30.917
3.90E 02	0.995	6.88E-03	0.997	3.45E-03	1.36E 05	0.000	6.96E-03	31.359

Table 7, page 2

ENERGY	1.-EPSL1	EPSILCN2	1.-N	K	ABSCOEFF	REFLECT%	ENERGYLOSS	N-EFF
4.00E 02	0.006	6.68E-03	0.003	3.35E-03	1.36E 05	0.000	6.75E-03	31.795
4.20E 02	0.005	6.26E-03	0.003	3.14E-03	1.34E 05	0.000	6.33E-03	32.663
4.40E 02	0.005	5.87E-03	0.003	2.94E-03	1.31E 05	0.000	5.93E-03	33.512
4.60E 02	0.005	5.50E-03	0.003	2.76E-03	1.29E 05	0.000	5.56E-03	34.345
4.80E 02	0.005	5.17E-03	0.002	2.59E-03	1.26E 05	0.000	5.22E-03	35.163
5.00E 02	0.005	4.88E-03	0.002	2.45E-03	1.24E 05	0.000	4.93E-03	35.967
5.50E 02	0.004	4.26E-03	0.002	2.14E-03	1.19E 05	0.000	4.30E-03	37.915
6.00E 02	0.004	3.75E-03	0.002	1.88E-03	1.14E 05	0.000	3.78E-03	39.747
6.50E 02	0.004	3.28E-03	0.002	1.64E-03	1.08E 05	0.000	3.30E-03	41.470
7.00E 02	0.003	2.89E-03	0.002	1.45E-03	1.02E 05	0.000	2.91E-03	43.062
7.50E 02	0.003	2.52E-03	0.002	1.26E-03	9.59E 04	0.000	2.54E-03	44.613
8.00E 02	0.003	2.23E-03	0.001	1.12E-03	8.99E 04	0.000	2.24E-03	45.983
8.50E 02	0.002	1.94E-03	0.001	9.73E-04	8.38E 04	0.000	1.95E-03	47.338
9.00E 02	0.002	1.68E-03	0.001	8.39E-04	7.63E 04	0.000	1.68E-03	48.529
9.50E 02	0.002	1.40E-03	0.001	7.01E-04	6.72E 04	0.000	1.41E-03	49.590
1.00E 03	0.002	1.16E-03	0.001	5.79E-04	5.85E 04	0.000	1.16E-03	50.524
1.10E 03	0.002	8.66E-04	0.001	4.34E-04	4.81E 04	0.000	8.69E-04	52.095
1.20E 03	0.001	6.58E-04	0.001	3.29E-04	4.00E 04	0.000	6.60E-04	53.445
1.30E 03	0.001	5.11E-04	0.001	2.56E-04	3.36E 04	0.000	5.12E-04	54.509
1.40E 03	0.001	3.96E-04	0.001	1.98E-04	2.80E 04	0.000	3.97E-04	55.412
1.60E 03	0.001	2.57E-04	0.000	1.29E-04	2.08E 04	0.0	2.57E-04	56.832
1.80E 03	0.001	1.76E-04	0.000	8.82E-05	1.60E 04	0.0	1.77E-04	57.885
2.00E 03	0.000	1.25E-04	0.000	6.27E-05	1.27E 04	0.0	1.25E-04	58.746
2.20E 03	0.000	9.08E-05	0.000	4.54E-05	1.01E 04	0.0	9.09E-05	59.428
2.40E 03	0.000	6.68E-05	0.000	3.34E-05	8.11E 03	0.0	6.68E-05	59.978
2.45E 03	0.000	1.29E-04	0.000	6.45E-05	1.60E 04	0.0	1.29E-04	60.149
2.50E 03	0.000	1.48E-04	0.000	7.39E-05	1.87E 04	0.0	1.48E-04	60.432
2.60E 03	-0.000	1.33E-04	-0.000	6.67E-05	1.76E 04	0.0	1.33E-04	60.993
2.80E 03	0.000	1.38E-04	0.000	6.92E-05	1.96E 04	0.0	1.38E-04	62.292
3.00E 03	0.000	1.11E-04	0.000	5.57E-05	1.69E 04	0.0	1.12E-04	63.324
3.10E 03	0.000	1.04E-04	0.000	5.18E-05	1.63E 04	0.0	1.04E-04	63.860
3.20E 03	-0.000	1.08E-04	-0.000	5.42E-05	1.76E 04	0.0	1.08E-04	64.442
3.30E 03	-0.000	1.05E-04	-0.000	5.23E-05	1.74E 04	0.0	1.04E-04	64.945
3.50E 03	-0.000	9.01E-05	-0.000	4.50E-05	1.58E 04	0.0	9.01E-05	65.887
4.00E 03	0.000	5.87E-05	0.000	2.93E-05	1.18E 04	0.0	5.87E-05	67.954
6.00E 03	-0.000	1.54E-05	-0.000	7.69E-06	4.65E 03	0.0	1.54E-05	72.283
8.00E 03	-0.000	5.28E-06	-0.000	2.64E-06	2.13E 03	0.0	5.27E-06	74.128
1.00E 04	-0.001	2.41E-06	-0.000	1.21E-06	1.21E 03	0.0	2.41E-06	75.073
1.20E 04	-0.001	1.33E-06	-0.000	6.63E-07	8.06E 02	0.0	1.33E-06	75.672
1.30E 04	-0.001	9.91E-07	-0.000	4.95E-07	6.51E 02	0.0	9.90E-07	75.887
1.40E 04	-0.000	1.87E-06	-0.000	9.36E-07	1.33E 03	0.0	1.87E-06	76.290
1.50E 04	-0.000	1.41E-06	-0.000	7.04E-07	1.07E 03	0.0	1.41E-06	76.640
2.00E 04	-0.000	8.26E-07	-0.000	4.13E-07	8.34E 02	0.0	8.26E-07	78.352
3.00E 04	-0.000	1.90E-07	-0.000	9.48E-08	2.85E 02	0.0	1.89E-07	79.724
5.00E 04	-0.000	3.20E-08	-0.000	1.60E-08	8.07E 01	0.0	3.20E-08	80.606
8.50E 04	-0.000	5.12E-09	-0.000	2.56E-09	2.20E 01	0.0	5.12E-09	81.031
9.00E 04	-0.000	1.43E-08	-0.000	7.13E-09	6.53E 01	0.0	1.43E-08	81.112
1.00E 05	-0.000	1.14E-08	-0.000	5.71E-09	5.76E 01	0.0	1.14E-08	81.303
3.00E 05	-0.000	2.39E-10	-0.000	1.19E-10	3.62E 00	0.0	2.39E-10	82.143
5.00E 05	-0.001	4.03E-11	-0.000	2.02E-11	1.01E 00	0.0	4.03E-11	82.251

Table 7, page 3

OPTICAL CONSTANTS OF C
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ENERGY	EPSILON1	EPSILON2	N	K	ABSCOEFF	REFLECT%	ENERGYLOSS	N-EFF
1.00E 02	-3.42E 02	2.04E 02	5.303	1.92E 01	1.95E 04	94.825	1.29E-03	0.0
1.50E 02	-1.15E 02	1.96E 02	7.489	1.31E 01	1.99E 04	87.692	3.79E-03	0.000
2.00E 02	-1.03E 02	1.77E 02	7.115	1.24E 01	2.52E 04	87.099	4.19E-03	0.000
2.50E 02	-1.01E 02	1.12E 02	4.997	1.12E 01	2.84E 04	87.630	4.54E-03	0.000
3.00E 02	-7.08E 01	7.58E 01	4.054	9.31E 00	2.81E 04	85.426	7.29E-03	0.000
4.00E 02	-3.54E 01	4.77E 01	3.472	6.86E 00	2.76E 04	79.060	1.40E-02	0.000
6.00E 02	-1.17E 01	2.94E 01	3.159	4.65E 00	2.83E 04	67.559	2.94E-02	0.001
8.00E 02	-4.103	2.09E 01	2.932	3.56E 00	2.88E 04	58.251	4.63E-02	0.001
1.00E 01	0.278	1.61E 01	2.870	2.79E 00	2.79E 04	49.423	6.26E-02	0.001
2.00E 01	6.703	9.08E 00	3.000	1.51E 00	3.05E 04	34.393	7.11E-02	0.002
3.00E 01	7.028	7.62E 00	2.949	1.29E 00	3.92E 04	31.663	7.09E-02	0.003
4.00E 01	6.539	6.89E 00	2.831	1.22E 00	4.93E 04	29.910	7.65E-02	0.005
5.00E 01	5.890	6.37E 00	2.698	1.18E 00	5.98E 04	28.380	8.46E-02	0.007
1.00E 00	3.775	4.59E 00	2.204	1.04E 00	1.05E 05	22.321	1.30E-01	0.021
1.50E 00	3.222	3.22E 00	1.974	8.16E-01	1.24E 05	16.984	1.55E-01	0.036
2.00E 00	2.986	2.78E 00	1.879	7.39E-01	1.50E 05	14.929	1.67E-01	0.053
2.50E 00	2.782	2.52E 00	1.807	6.96E-01	1.76E 05	13.585	1.79E-01	0.072
3.00E 00	2.610	2.38E 00	1.752	6.78E-01	2.06E 05	12.763	1.91E-01	0.094
3.50E 00	2.445	2.32E 00	1.706	6.81E-01	2.42E 05	12.354	2.04E-01	0.119
4.00E 00	2.161	2.37E 00	1.638	7.23E-01	2.93E 05	12.431	2.30E-01	0.148
4.50E 00	1.722	2.32E 00	1.518	7.64E-01	3.48E 05	12.309	2.78E-01	0.180
5.00E 00	1.238	2.03E 00	1.344	7.54E-01	3.82E 05	11.329	3.59E-01	0.211
5.50E 00	1.055	1.46E 00	1.195	6.10E-01	3.40E 05	7.904	4.50E-01	0.236
6.00E 00	1.163	9.61E-01	1.158	4.15E-01	2.52E 05	4.083	4.20E-01	0.254
6.50E 00	1.352	6.70E-01	1.196	2.80E-01	1.84E 05	2.335	2.94E-01	0.267
7.00E 00	1.614	4.05E-01	1.280	1.58E-01	1.12E 05	1.981	1.46E-01	0.276
7.50E 00	1.948	2.83E-01	1.399	1.01E-01	7.68E 04	2.944	7.30E-02	0.282
8.00E 00	2.337	2.66E-01	1.531	9.69E-02	7.05E 04	4.518	4.81E-02	0.289
8.50E 00	2.698	4.75E-01	1.649	1.44E-01	1.24E 05	6.279	6.33E-02	0.301
9.00E 00	2.963	7.74E-01	1.736	2.23E-01	2.03E 05	7.845	8.25E-02	0.323
9.50E 00	3.095	1.20E 00	1.791	3.34E-01	3.22E 05	9.325	1.09E-01	0.356
1.00E 01	3.073	1.63E 00	1.811	4.49E-01	4.55E 05	10.606	1.34E-01	0.407
1.05E 01	2.847	2.08E 00	1.785	5.82E-01	6.19E 05	11.796	1.67E-01	0.474
1.10E 01	2.522	2.31E 00	1.723	6.69E-01	7.46E 05	12.342	1.97E-01	0.552
1.15E 01	2.232	2.43E 00	1.663	7.30E-01	8.51E 05	12.754	2.23E-01	0.638
1.20E 01	1.969	2.53E 00	1.603	7.86E-01	9.56E 05	13.311	2.46E-01	0.731
1.25E 01	1.652	2.62E 00	1.542	8.51E-01	1.08E 06	14.164	2.73E-01	0.832
1.30E 01	1.341	2.62E 00	1.463	8.94E-01	1.18E 06	14.764	3.03E-01	0.935
1.35E 01	1.027	2.57E 00	1.378	9.34E-01	1.28E 06	15.553	3.35E-01	1.043
1.40E 01	0.735	2.46E 00	1.284	9.56E-01	1.36E 06	16.224	3.74E-01	1.146
1.45E 01	0.496	2.29E 00	1.191	9.60E-01	1.41E 06	16.745	4.18E-01	1.250
1.50E 01	0.296	2.10E 00	1.099	9.55E-01	1.45E 06	17.334	4.67E-01	1.347
1.55E 01	0.131	1.89E 00	1.005	9.38E-01	1.47E 06	17.955	5.28E-01	1.437
1.60E 01	0.009	1.64E 00	0.908	9.03E-01	1.46E 06	18.490	6.10E-01	1.517
1.80E 01	0.139	9.25E-01	0.733	6.31E-01	1.15E 06	13.795	1.06E 00	1.722
2.00E 01	0.296	6.38E-01	0.707	4.51E-01	9.14E 05	9.286	1.29E 00	1.878
2.20E 01	0.441	4.61E-01	0.735	3.14E-01	7.00E 05	5.439	1.13E 00	2.003
2.40E 01	0.531	3.94E-01	0.772	2.55E-01	6.20E 05	3.645	9.00E-01	2.119
2.60E 01	0.587	3.29E-01	0.794	2.07E-01	5.45E 05	2.622	7.26E-01	2.224
2.80E 01	0.638	2.71E-01	0.816	1.66E-01	4.71E 05	1.850	5.64E-01	2.317

Table 8, page 1

OPTICAL CONSTANTS OF C

ENERGY	EPSILON1	EPSILON2	N	K	ABSCOEFF	REFLECT%	ENERGYLOSS	N-EFF
3.00E 01	0.681	2.34E-01	0.837	1.40E-01	4.26E 05	1.360	4.52E-01	2.403
3.20E 01	0.720	2.02E-01	0.857	1.18E-01	3.83E 05	0.994	3.61E-01	2.483
3.40E 01	0.750	1.90E-01	0.873	1.09E-01	3.76E 05	0.799	3.18E-01	2.562
3.60E 01	0.762	1.79E-01	0.879	1.02E-01	3.72E 05	0.710	2.93E-01	2.641
3.80E 01	0.773	1.52E-01	0.883	8.60E-02	3.31E 05	0.590	2.45E-01	2.712
4.00E 01	0.793	1.30E-01	0.893	7.30E-02	2.96E 05	0.466	2.02E-01	2.776
4.20E 01	0.813	1.10E-01	0.904	6.50E-02	2.77E 05	0.370	1.74E-01	2.837
4.40E 01	0.826	1.15E-01	0.911	6.30E-02	2.81E 05	0.325	1.65E-01	2.899
4.60E 01	0.832	1.06E-01	0.914	5.80E-02	2.70E 05	0.294	1.51E-01	2.959
5.00E 01	0.848	8.30E-02	0.922	4.50E-02	2.28E 05	0.219	1.14E-01	3.061
5.50E 01	0.868	6.53E-02	0.932	3.50E-02	1.95E 05	0.155	8.61E-02	3.171
6.00E 01	0.884	5.08E-02	0.940	2.70E-02	1.64E 05	0.114	6.48E-02	3.264
6.50E 01	0.898	3.79E-02	0.948	2.00E-02	1.32E 05	0.083	4.70E-02	3.340
7.00E 01	0.912	2.86E-02	0.955	1.50E-02	1.06E 05	0.059	3.44E-02	3.402
7.50E 01	0.924	2.33E-02	0.961	1.21E-02	9.21E 04	0.043	2.73E-02	3.457
8.00E 01	0.933	1.93E-02	0.966	1.02E-02	8.29E 04	0.033	2.27E-02	3.506
8.50E 01	0.940	1.66E-02	0.970	8.58E-03	7.38E 04	0.026	1.88E-02	3.549
9.00E 01	0.946	1.41E-02	0.973	7.25E-03	6.61E 04	0.020	1.58E-02	3.588
9.50E 01	0.952	1.20E-02	0.976	6.13E-03	5.89E 04	0.016	1.32E-02	3.622
1.00E 02	0.956	1.01E-02	0.978	5.19E-03	5.25E 04	0.013	1.11E-02	3.653
1.10E 02	0.964	7.40E-03	0.982	3.77E-03	4.19E 04	0.009	7.96E-03	3.706
1.20E 02	0.970	5.56E-03	0.985	2.82E-03	3.43E 04	0.006	5.90E-03	3.749
1.30E 02	0.975	4.55E-03	0.987	2.35E-03	3.09E 04	0.004	4.89E-03	3.786
1.40E 02	0.978	3.81E-03	0.989	1.93E-03	2.72E 04	0.003	3.99E-03	3.817
1.60E 02	0.984	2.40E-03	0.992	1.21E-03	1.95E 04	0.002	2.48E-03	3.864
1.80E 02	0.988	1.69E-03	0.994	8.48E-04	1.54E 04	0.001	1.73E-03	3.902
2.00E 02	0.990	1.16E-03	0.995	5.85E-04	1.17E 04	0.001	1.19E-03	3.929
2.50E 02	0.996	5.43E-04	0.998	2.72E-04	6.79E 03	0.000	5.48E-04	3.975
2.70E 02	0.999	4.12E-04	0.999	2.06E-04	5.53E 03	0.000	4.14E-04	3.987
2.90E 02	1.002	1.59E-03	1.001	7.94E-04	2.34E 04	0.000	1.58E-03	4.017
3.00E 02	1.004	7.09E-03	1.002	3.54E-03	1.08E 05	0.000	7.03E-03	4.103
3.10E 02	0.998	9.93E-03	0.999	4.97E-03	1.56E 05	0.001	9.97E-03	4.299
3.20E 02	0.995	7.35E-03	0.998	3.68E-03	1.19E 05	0.000	7.41E-03	4.447
3.30E 02	0.995	5.52E-03	0.998	2.77E-03	9.25E 04	0.000	5.58E-03	4.559
3.40E 02	0.995	4.70E-03	0.998	2.36E-03	8.10E 04	0.000	4.75E-03	4.654
3.50E 02	0.995	4.26E-03	0.998	2.13E-03	7.56E 04	0.000	4.30E-03	4.744
4.50E 02	0.996	1.67E-03	0.998	8.39E-04	3.78E 04	0.000	1.69E-03	5.276
5.00E 02	0.997	1.14E-03	0.999	5.69E-04	2.83E 04	0.000	1.14E-03	5.432
6.00E 02	0.998	6.63E-04	0.999	3.32E-04	1.91E 04	0.000	6.66E-04	5.625
8.00E 02	0.999	1.97E-04	0.999	9.85E-05	7.87E 03	0.0	1.97E-04	5.869
1.00E 03	0.999	3.44E-05	1.000	4.22E-05	4.13E 03	0.0	8.45E-05	5.963
1.50E 03	1.000	1.72E-05	1.000	8.62E-06	1.29E 03	0.0	1.72E-05	6.062
2.00E 03	1.000	4.91E-06	1.000	2.41E-06	4.80E 02	0.0	4.81E-06	6.093
3.00E 03	1.000	8.95E-07	1.000	4.48E-07	1.36E 02	0.0	8.95E-07	6.119
5.00E 03	1.000	1.03E-07	1.000	5.38E-08	2.72E 01	0.0	1.08E-07	6.132
7.00E 03	1.000	2.67E-08	1.000	1.34E-08	9.45E 00	0.0	2.67E-08	6.136
9.00E 03	1.000	1.00E-08	1.000	5.00E-09	4.54E 00	0.0	1.00E-08	6.137
1.50E 04	1.000	1.44E-09	1.000	7.20E-10	1.09E 00	0.0	1.44E-09	6.139
2.00E 04	1.000	4.35E-10	1.000	2.17E-10	4.38E-01	0.0	4.35E-10	6.139
3.00E 04	1.000	6.58E-11	1.000	3.29E-11	1.00E-01	0.0	6.58E-11	6.139

Table 8, page 2

OPTICAL CONSTANTS OF AL2O3

ENERGY	EPSILON1	EPSILON2	N	K	ABSCOEFF	REFLECT%	ENERGYLOSS	N-EFF
6.00E 00	3.155	8.50E-03	1.774	2.20E-03	1.57E 03	7.794	6.14E-04	0.002
7.00E 00	3.704	3.18E-02	1.924	8.24E-03	5.87E 03	9.993	2.30E-03	0.007
8.00E 00	4.236	1.16E-01	2.058	2.80E-02	2.29E 04	11.976	6.34E-03	0.022
8.50E 00	4.636	2.06E-01	2.153	4.78E-02	4.13E 04	13.397	9.49E-03	0.040
9.00E 00	5.268	4.12E-01	2.297	8.95E-02	8.17E 04	15.537	1.47E-02	0.072
9.50E 00	6.304	1.28E 00	2.524	2.53E-01	2.44E 05	19.120	3.07E-02	0.160
1.00E 01	6.308	3.08E 00	2.582	5.97E-01	6.05E 05	21.680	6.26E-02	0.445
1.05E 01	5.266	4.72E 00	2.484	9.51E-01	1.01E 06	23.833	9.43E-02	0.925
1.10E 01	3.688	4.92E 00	2.218	1.11E 00	1.24E 06	23.448	1.30E-01	1.523
1.15E 01	2.731	4.66E 00	2.017	1.16E 00	1.35E 06	22.723	1.60E-01	2.124
1.20E 01	2.133	4.36E 00	1.868	1.17E 00	1.42E 06	22.036	1.85E-01	2.711
1.25E 01	1.702	4.10E 00	1.753	1.17E 00	1.48E 06	21.660	2.08E-01	3.285
1.30E 01	1.342	3.87E 00	1.645	1.17E 00	1.55E 06	21.415	2.31E-01	3.849
1.35E 01	1.053	3.63E 00	1.555	1.17E 00	1.60E 06	21.207	2.54E-01	4.399
1.40E 01	0.809	3.43E 00	1.471	1.16E 00	1.65E 06	21.145	2.76E-01	4.937
1.45E 01	0.553	3.20E 00	1.379	1.16E 00	1.70E 06	21.254	3.03E-01	5.460
1.50E 01	0.379	2.94E 00	1.293	1.14E 00	1.73E 06	21.065	3.34E-01	5.960
1.60E 01	0.165	2.47E 00	1.148	1.07E 00	1.74E 06	20.376	4.04E-01	6.877
1.70E 01	0.077	2.07E 00	1.035	9.97E-01	1.72E 06	19.337	4.84E-01	7.693
1.80E 01	0.064	1.73E 00	0.947	9.12E-01	1.66E 06	18.072	5.78E-01	8.419
1.90E 01	0.122	1.48E 00	0.896	8.25E-01	1.59E 06	16.179	6.71E-01	9.067
1.95E 01	0.144	1.40E 00	0.880	7.94E-01	1.57E 06	15.485	7.08E-01	9.372
2.00E 01	0.153	1.33E 00	0.862	7.69E-01	1.56E 06	15.026	7.45E-01	9.667
2.05E 01	0.150	1.26E 00	0.841	7.47E-01	1.55E 06	14.771	7.85E-01	9.956
2.10E 01	0.137	1.17E 00	0.812	7.23E-01	1.54E 06	14.653	8.40E-01	10.235
2.20E 01	0.162	9.97E-01	0.765	6.51E-01	1.45E 06	13.533	9.77E-01	10.746
2.40E 01	0.269	7.25E-01	0.722	5.02E-01	1.22E 06	10.245	1.21E 00	11.609
2.60E 01	0.405	5.88E-01	0.748	3.93E-01	1.04E 06	6.787	1.15E 00	12.324
2.80E 01	0.492	5.06E-01	0.774	3.27E-01	9.28E 05	4.862	1.02E 00	12.972
3.00E 01	0.551	4.49E-01	0.794	2.82E-01	8.59E 05	3.708	8.89E-01	13.583
3.50E 01	0.636	3.34E-01	0.823	2.03E-01	7.19E 05	2.155	6.47E-01	14.979
4.00E 01	0.697	2.51E-01	0.848	1.48E-01	6.00E 05	1.309	4.57E-01	16.193
4.50E 01	0.748	1.93E-01	0.872	1.11E-01	5.05E 05	0.814	3.23E-01	17.210
5.00E 01	0.788	1.54E-01	0.892	8.64E-02	4.38E 05	0.536	2.39E-01	18.116
5.50E 01	0.819	1.25E-01	0.907	6.86E-02	3.83E 05	0.367	1.82E-01	18.916
6.00E 01	0.844	9.96E-02	0.920	5.41E-02	3.29E 05	0.252	1.38E-01	19.621
6.50E 01	0.868	8.17E-02	0.933	4.38E-02	2.88E 05	0.172	1.07E-01	20.240
7.00E 01	0.890	6.90E-02	0.944	3.65E-02	2.59E 05	0.118	8.66E-02	20.798
7.20E 01	0.898	6.47E-02	0.948	3.41E-02	2.49E 05	0.101	7.98E-02	21.009
7.30E 01	0.903	6.26E-02	0.951	3.29E-02	2.43E 05	0.092	7.64E-02	21.111
7.40E 01	0.908	6.04E-02	0.953	3.17E-02	2.38E 05	0.083	7.30E-02	21.211
7.45E 01	0.911	5.95E-02	0.955	3.11E-02	2.35E 05	0.079	7.14E-02	21.261
7.50E 01	0.914	5.86E-02	0.957	3.06E-02	2.33E 05	0.074	6.99E-02	21.310
7.55E 01	0.918	5.78E-02	0.958	3.02E-02	2.31E 05	0.069	6.84E-02	21.358
7.60E 01	0.923	5.73E-02	0.961	2.98E-02	2.30E 05	0.062	6.70E-02	21.407
7.65E 01	0.932	5.90E-02	0.966	3.05E-02	2.37E 05	0.054	6.76E-02	21.456
7.70E 01	0.934	7.20E-02	0.967	3.72E-02	2.91E 05	0.063	8.20E-02	21.513
7.75E 01	0.926	7.55E-02	0.963	3.92E-02	3.08E 05	0.075	9.74E-02	21.578
7.80E 01	0.925	6.98E-02	0.963	3.63E-02	2.87E 05	0.070	8.11E-02	21.641
7.85E 01	0.930	7.17E-02	0.965	3.72E-02	2.96E 05	0.067	8.24E-02	21.703

Table 9, page 1

OPTICAL CONSTANTS OF AL2O3

ENERGY	EPSILON1	EPSILON2	N	K	ABSCOEFF	REFLECT%	ENERGYLOSS	N-EFF
7.90E 01	0.932	7.69E-02	0.966	3.98E-02	3.19E 05	0.071	8.80E-02	21.770
7.95E 01	0.930	8.29E-02	0.965	4.30E-02	3.46E 05	0.079	9.51E-02	21.842
8.00E 01	0.922	8.55E-02	0.961	4.45E-02	3.61E 05	0.090	9.57E-02	21.918
8.05E 01	0.916	8.26E-02	0.958	4.31E-02	3.52E 05	0.094	9.77E-02	21.993
8.10E 01	0.913	7.72E-02	0.956	4.04E-02	3.31E 05	0.092	9.19E-02	22.064
8.20E 01	0.915	7.00E-02	0.957	3.65E-02	3.04E 05	0.082	8.30E-02	22.134
8.30E 01	0.919	6.72E-02	0.959	3.50E-02	2.95E 05	0.075	7.92E-02	22.319
8.40E 01	0.921	6.59E-02	0.960	3.43E-02	2.92E 05	0.071	7.73E-02	22.443
8.50E 01	0.923	6.48E-02	0.961	3.37E-02	2.90E 05	0.069	7.58E-02	22.565
8.60E 01	0.924	6.34E-02	0.962	3.30E-02	2.87E 05	0.066	7.40E-02	22.687
8.70E 01	0.925	6.16E-02	0.962	3.20E-02	2.82E 05	0.064	7.17E-02	22.807
8.80E 01	0.926	5.91E-02	0.963	3.07E-02	2.74E 05	0.060	6.86E-02	22.924
8.90E 01	0.929	5.69E-02	0.964	2.95E-02	2.66E 05	0.056	6.57E-02	23.029
9.00E 01	0.932	5.53E-02	0.966	2.86E-02	2.61E 05	0.051	6.34E-02	23.140
9.10E 01	0.936	5.49E-02	0.968	2.84E-02	2.62E 05	0.047	6.25E-02	23.261
9.20E 01	0.940	5.64E-02	0.970	2.91E-02	2.71E 05	0.045	6.35E-02	23.375
9.40E 01	0.943	6.10E-02	0.972	3.14E-02	2.99E 05	0.046	6.84E-02	23.626
9.60E 01	0.942	6.62E-02	0.971	3.41E-02	3.32E 05	0.052	7.43E-02	23.902
9.80E 01	0.938	6.70E-02	0.969	3.46E-02	3.43E 05	0.056	7.58E-02	24.193
1.00E 02	0.933	6.42E-02	0.966	3.32E-02	3.37E 05	0.058	7.34E-02	24.494
1.05E 02	0.932	5.30E-02	0.966	2.75E-02	2.92E 05	0.049	6.08E-02	25.136
1.10E 02	0.936	4.51E-02	0.968	2.33E-02	2.60E 05	0.041	5.14E-02	25.710
1.15E 02	0.941	3.96E-02	0.970	2.04E-02	2.38E 05	0.034	4.47E-02	26.232
1.20E 02	0.946	3.59E-02	0.973	1.85E-02	2.25E 05	0.028	4.01E-02	26.722
1.22E 02	0.947	3.55E-02	0.973	1.83E-02	2.26E 05	0.027	3.96E-02	26.915
1.24E 02	0.947	3.52E-02	0.974	1.81E-02	2.27E 05	0.026	3.91E-02	27.110
1.26E 02	0.948	3.34E-02	0.974	1.71E-02	2.19E 05	0.025	3.71E-02	27.290
1.30E 02	0.950	3.04E-02	0.975	1.56E-02	2.06E 05	0.023	3.37E-02	27.663
1.34E 02	0.953	2.79E-02	0.976	1.43E-02	1.94E 05	0.020	3.07E-02	28.003
1.36E 02	0.954	2.71E-02	0.977	1.39E-02	1.91E 05	0.019	2.97E-02	28.168
1.38E 02	0.955	2.65E-02	0.978	1.35E-02	1.89E 05	0.018	2.90E-02	28.331
1.40E 02	0.956	2.61E-02	0.978	1.33E-02	1.89E 05	0.017	2.85E-02	28.494
1.50E 02	0.960	2.22E-02	0.980	1.13E-02	1.72E 05	0.014	2.41E-02	29.271
1.60E 02	0.963	1.92E-02	0.982	9.77E-03	1.57E 05	0.011	2.07E-02	29.895
1.80E 02	0.970	1.40E-02	0.985	7.09E-03	1.28E 05	0.007	1.49E-02	31.002
2.00E 02	0.974	1.05E-02	0.987	5.33E-03	1.06E 05	0.005	1.11E-02	31.792
2.50E 02	0.982	6.45E-03	0.991	3.26E-03	7.55E 04	0.003	6.73E-03	33.061
3.00E 02	0.987	3.60E-03	0.994	1.81E-03	5.29E 04	0.001	3.70E-03	34.077
3.50E 02	0.990	2.46E-03	0.995	1.24E-03	4.05E 04	0.001	2.52E-03	34.736
4.00E 02	0.993	1.45E-03	0.997	7.29E-04	2.93E 04	0.000	1.47E-03	35.351
5.00E 02	0.996	8.03E-04	0.998	4.02E-04	1.95E 04	0.000	8.10E-04	36.099
5.50E 02	0.998	1.62E-03	0.999	8.09E-04	4.51E 04	0.000	1.62E-03	36.789
6.00E 02	0.997	1.55E-03	0.999	9.77E-04	5.93E 04	0.000	1.96E-03	38.034
8.00E 02	0.998	6.97E-04	0.999	3.49E-04	2.82E 04	0.000	7.00E-04	41.225
1.00E 03	0.999	3.21E-04	0.999	1.61E-04	1.61E 04	0.000	3.22E-04	42.926
1.20E 03	0.999	1.62E-04	1.000	8.10E-05	9.81E 03	0.0	1.62E-04	43.881
1.40E 03	0.999	9.00E-05	1.000	4.50E-05	6.38E 03	0.0	9.01E-05	44.500
1.50E 03	1.000	6.79E-05	1.000	3.40E-05	5.15E 03	0.0	6.80E-05	44.731
1.55E 03	1.000	5.93E-05	1.000	2.97E-05	4.65E 03	0.0	5.94E-05	44.831
1.60E 03	1.000	1.83E-04	1.000	9.14E-05	1.48E 04	0.0	1.83E-04	45.090

Table 9, page [illegible]

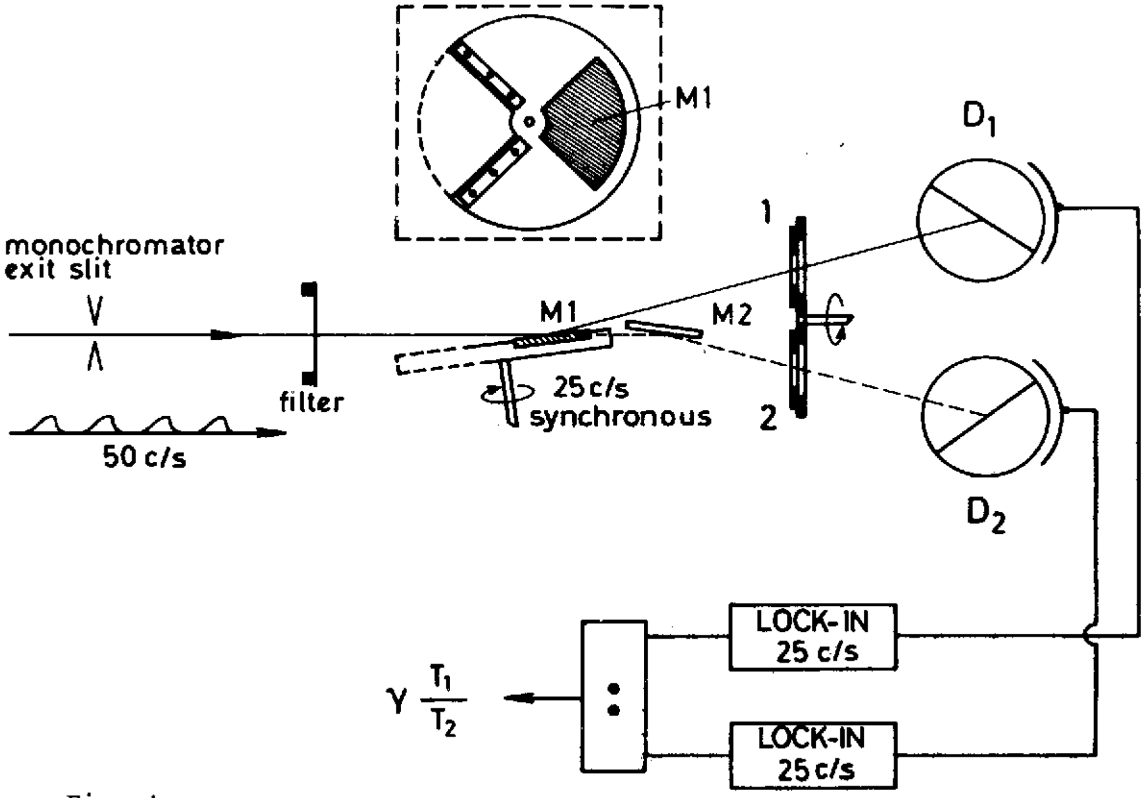

M1
D_1
1
monochromator
exit slit
M1
M2
filter
25 c/s
synchronous
2
50 c/s
D_2
LOCK-IN
25 c/s
LOCK-IN
25 c/s
$\gamma \frac{T_1}{T_2}$

Fig. 1

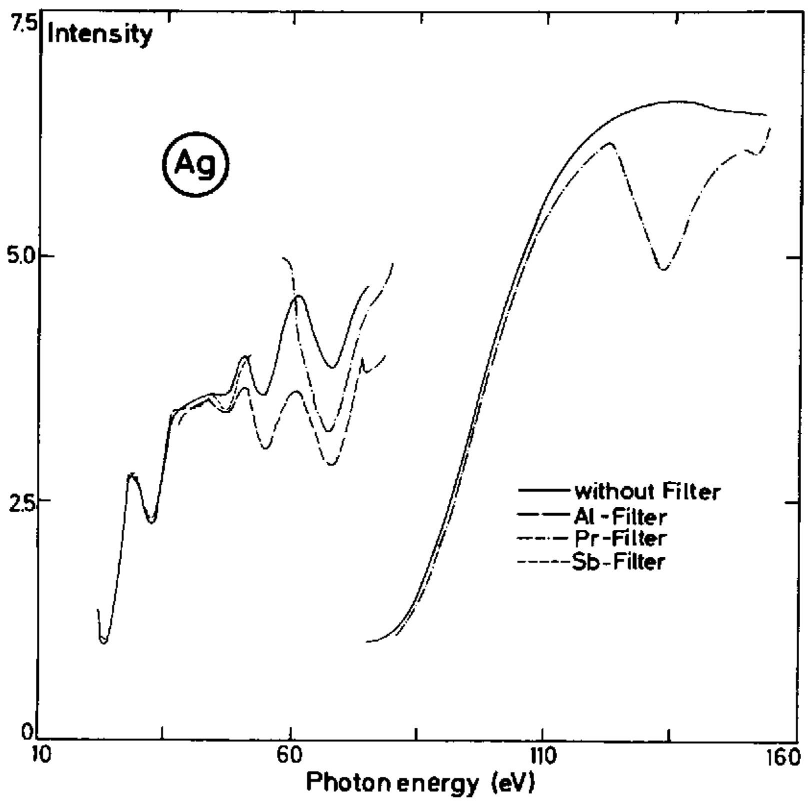

Intensity
7.5
5.0
2.5
0
Ag
without Filter
Al-Filter
Pr-Filter
Sb-Filter
10
60
110
160
Photon energy (eV)

Fig. 2a

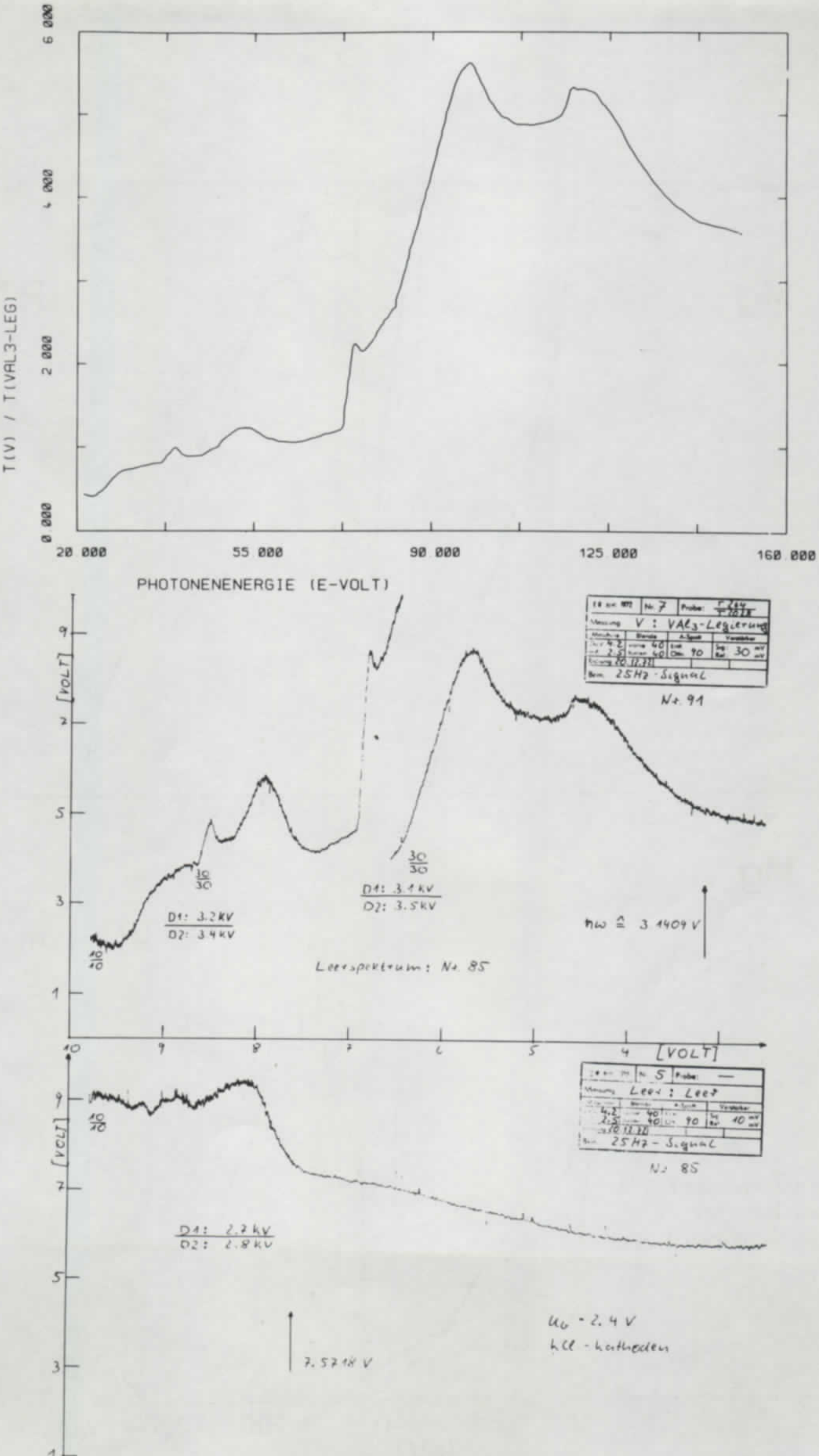
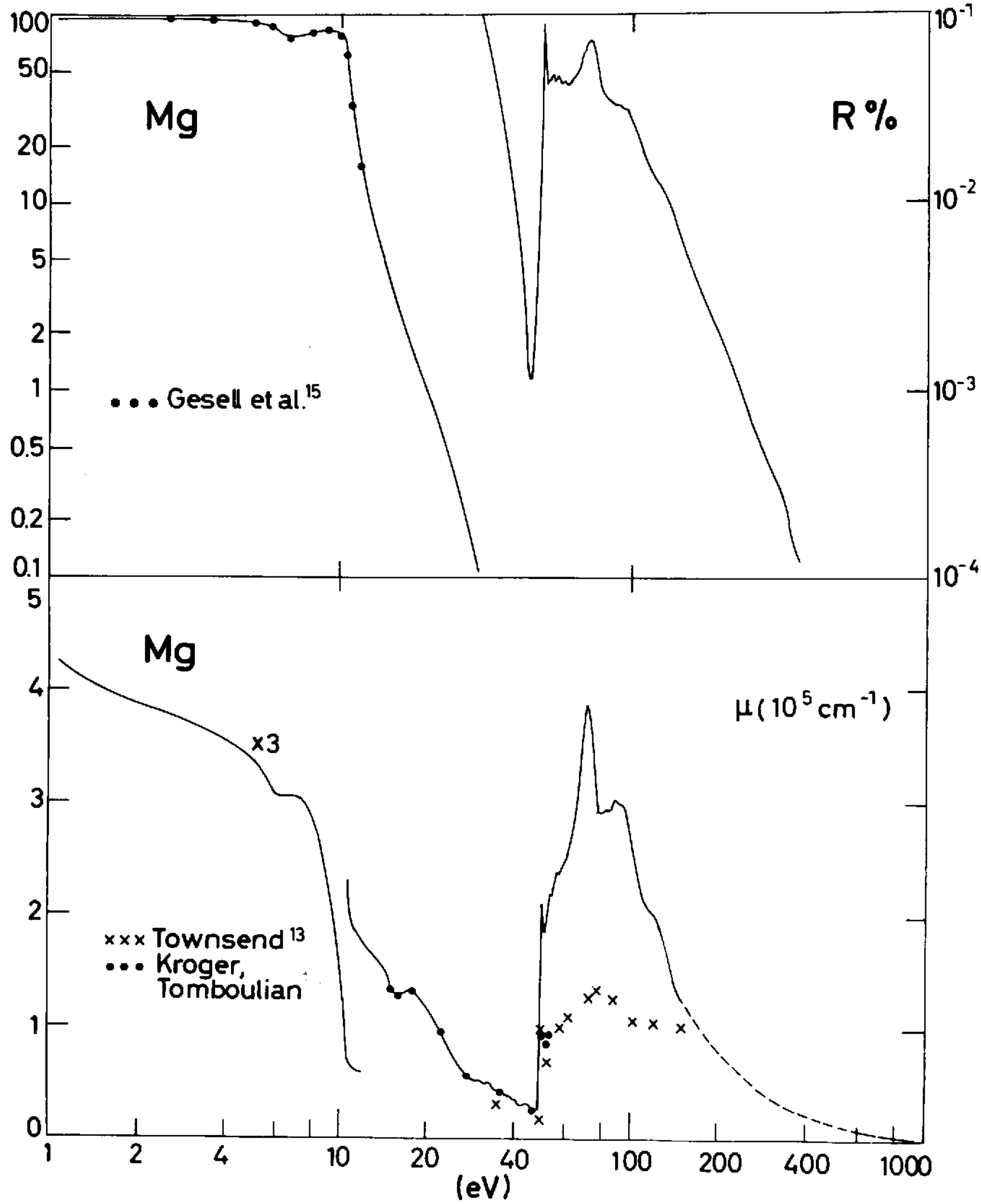
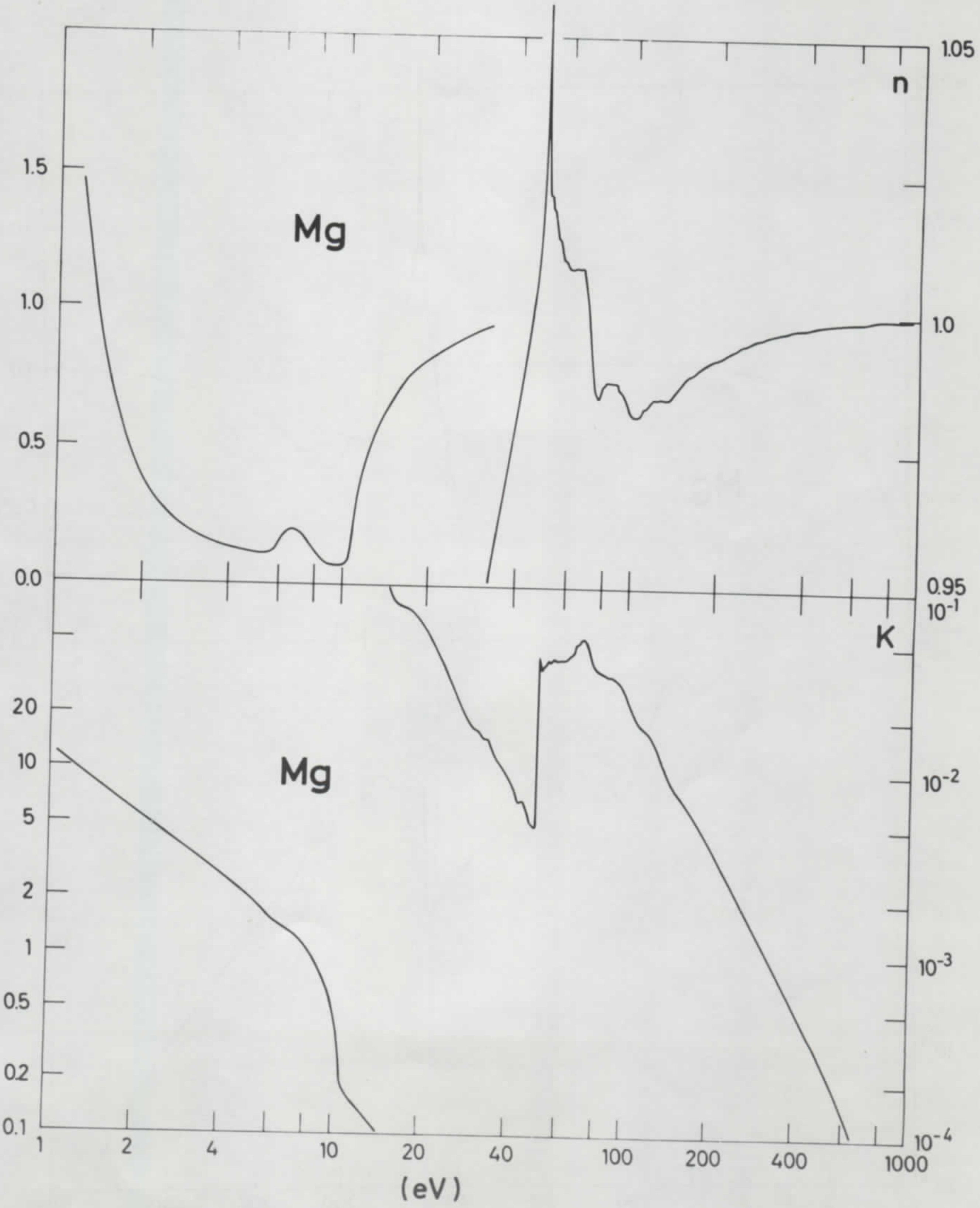

T(V) / T(VAL3-LEG)
0.000
2.000
4.000
6.000
20.000
55.000
90.000
125.000
160.000
PHOTONENENERGIE (E-VOLT)
[VOLT]
D1: 3.2 kV
D2: 3.4 kV
D1: 3.1 kV
D2: 3.5 kV
ħω ≙ 3.1409 V
Leerspektrum: Nr. 85
V : VAl3-Legierung
25Hz-Signal
Nr. 91
[VOLT]
Leer : Leer
25Hz-Signal
Nr. 85
D1: 2.7 kV
D2: 2.8 kV
7.5718 V
U_G = 2.4 V
kalte Kathoden
[VOLT]

Fig. 2b



Mg
R %
••• Gesell et al.[15]
Mg
μ (10⁵ cm⁻¹)
×3
××× Townsend [13]
••• Kroger, Tomboulian
100
50
20
10
5
2
1
0.5
0.2
0.1
10⁻¹
10⁻²
10⁻³
10⁻⁴
5
4
3
2
1
0
1
2
4
10
20
40
100
200
400
1000
(eV)

Fig. 3


Mg
n
1.05
1.0
0.95
1.5
1.0
0.5
0.0
Mg
K
10^{-1}
10^{-2}
10^{-3}
10^{-4}
20
10
5
2
1
0.5
0.2
0.1
1
2
4
10
20
40
100
200
400
1000
(eV)

Fi:.

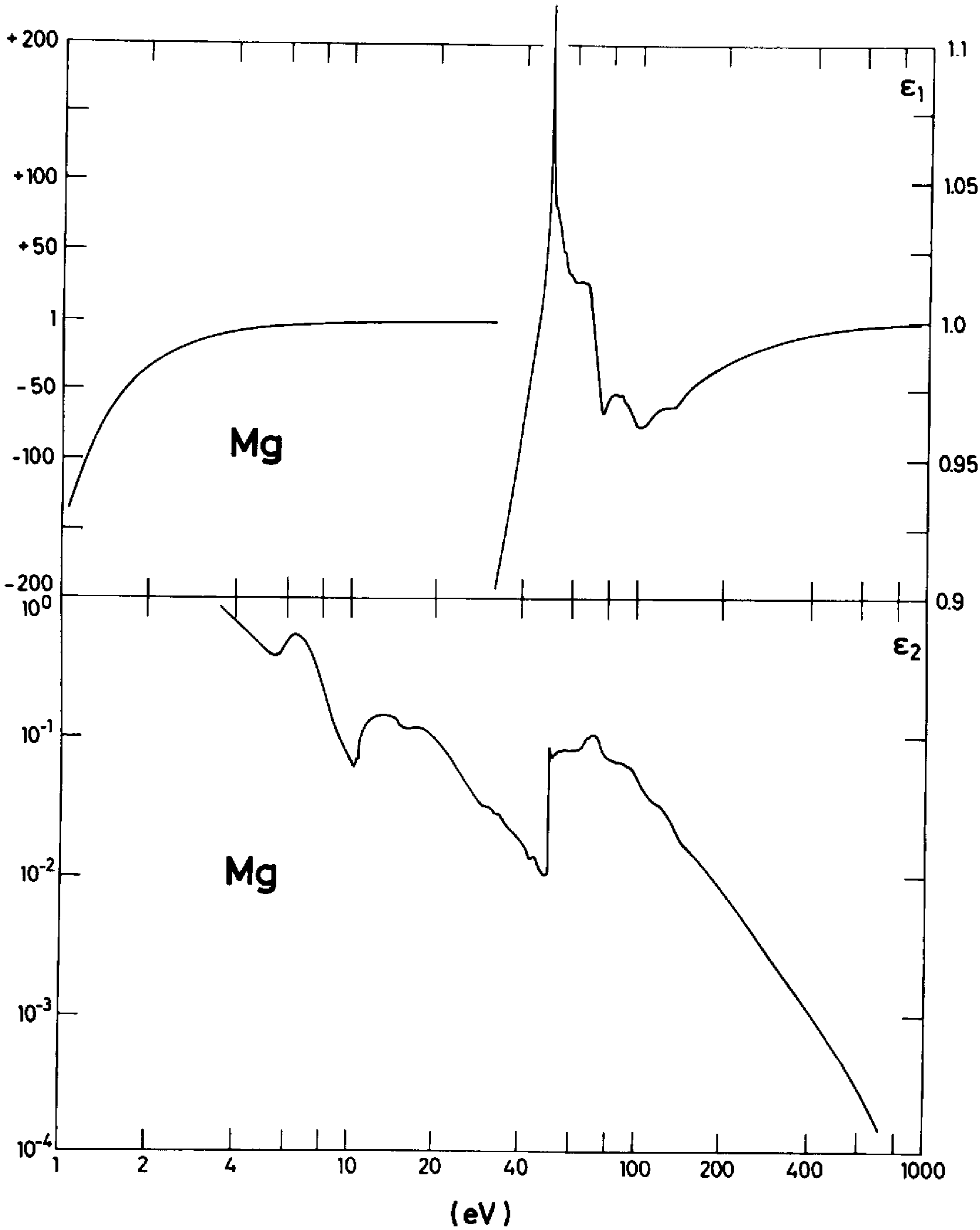

+200
+100
+50
1
-50
-100
-200
1.1
1.05
1.0
0.95
0.9
ε_1
Mg
10^0
10^{-1}
10^{-2}
10^{-3}
10^{-4}
ε_2
Mg
1
2
4
10
20
40
100
200
400
1000
(eV)

Fig. 5

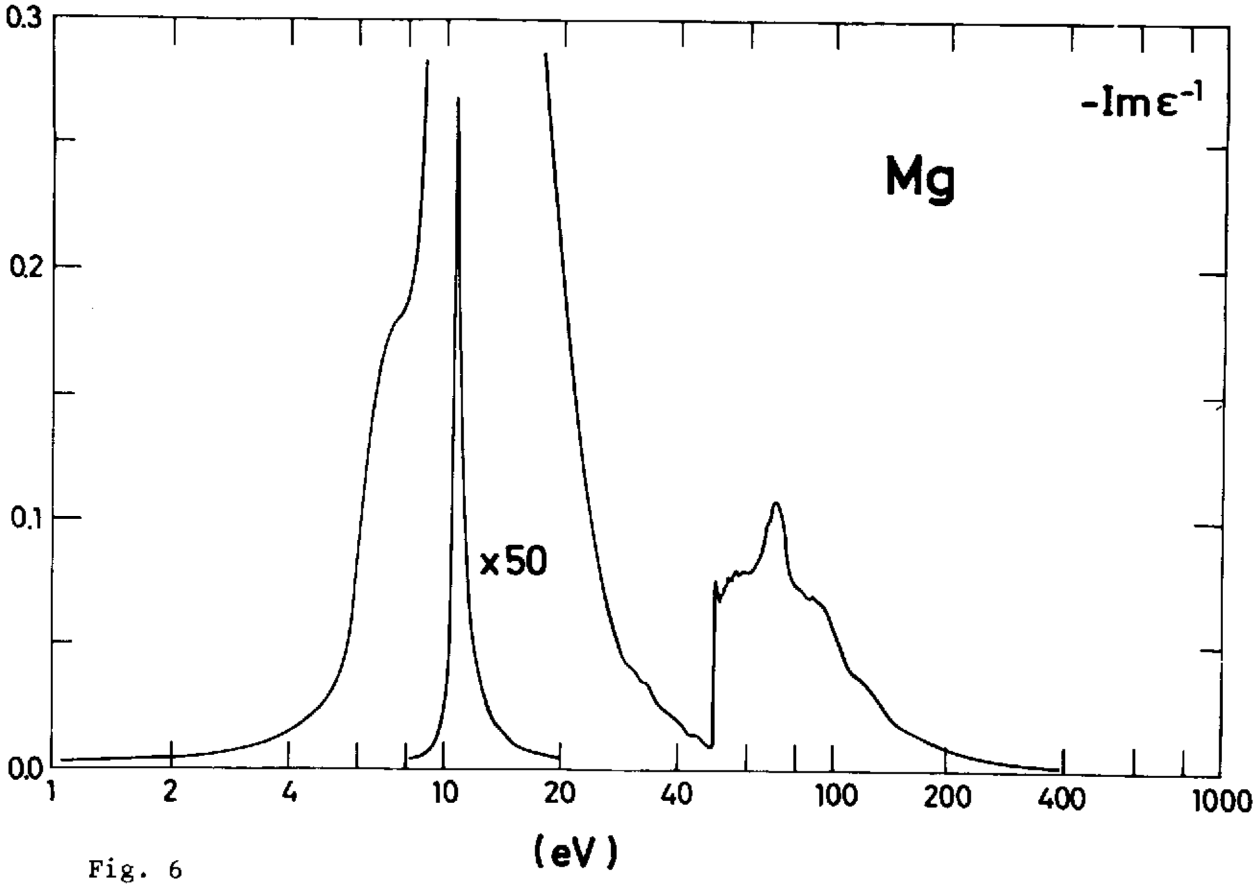


Fig. 6

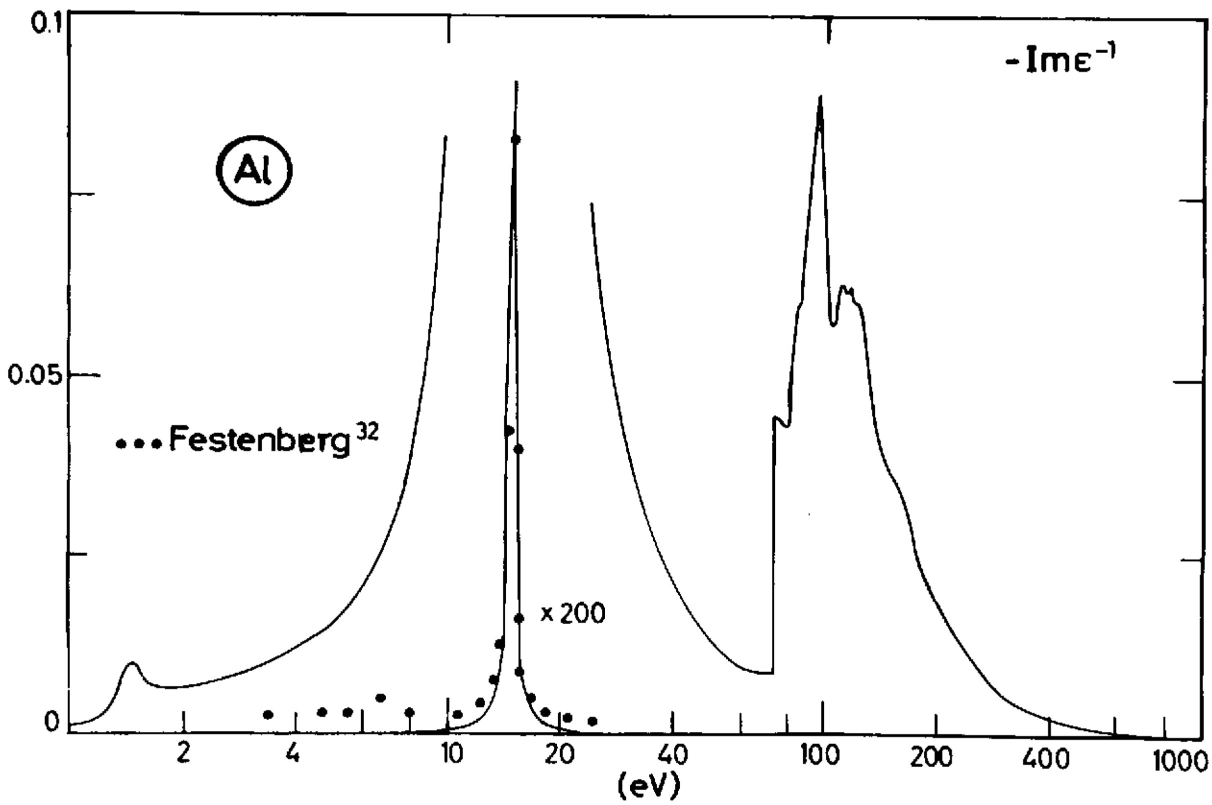
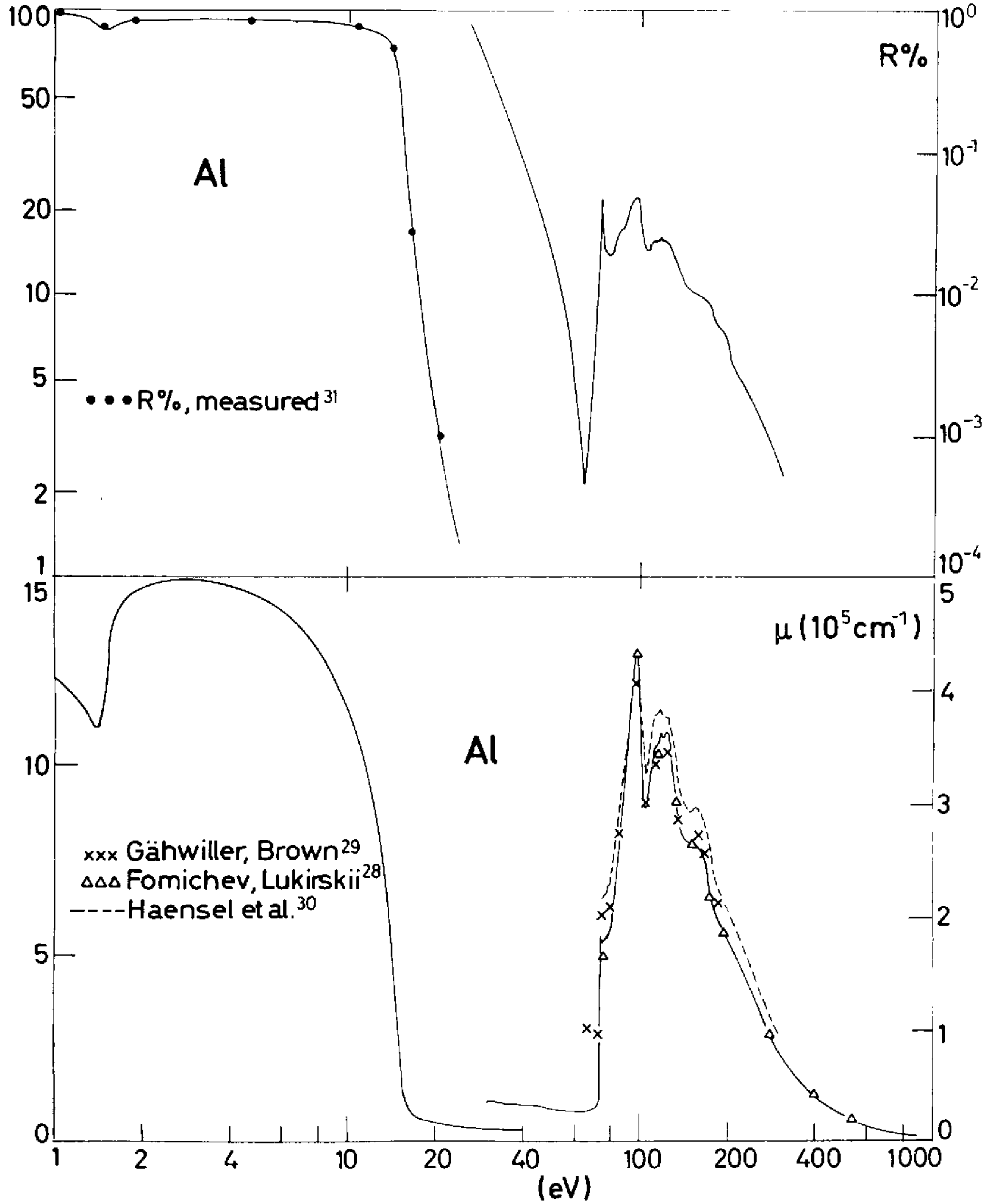
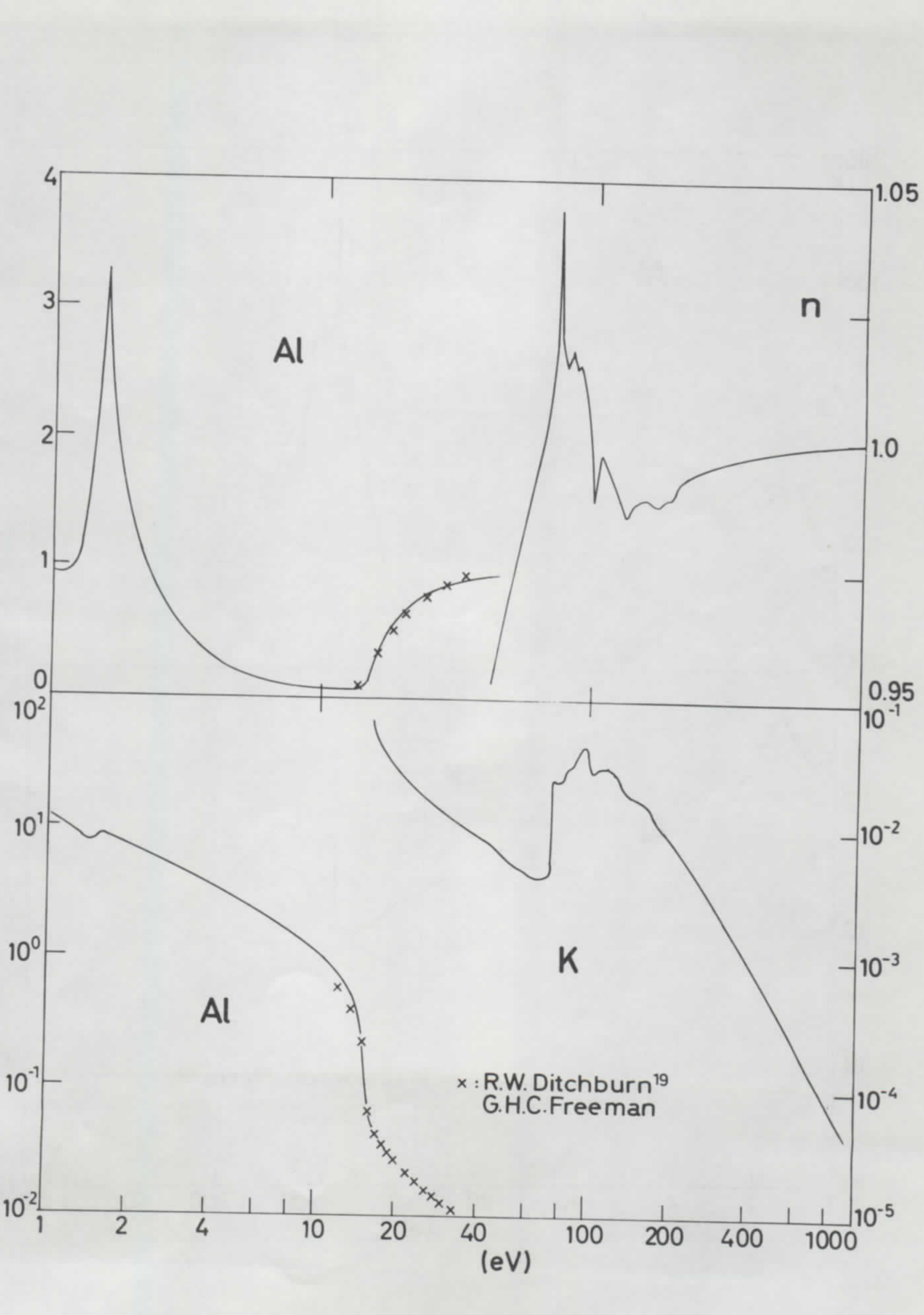


Fig. 7



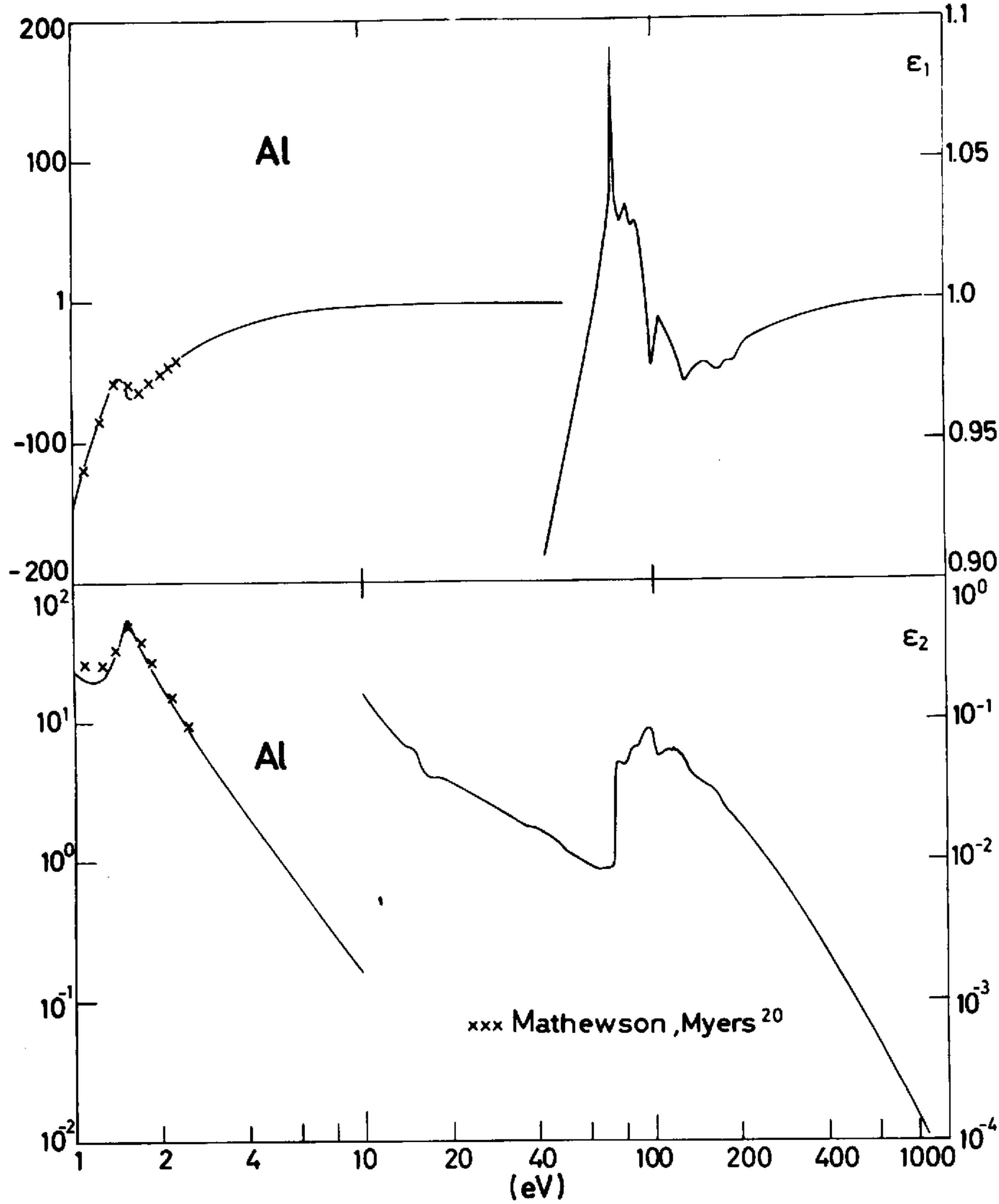
100
50
20
10
5
2
1
Al
• • • R%, measured 31
10^0
R%
10^{-1}
10^{-2}
10^{-3}
10^{-4}
15
10
5
0
Al
xxx Gähwiller, Brown 29
ΔΔΔ Fomichev, Lukirskii 28
----Haensel et al. 30
5
μ (10⁵cm⁻¹)
4
3
2
1
0
1
2
4
10
20
40
100
200
400
1000
(eV)

Fig. 8



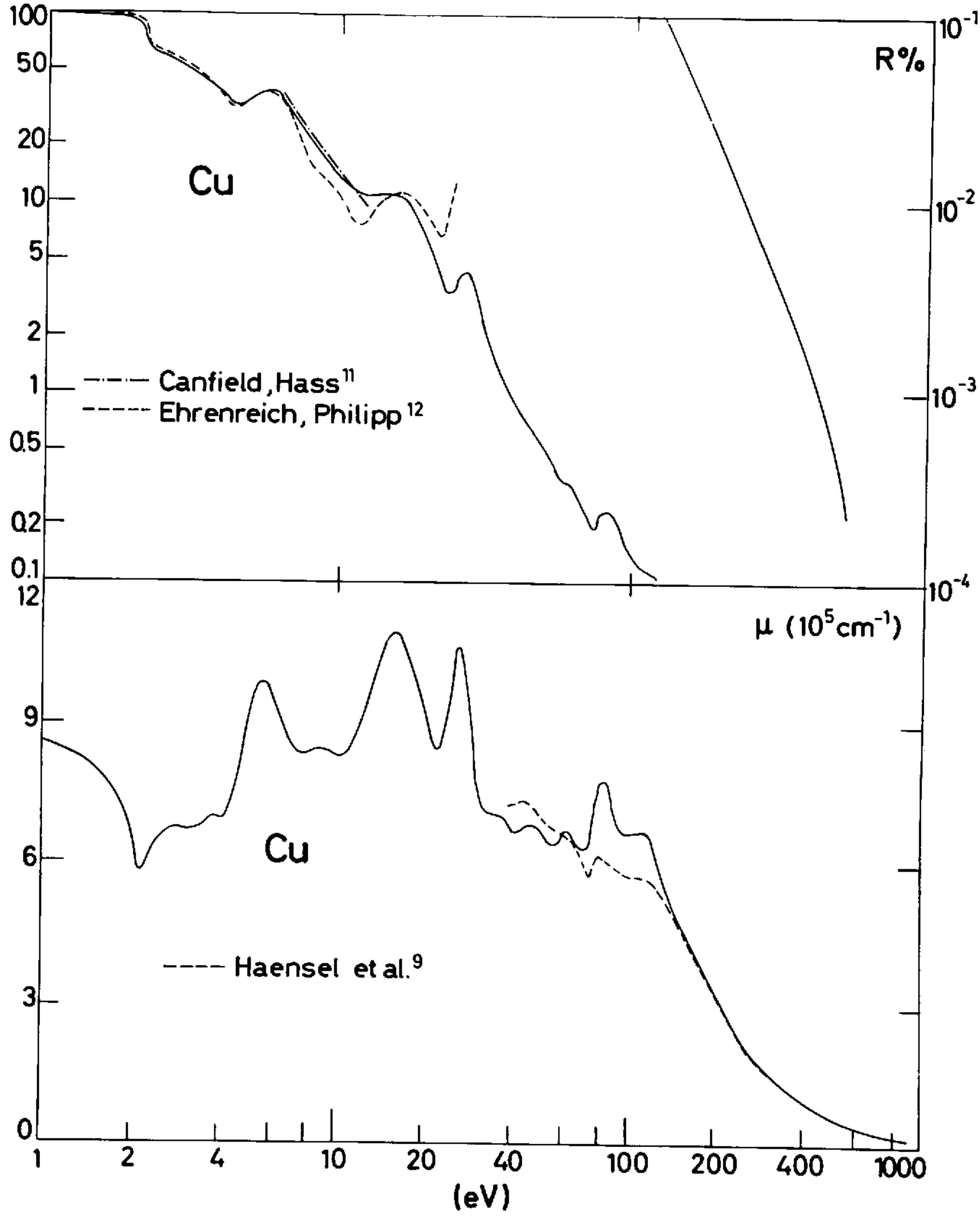
4
3
2
1
0
1.05
1.0
0.95
n
Al
10^2
10^1
10^0
10^{-1}
10^{-2}
10^{-1}
10^{-2}
10^{-3}
10^{-4}
10^{-5}
K
Al
× : R.W. Ditchburn[19]
G.H.C. Freeman
1
2
4
10
20
40
100
200
400
1000
(eV)

Fig. 9



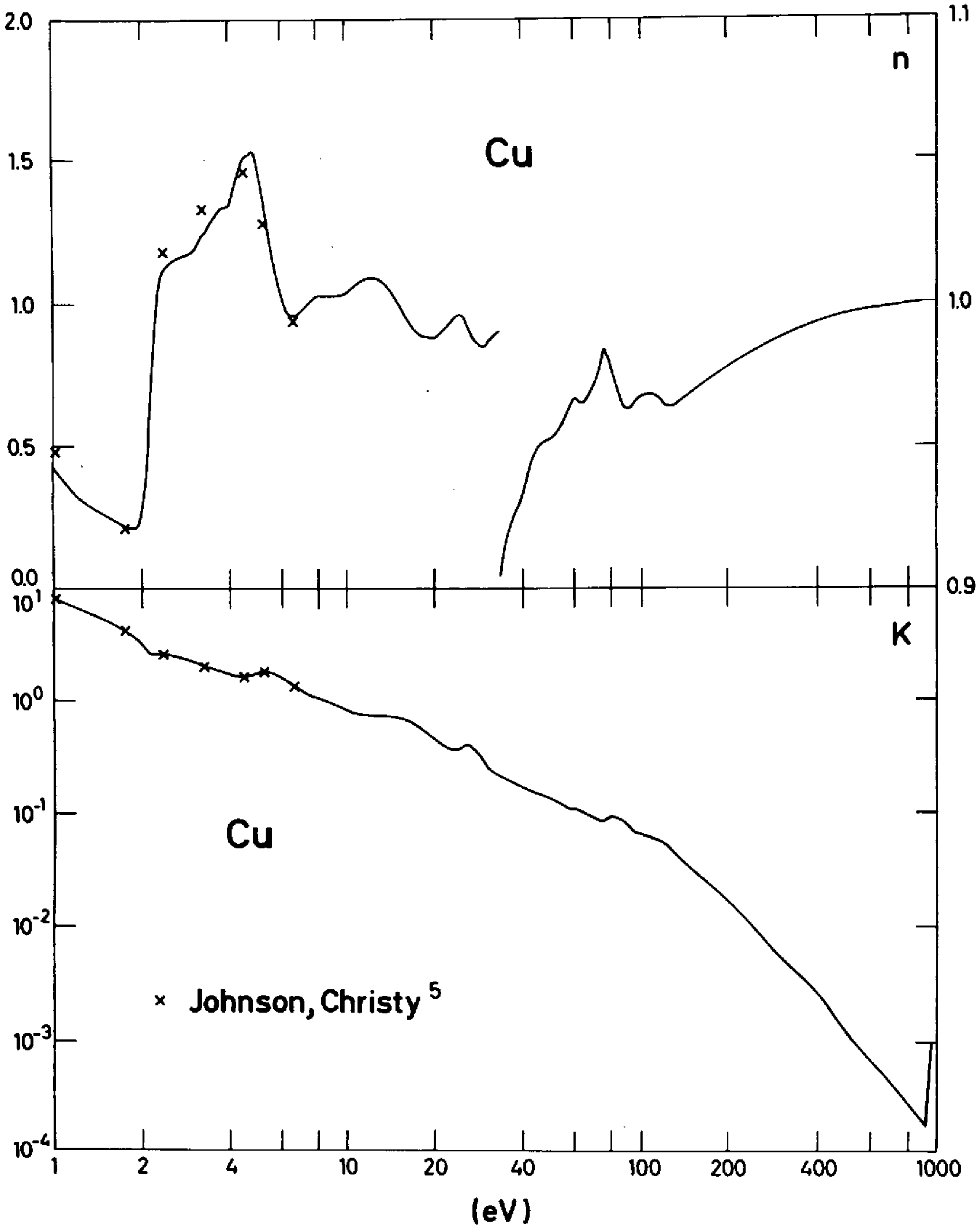
200
100
1
-100
- 200
1.1
1.05
1.0
0.95
0.90
ε1
Al
10^2
10^1
10^0
10^-1
10^-2
10^0
10^-1
10^-2
10^-3
10^-4
ε2
Al
xxx Mathewson ,Myers 20
1
2
4
10
20
40
100
200
400
1000
(eV)

Fig. 10



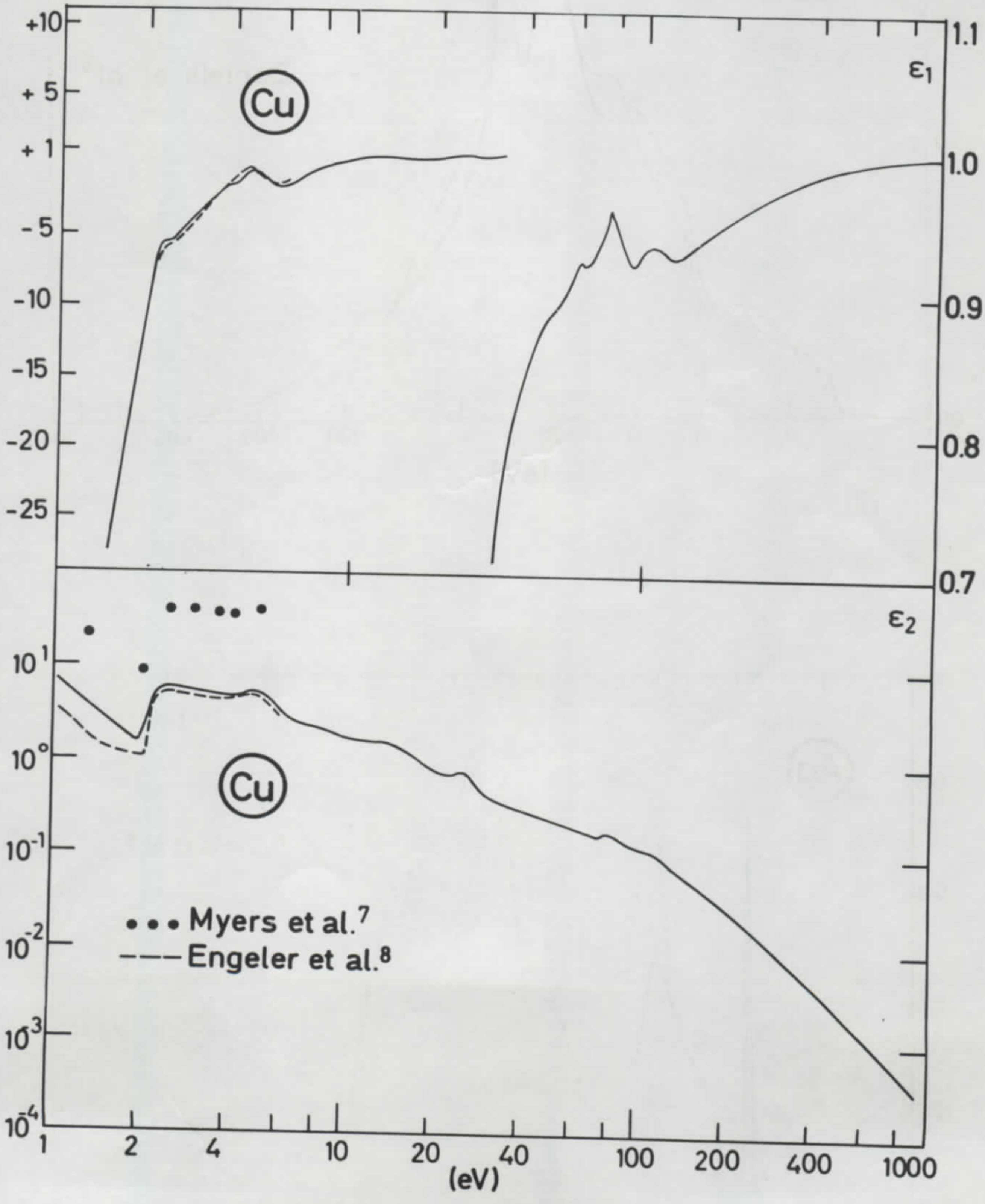
100
50
20
10
5
2
1
0.5
0.2
0.1
10^-1
R%
10^-2
10^-3
10^-4
Cu
Canfield, Hass 11
Ehrenreich, Philipp 12
12
9
6
3
0
μ (10^5 cm^-1)
Cu
Haensel et al. 9
1
2
4
10
20
40
100
200
400
1000
(eV)

Fig. 11



n
Cu
K
Cu
× Johnson, Christy 5
2.0
1.5
1.0
0.5
0.0
1.1
1.0
0.9
10^1
10^0
10^-1
10^-2
10^-3
10^-4
1
2
4
10
20
40
100
200
400
1000
(eV)

Fig. 12



+10
+ 5
+ 1
- 5
-10
-15
-20
-25
1.1
1.0
0.9
0.8
0.7
ε1
Cu
ε2
10 1
10°
10-1
10-2
10-3
10-4
Cu
• • • Myers et al.7
--- Engeler et al.8
1
2
4
10
20
40
100
200
400
1000
(eV)

Fig. 13

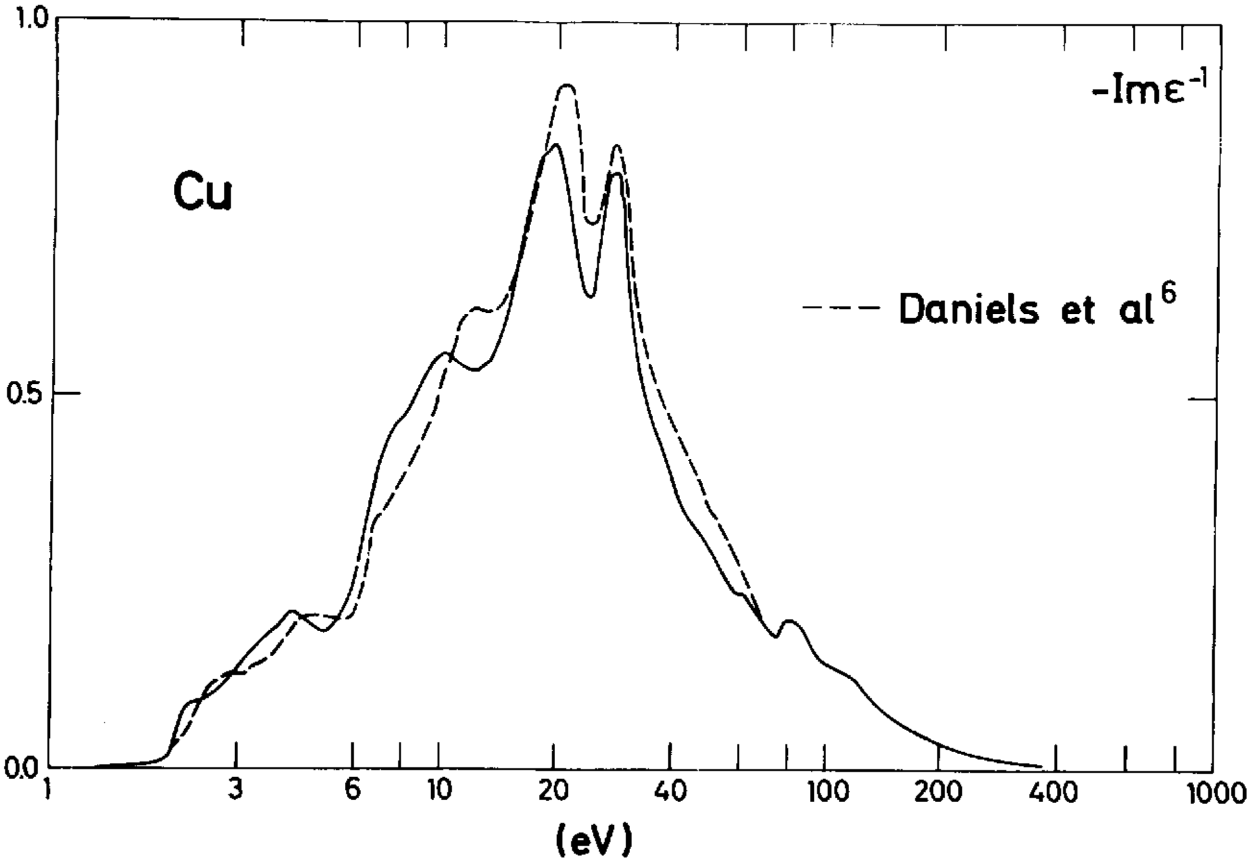

1.0
0.5
0.0
-Imε⁻¹
Cu
--- Daniels et al 6
1
3
6
10
20
40
100
200
400
1000
(eV)

Fig. 14

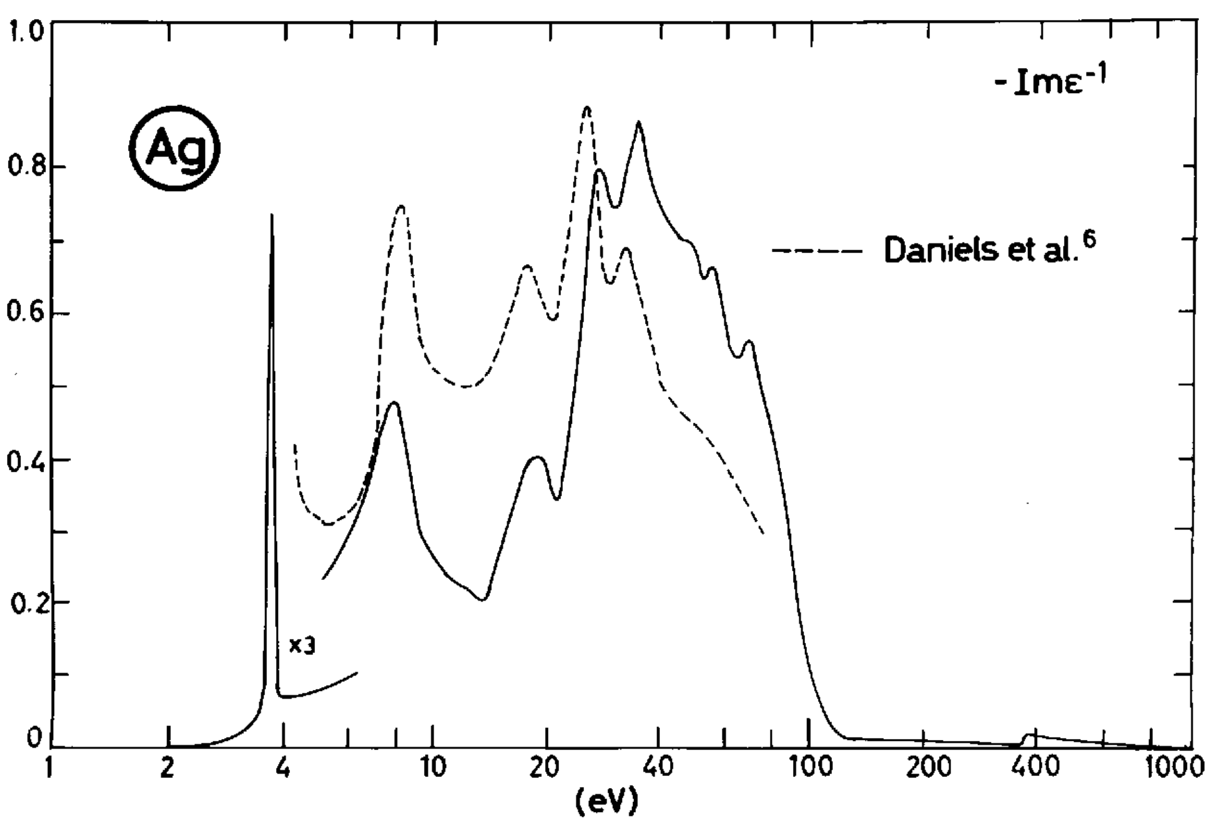
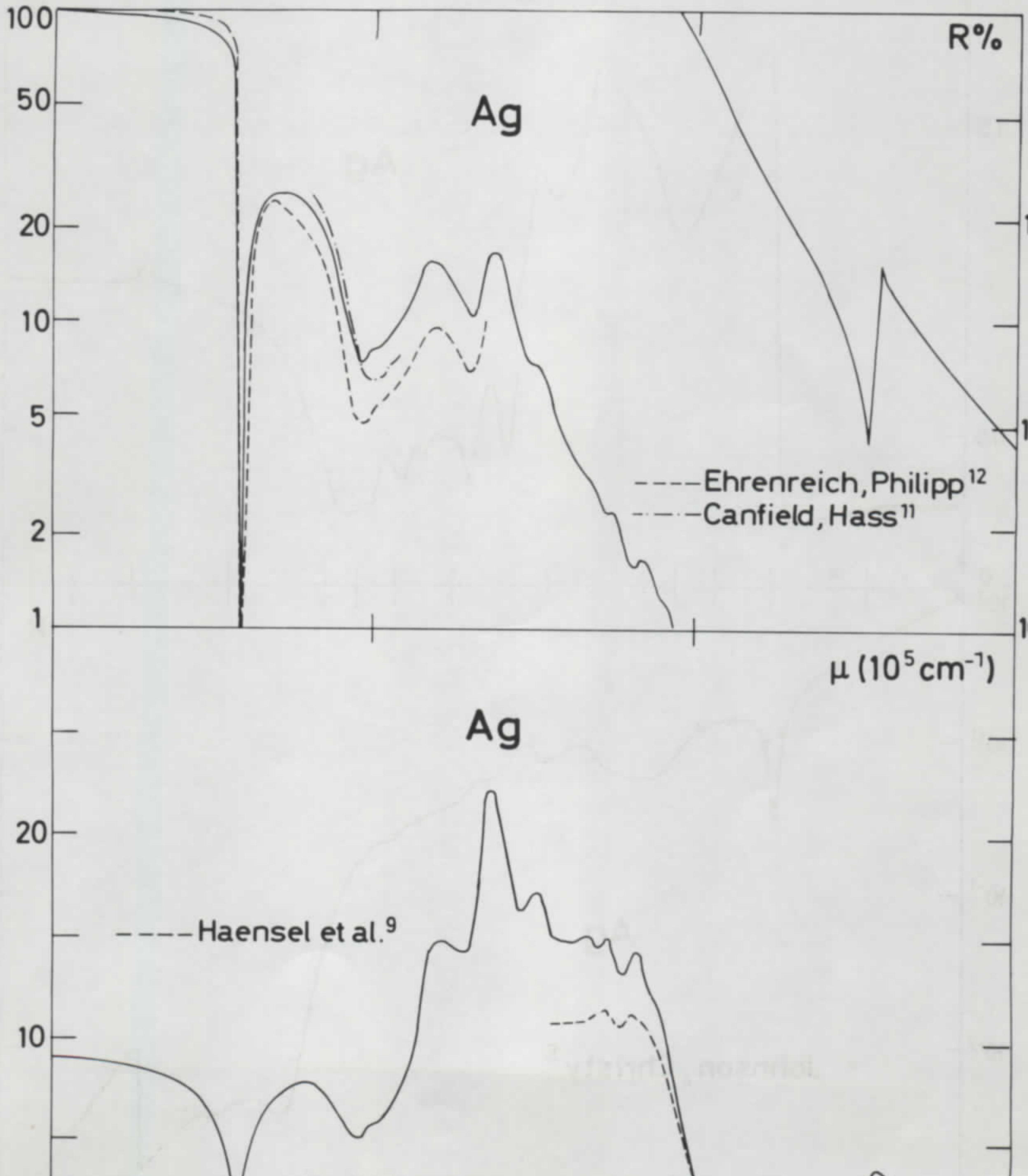

1.0
0.8
0.6
0.4
0.2
0
-Imε⁻¹
Ag
---- Daniels et al. 6
x3
1
2
4
10
20
40
100
200
400
1000
(eV)

Fig. 15



R%
Ag
Ehrenreich, Philipp 12
Canfield, Hass 11
μ (10⁵ cm⁻¹)
Ag
Haensel et al. 9
(eV)

Fig. 16

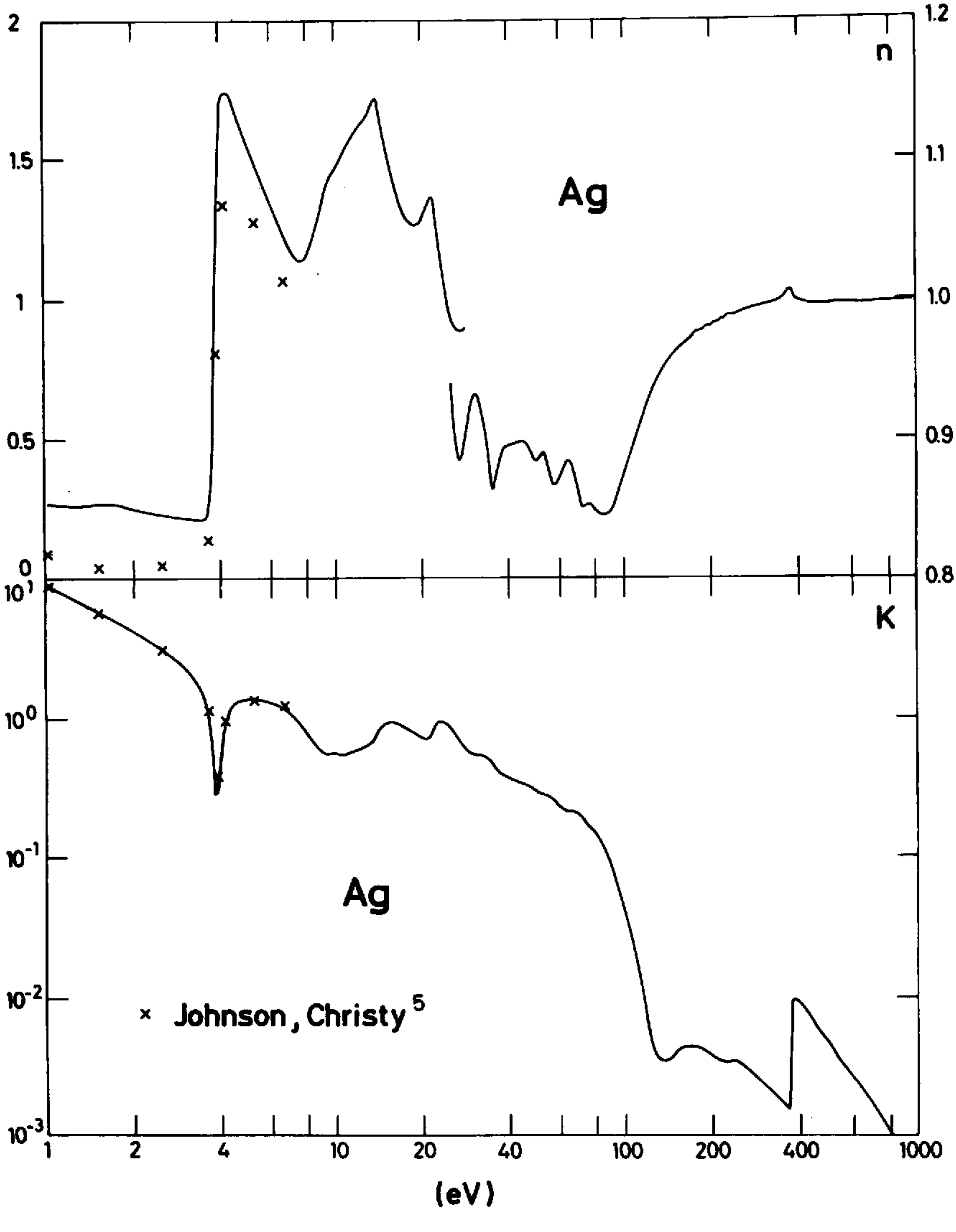


Fig. 17

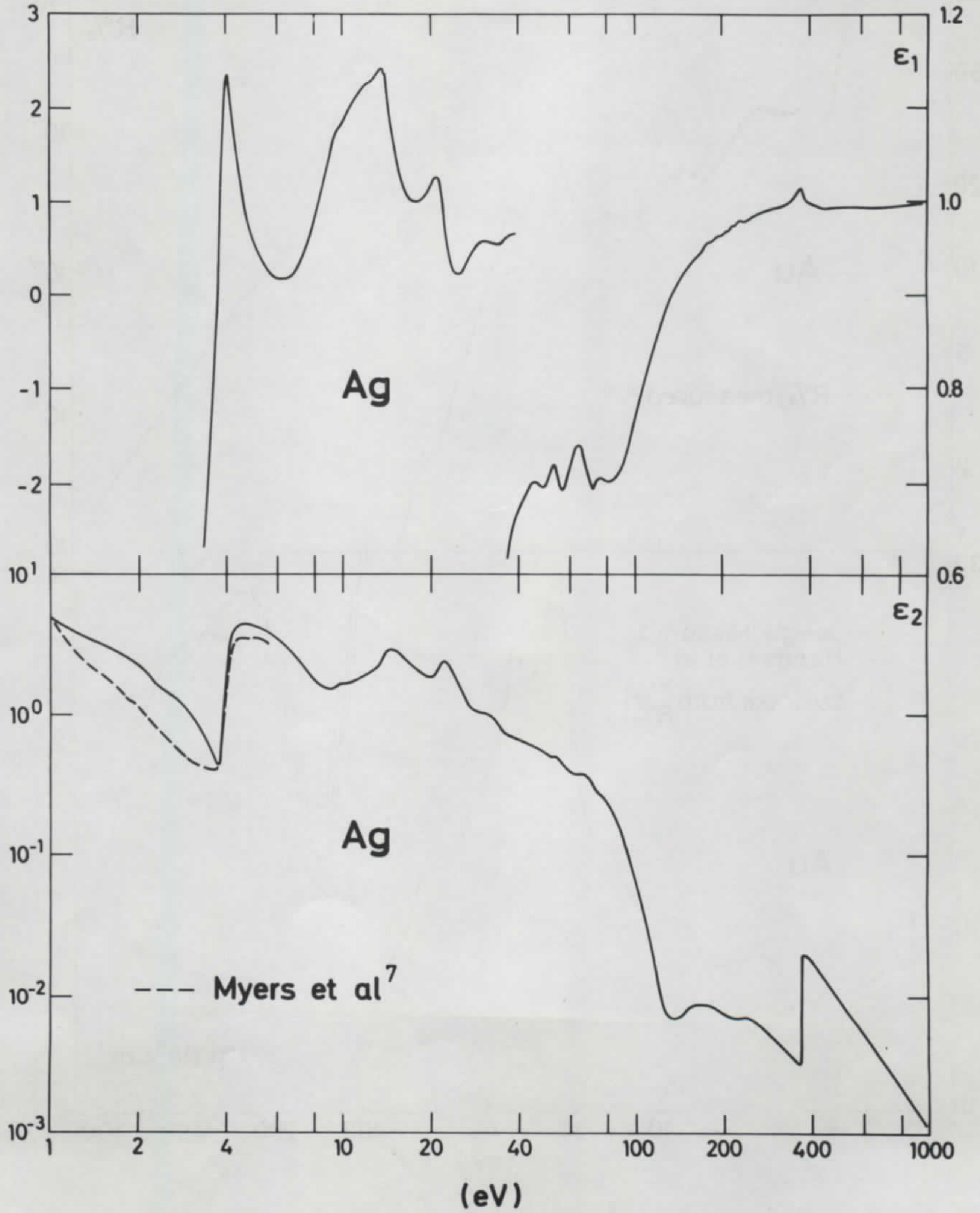


Fig. 18

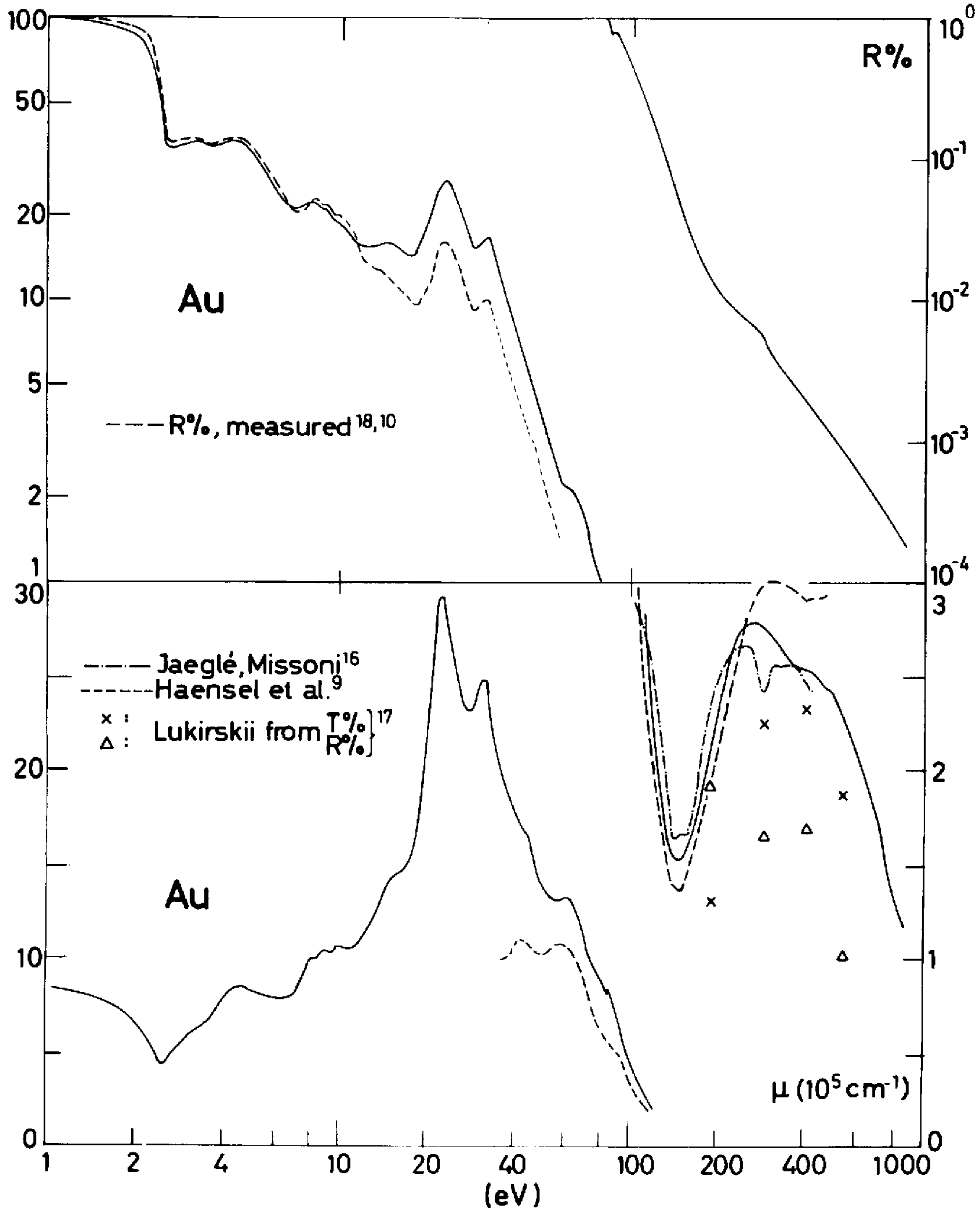
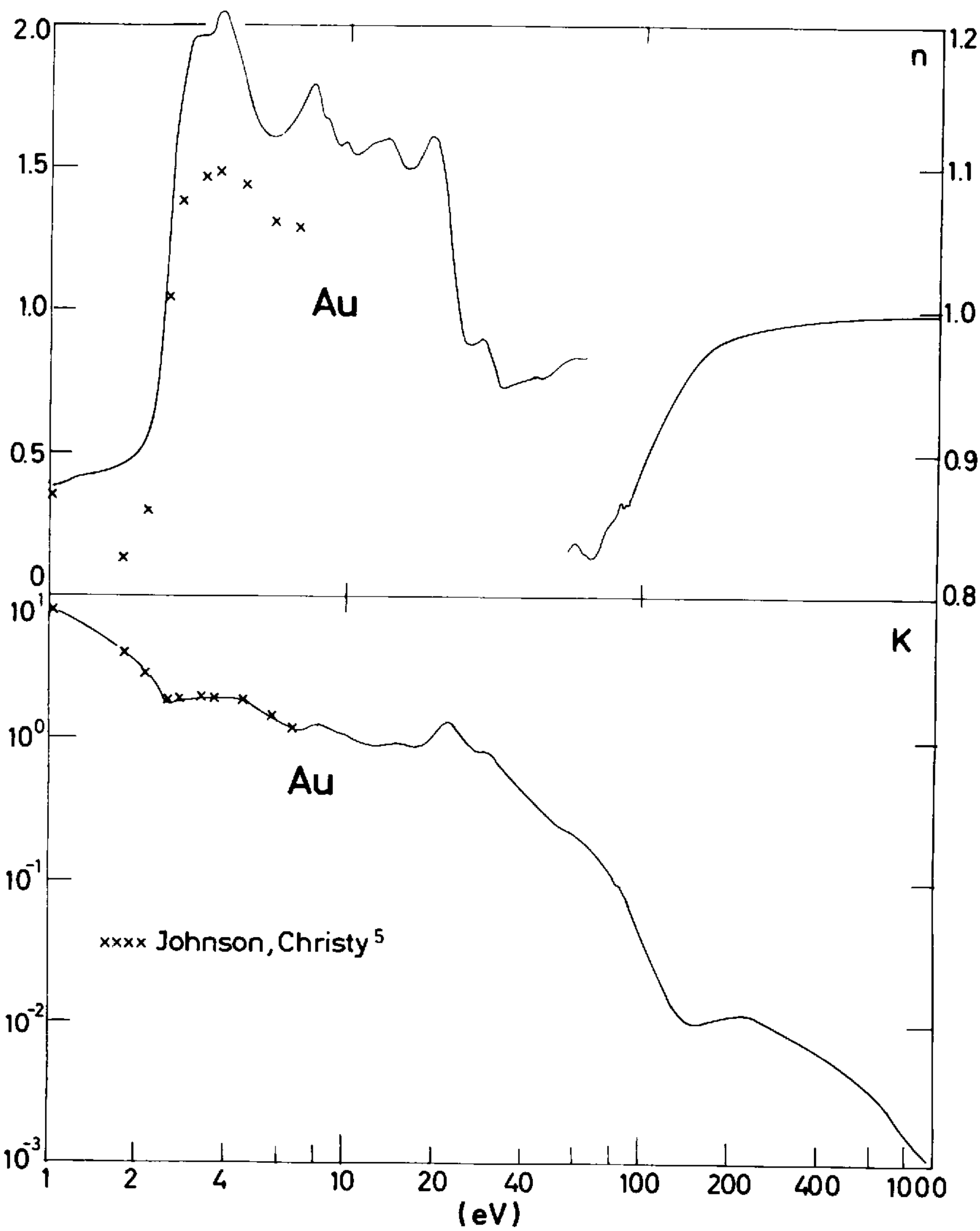
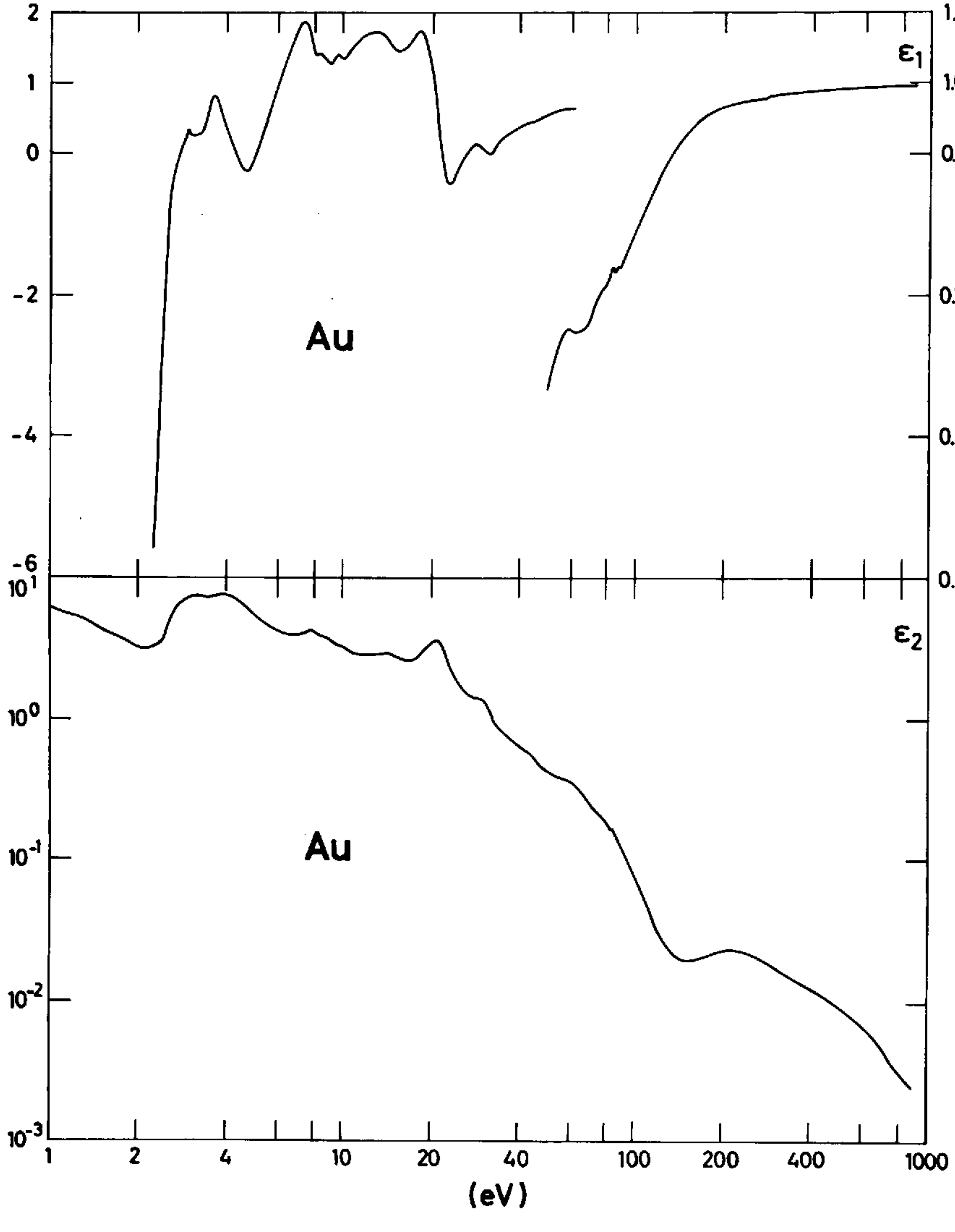

R%
Au
R%, measured[18,10]
Jaeglé, Missoni[16]
Haensel et al.[9]
Lukirskii from T%, R%[17]
Au
μ (10^5 cm^-1)
(eV)

Fig. 19



2.0
1.5
1.0
0.5
0
n
1.2
1.1
1.0
0.9
0.8
Au
K
Au
10^1
10^0
10^-1
10^-2
10^-3
×××× Johnson, Christy 5
1
2
4
10
20
40
100
200
400
1000
(eV)

Fig. 20



ε1
Au
ε2
Au
2
1
0
-2
-4
-6
1.1
1.0
0.9
0.7
0.5
0.3
10¹
10⁰
10⁻¹
10⁻²
10⁻³
1
2
4
10
20
40
100
200
400
1000
(eV)

Fig. 21

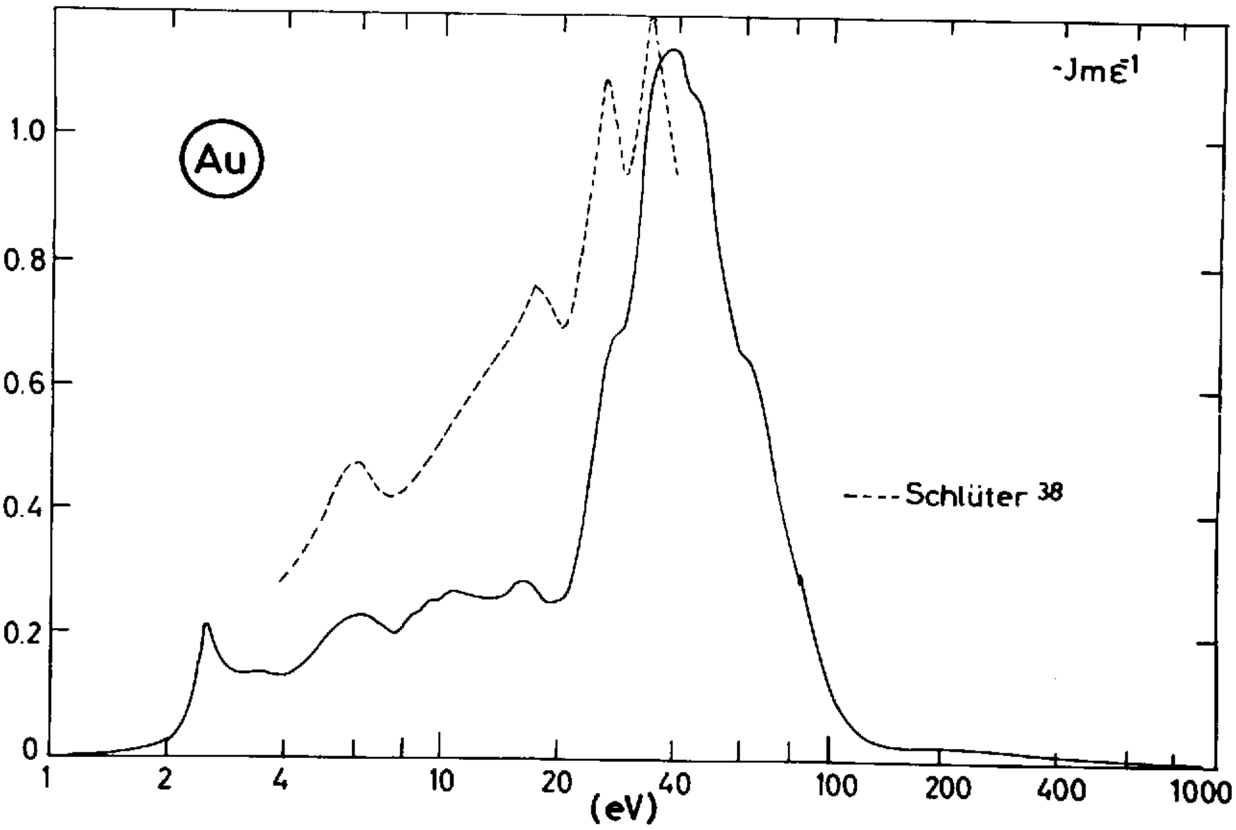

-Jmε⁻¹
Au
----Schlüter 38
(eV)
0
0.2
0.4
0.6
0.8
1.0
1
2
4
10
20
40
100
200
400
1000

Fig. 22

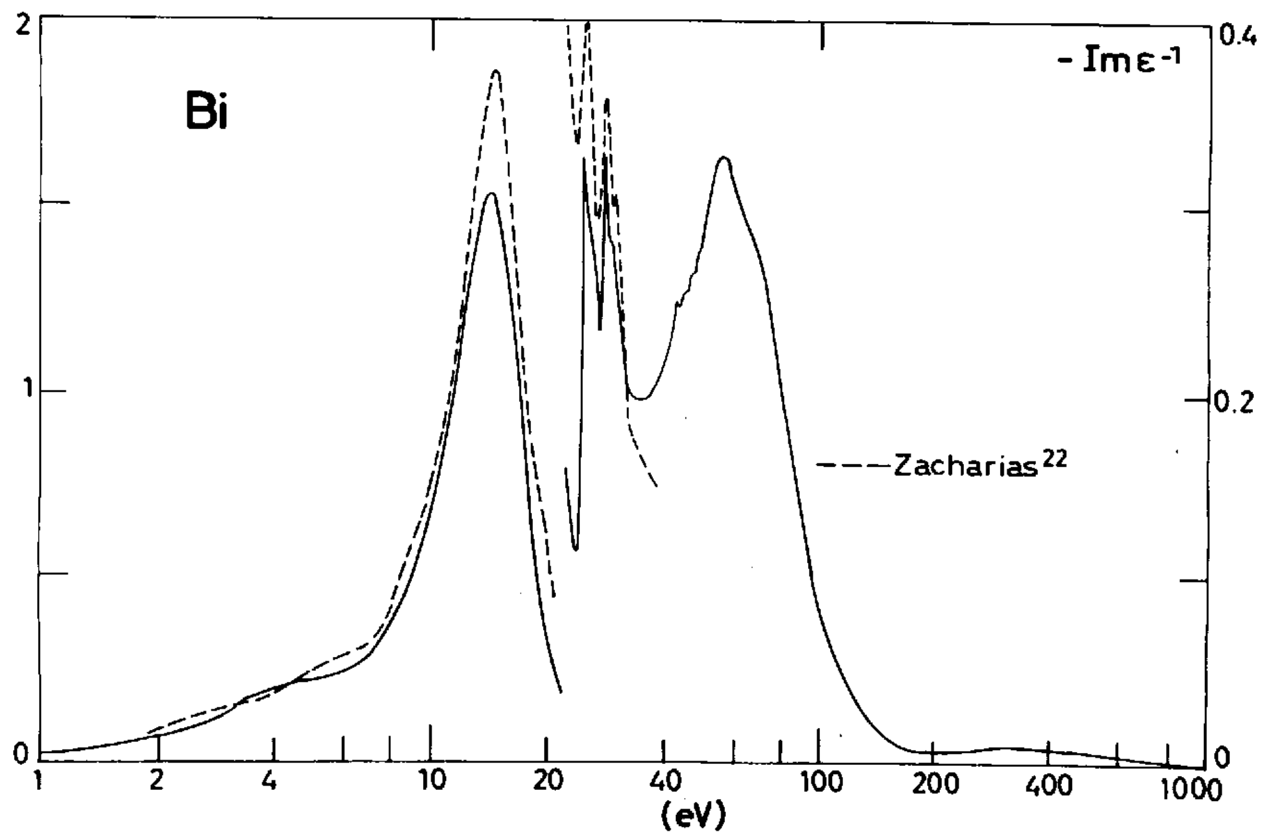

- Imε⁻¹
Bi
---Zacharias 22
(eV)
0
1
2
0
0.2
0.4
1
2
4
10
20
40
100
200
400
1000

Fig. 23

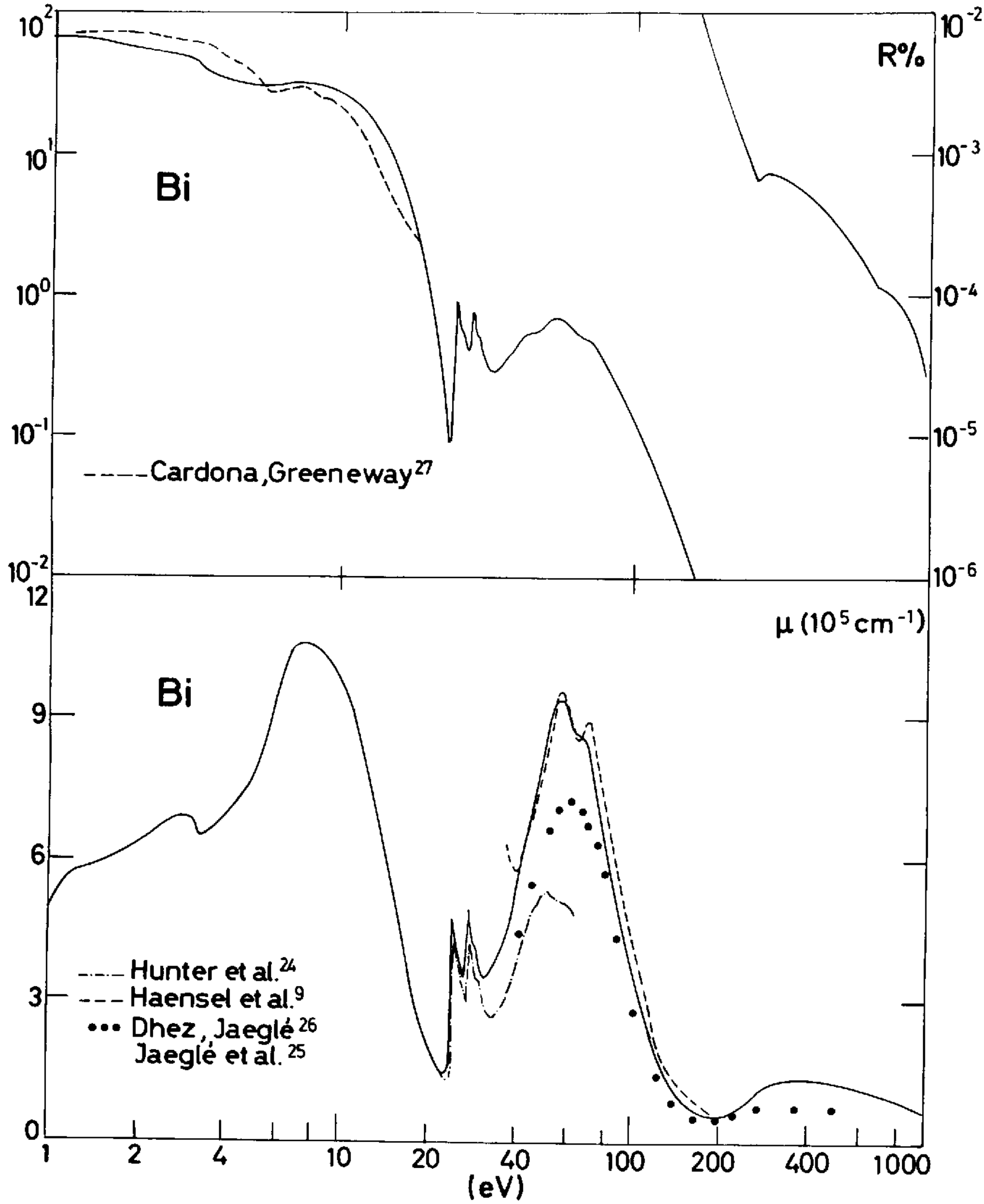
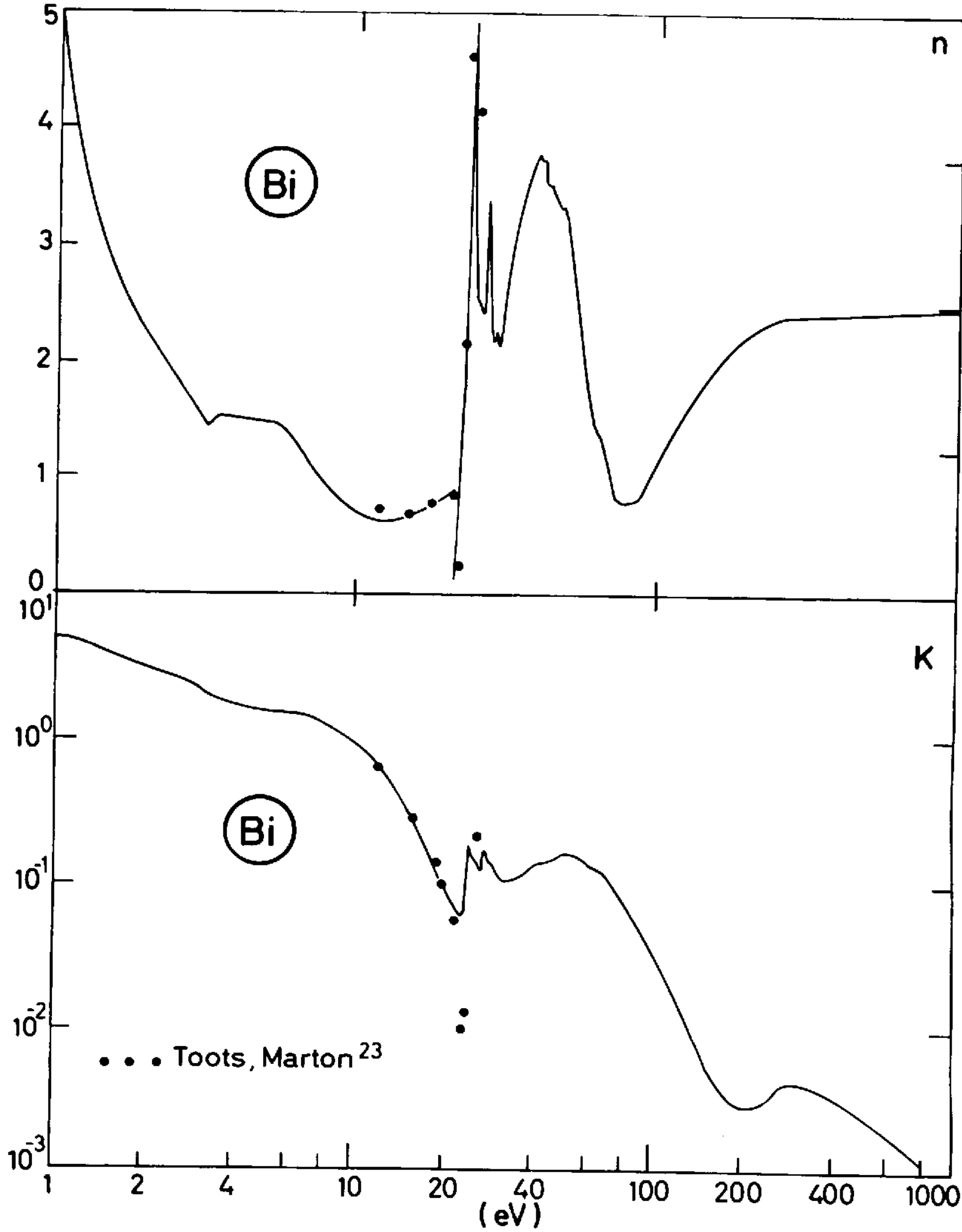
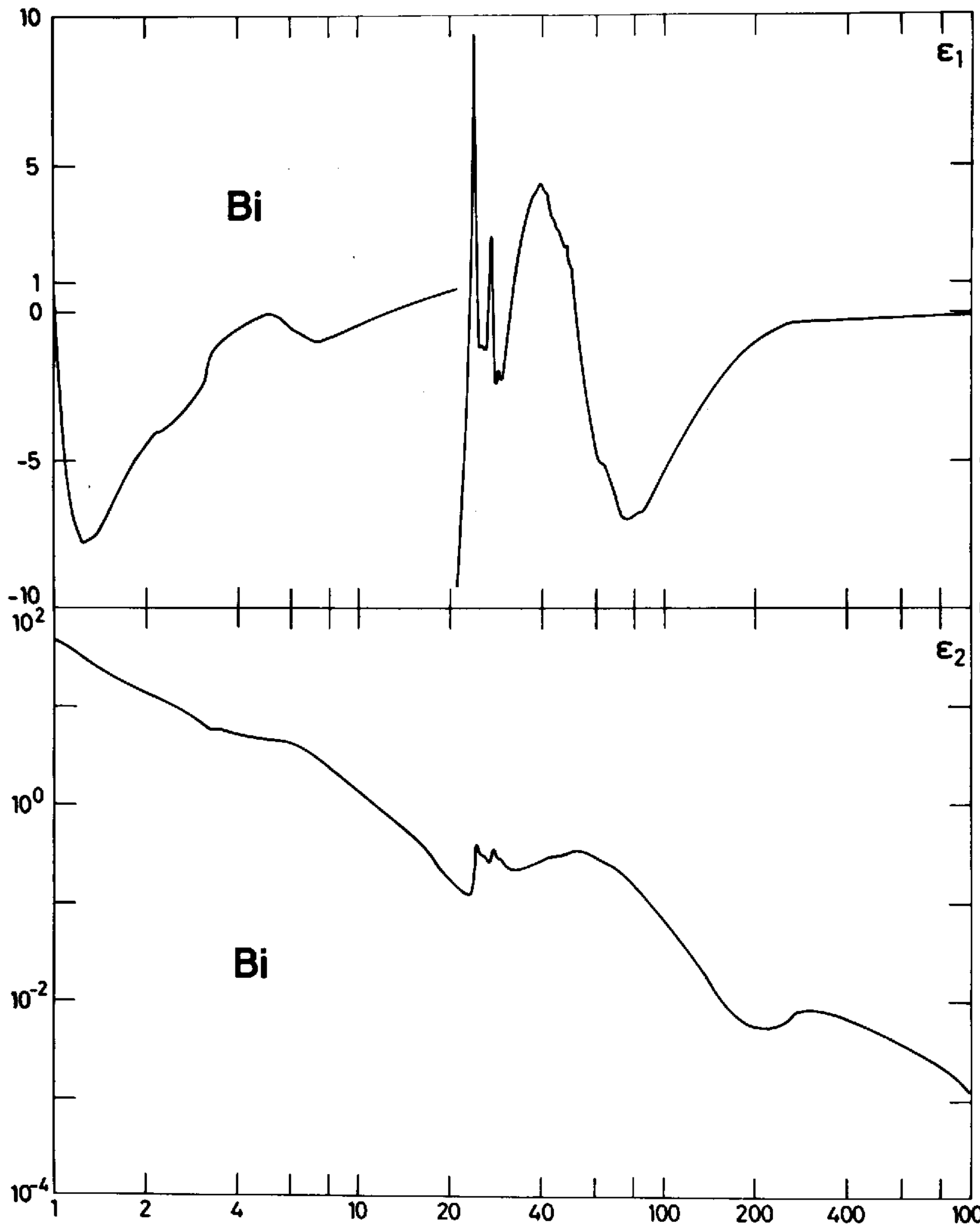

R%
Bi
----Cardona,Greeneway[27]
μ (10^5 cm^-1)
Bi
Hunter et al.[24]
Haensel et al.[9]
Dhez, Jaeglé[26]
Jaeglé et al.[25]
(eV)

Fig. 24

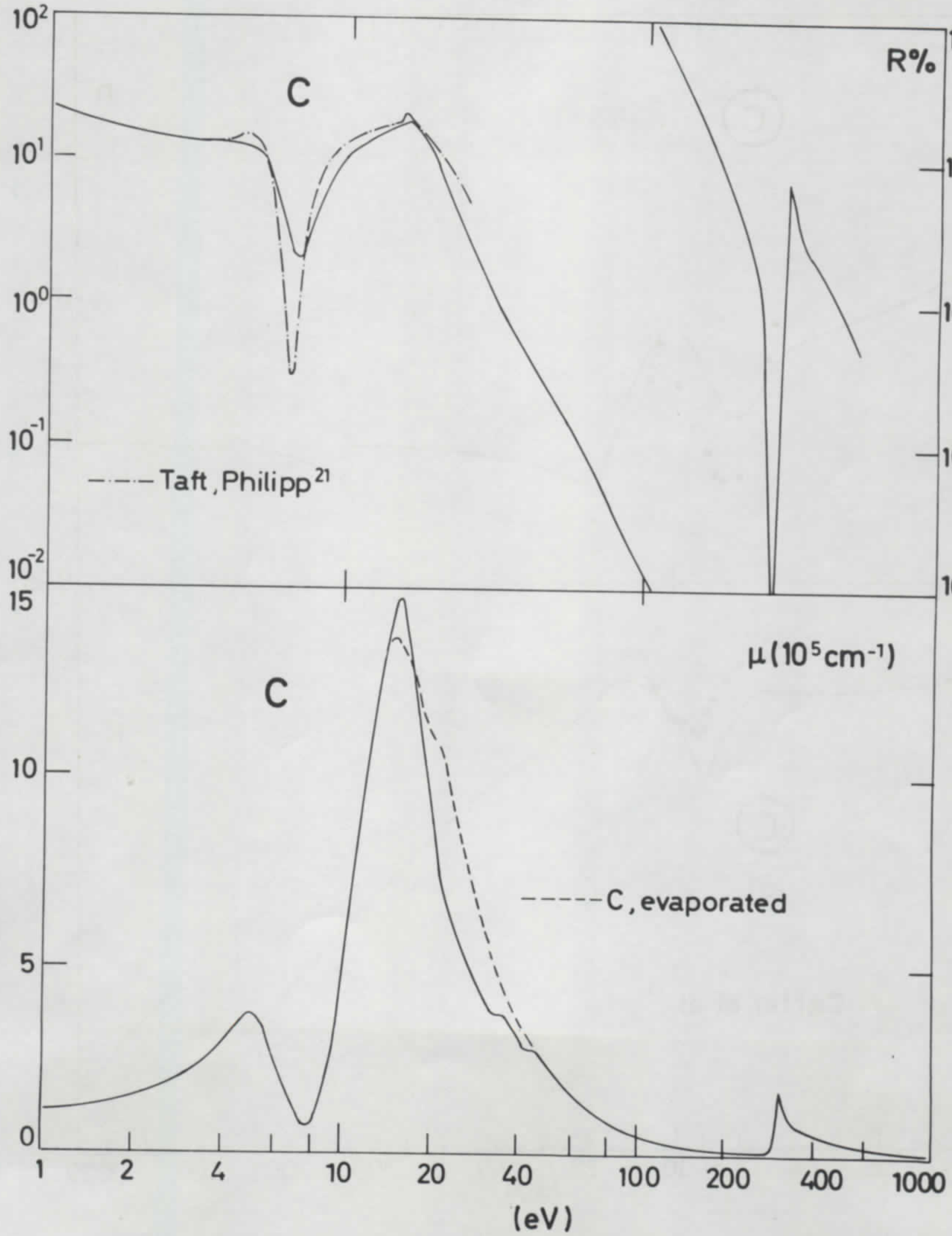


n
Bi
K
Bi
• • • Toots, Marton 23
1
2
4
10
20
40
100
200
400
1000
(eV)



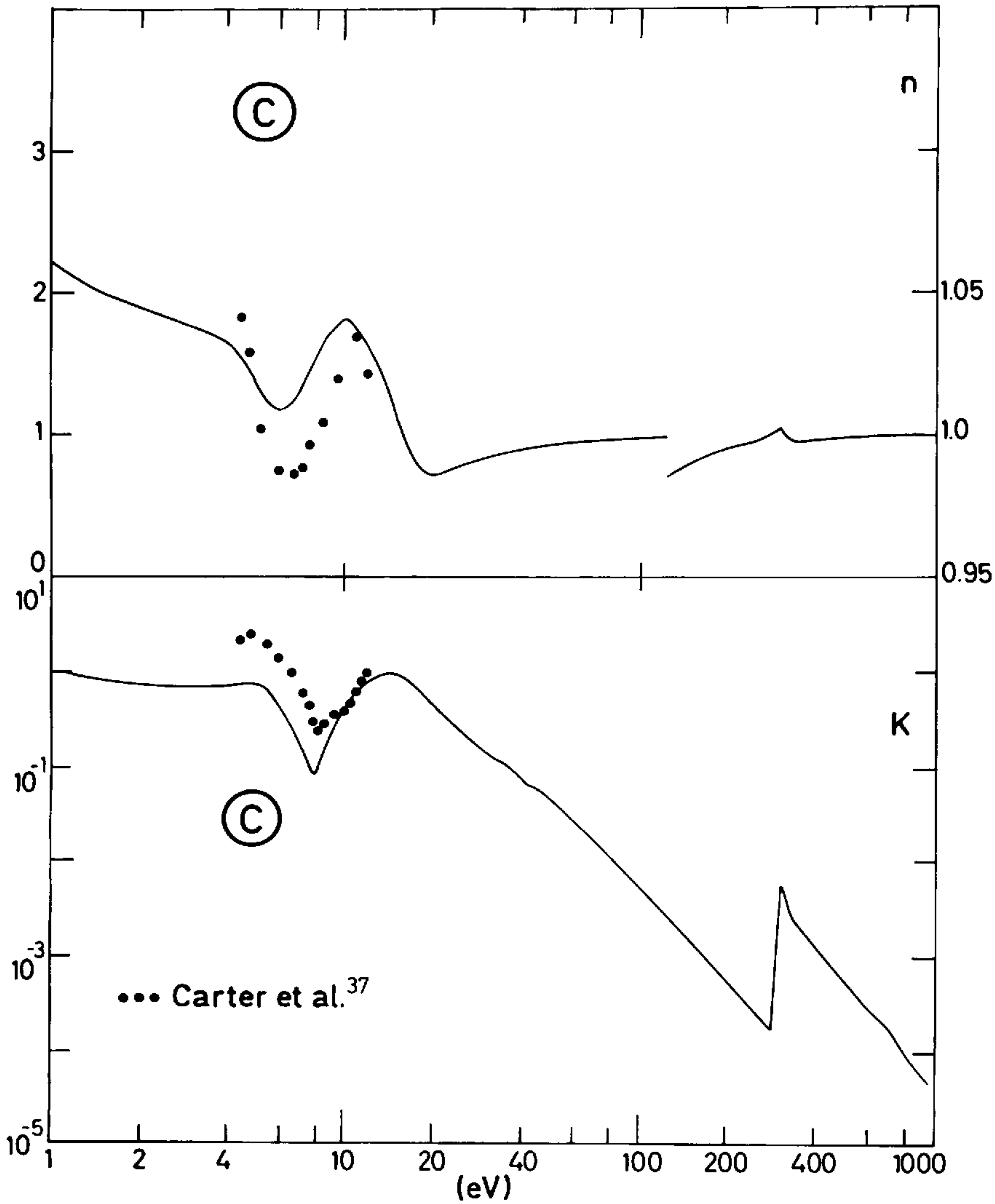
Bi
ε1
ε2
10
5
1
0
-5
-10
1.2
1.1
1.0
0.9
0.8
10²
10⁰
10⁻²
10⁻⁴
1
2
4
10
20
40
100
200
400
1000
(eV)

Fig. 26



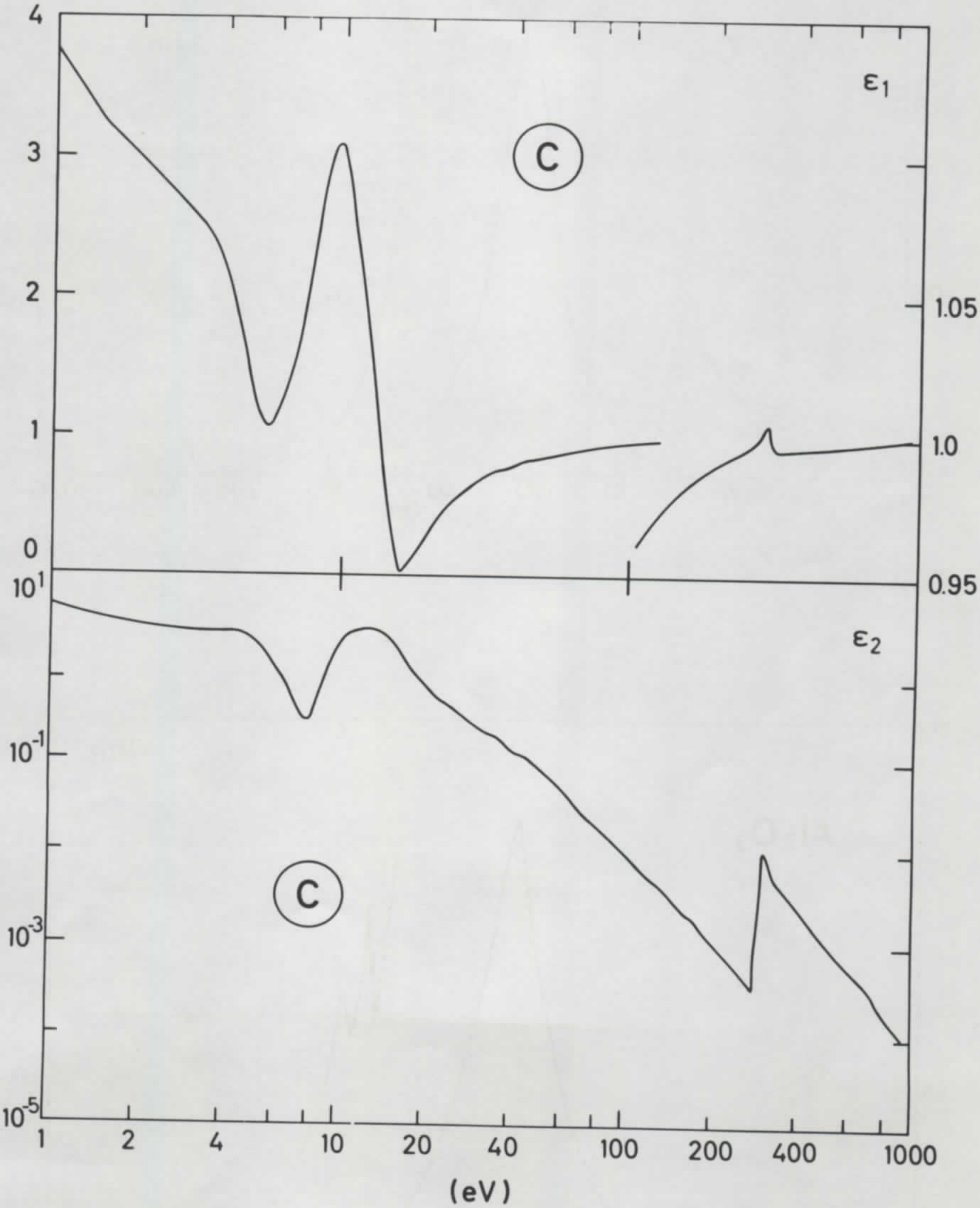
10²
10¹
10⁰
10⁻¹
10⁻²
C
R%
10⁻²
10⁻³
10⁻⁴
10⁻⁵
10⁻⁶
Taft, Philipp21
15
10
5
0
C
μ(10⁵cm⁻¹)
C, evaporated
1
2
4
10
20
40
100
200
400
1000
(eV)

Fig. 27



C
n
3
2
1
0
1.05
1.0
0.95
10^{1}
10^{-1}
10^{-3}
10^{-5}
K
C
••• Carter et al.[37]
1
2
4
10
20
40
100
200
400
1000
(eV)

Fig. 28



4
3
2
1
0
ε_1
C
1.05
1.0
0.95
10^1
10^{-1}
10^{-3}
10^{-5}
ε_2
C
1
2
4
10
20
40
100
200
400
1000
(eV)

Fig. 29

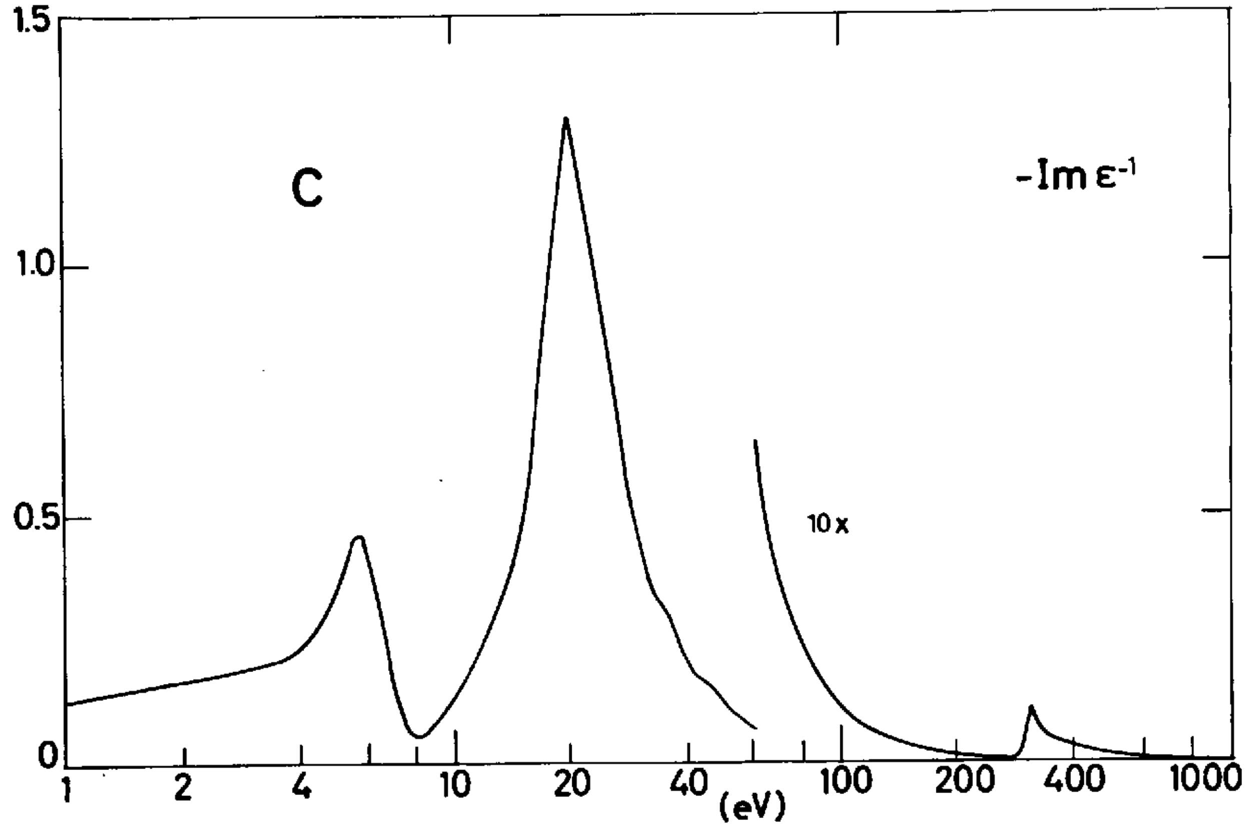

1.5
1.0
0.5
0
C
-Im ε⁻¹
10 x
1
2
4
10
20
40
100
200
400
1000
(eV)

Fig. 30

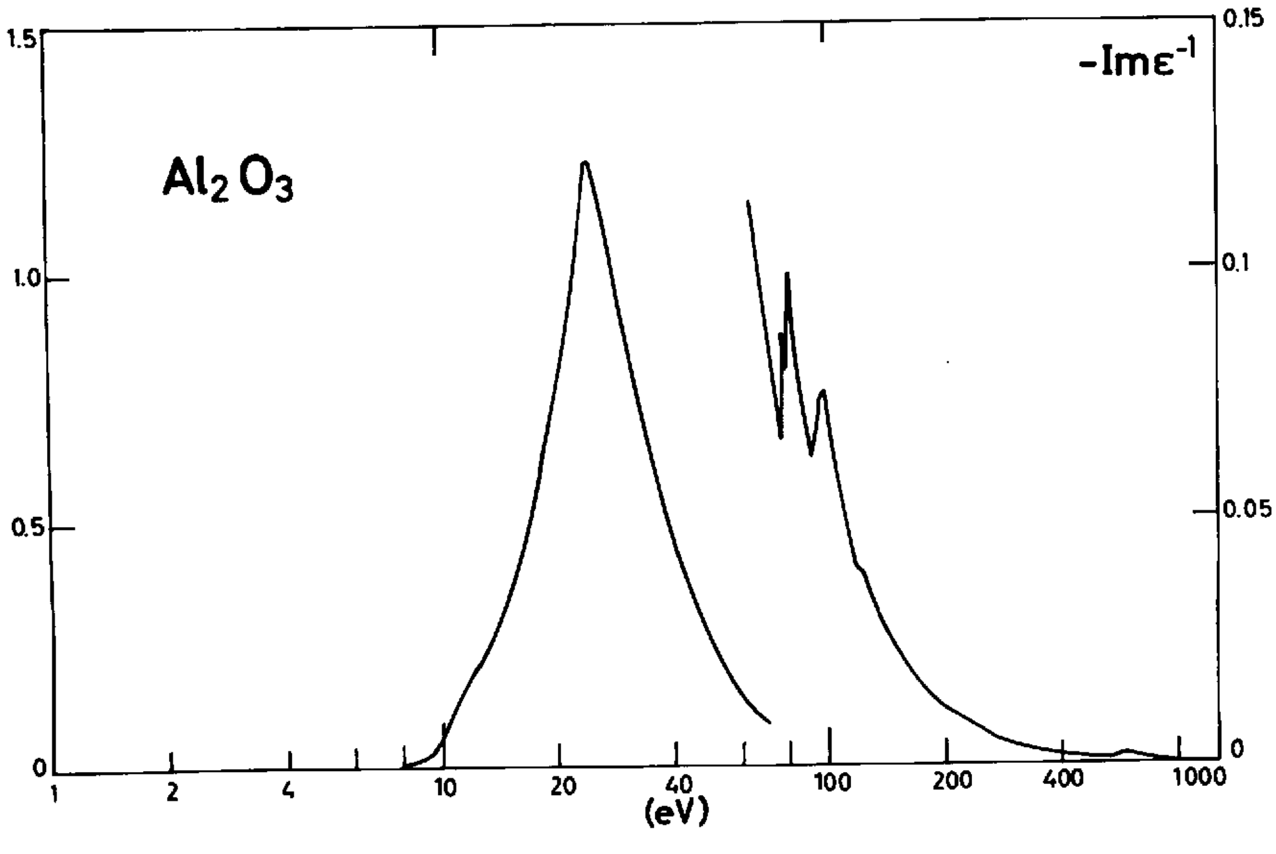

1.5
1.0
0.5
0
0.15
0.1
0.05
0
-Imε⁻¹
Al₂ O₃
1
2
4
10
20
40
100
200
400
1000
(eV)

Fig. 31

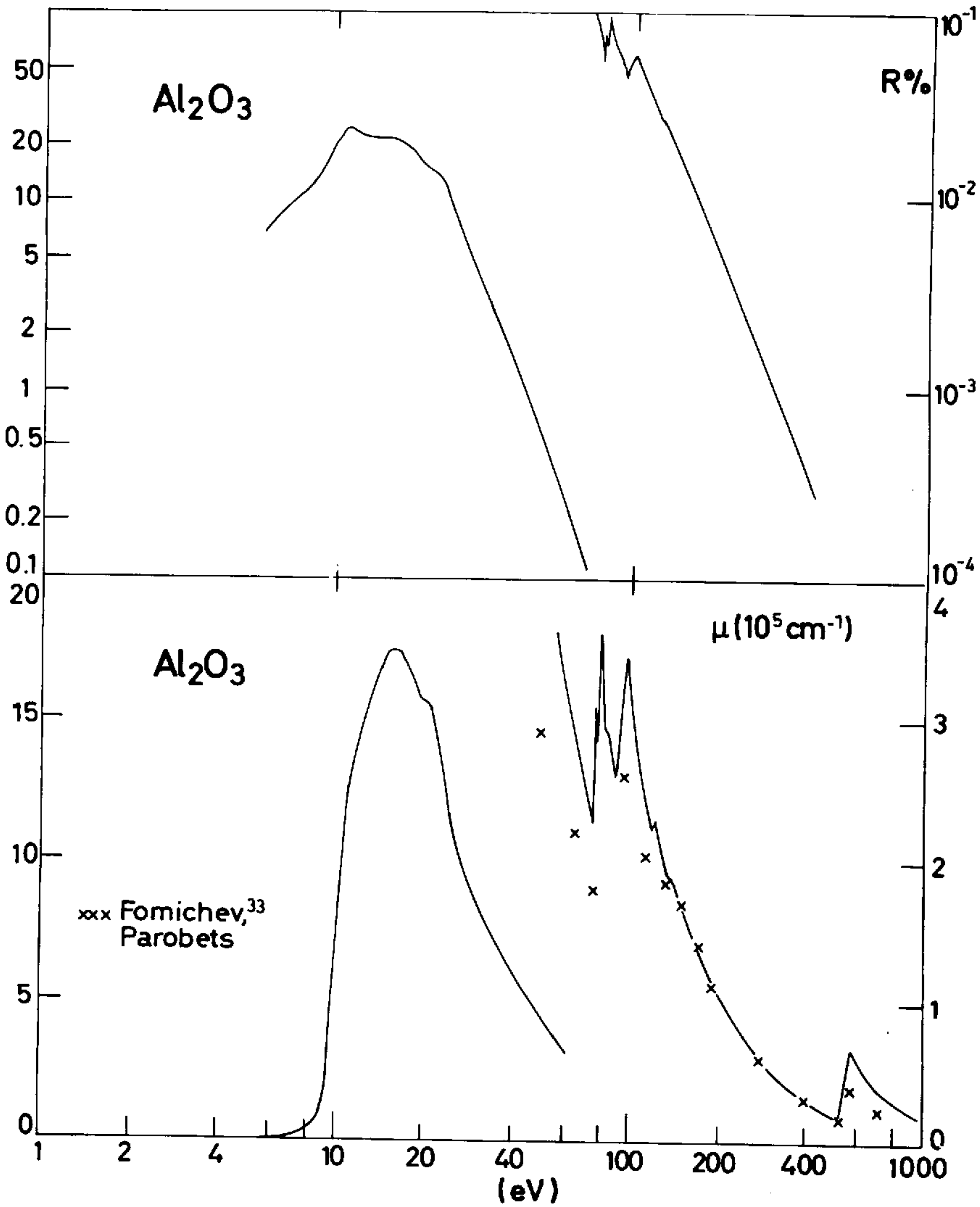
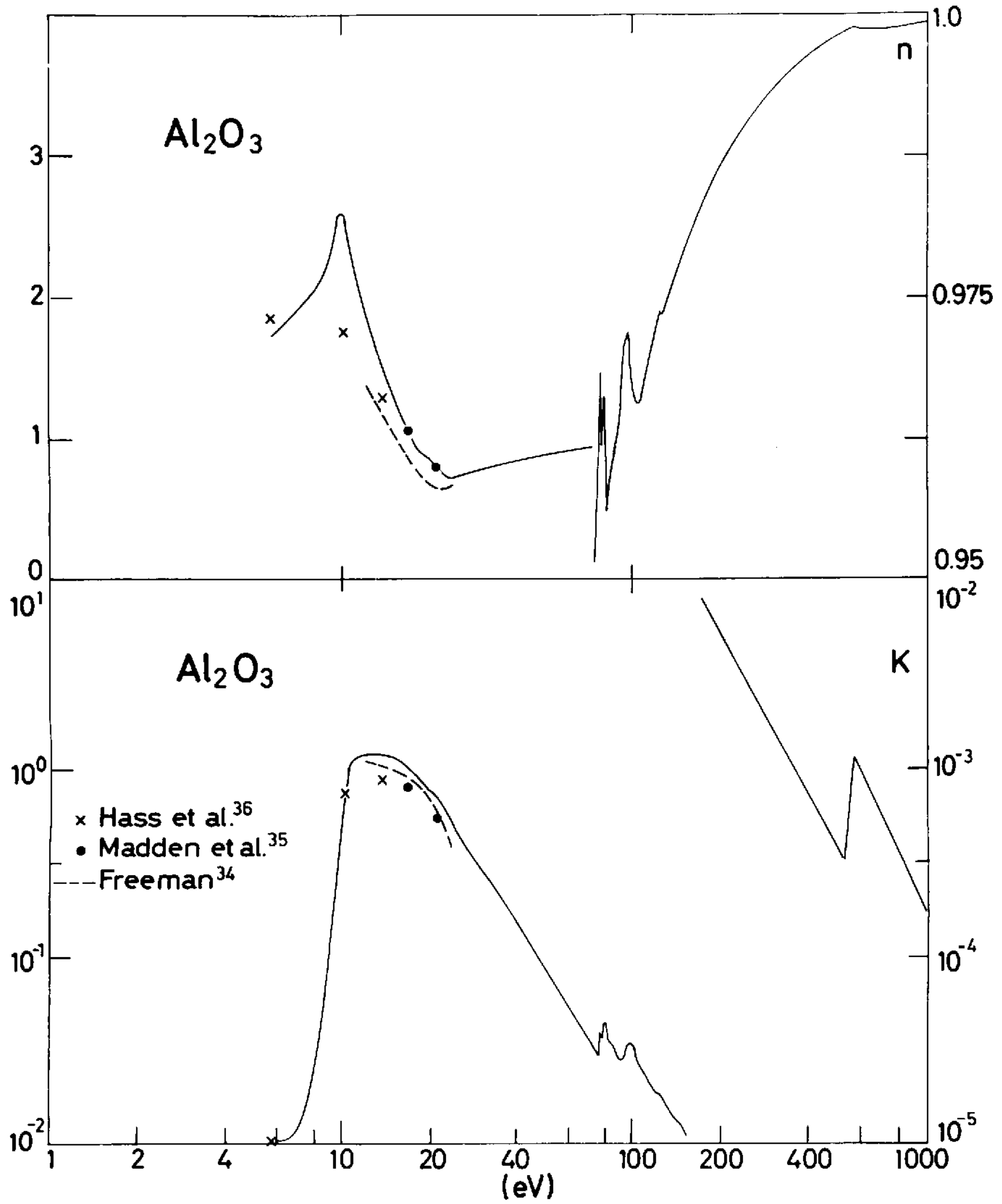
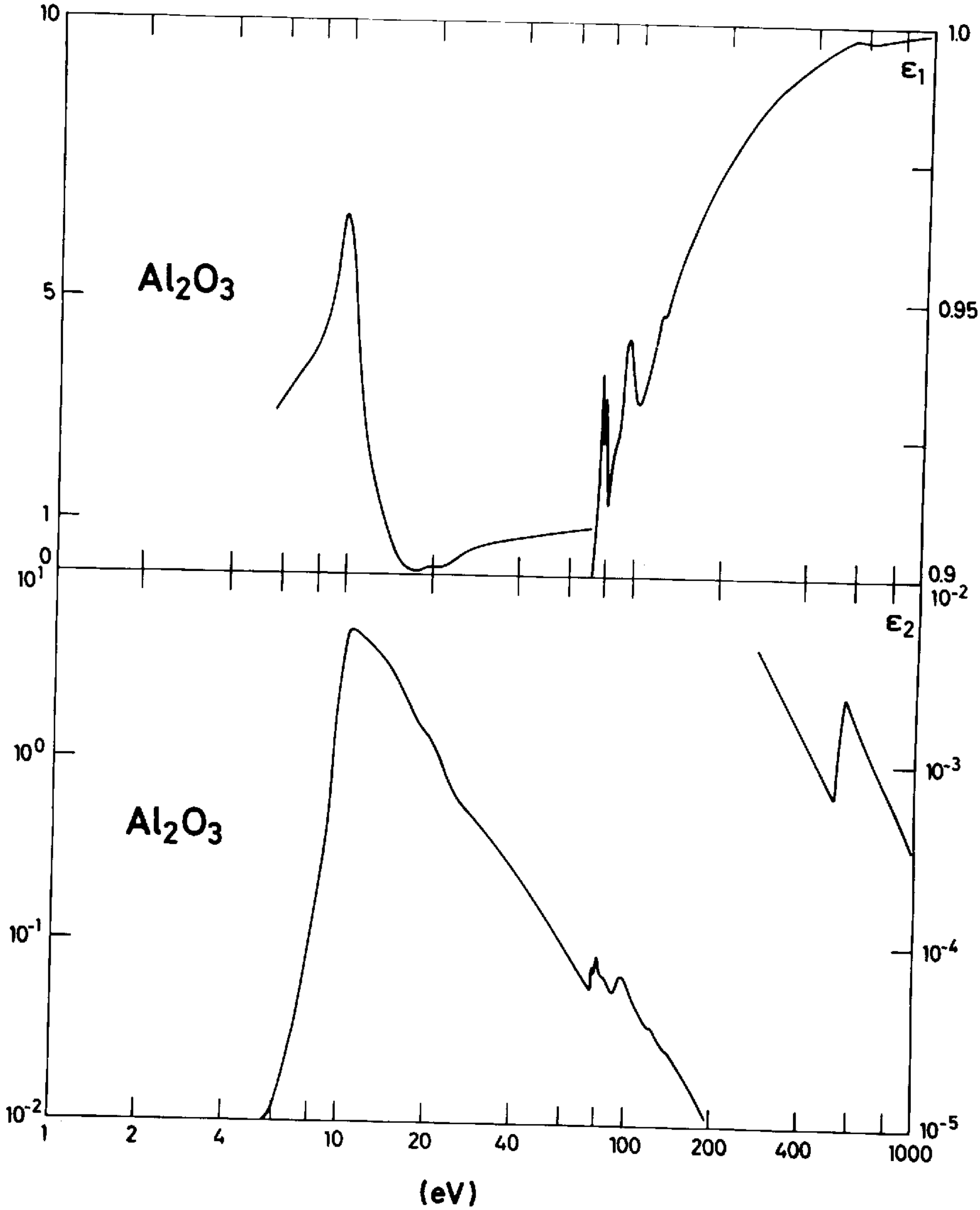

Al2O3
R%
50
20
10
5
2
1
0.5
0.2
0.1
10-1
10-2
10-3
10-4
Al2O3
μ (105 cm-1)
20
15
10
5
0
4
3
2
1
0
xxx Fomichev,33
Parobets
1
2
4
10
20
40
100
200
400
1000
(eV)

Fig. 32



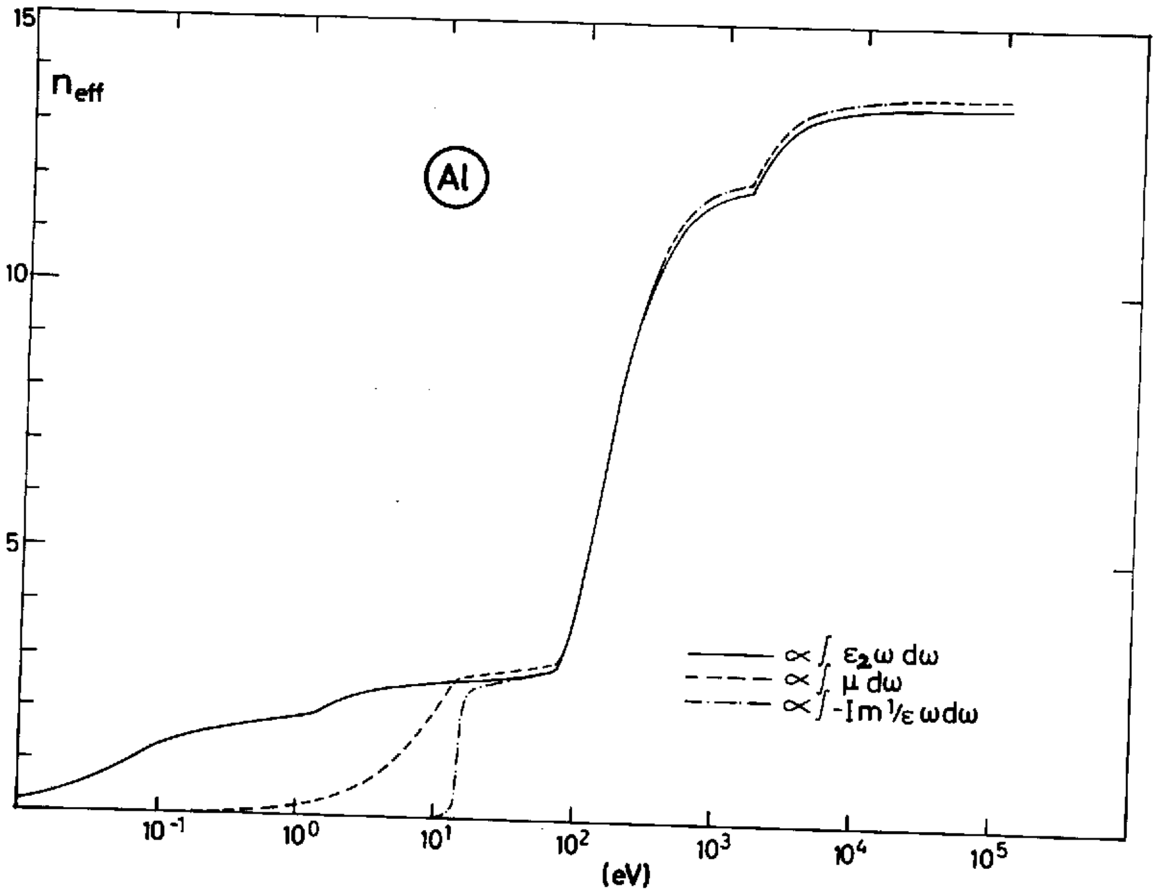
Al2O3
n
1.0
0.975
0.95
3
2
1
0
Al2O3
K
10^1
10^0
10^-1
10^-2
10^-2
10^-3
10^-4
10^-5
× Hass et al.36
• Madden et al.35
---Freeman34
1
2
4
10
20
40
100
200
400
1000
(eV)

Fig. 33



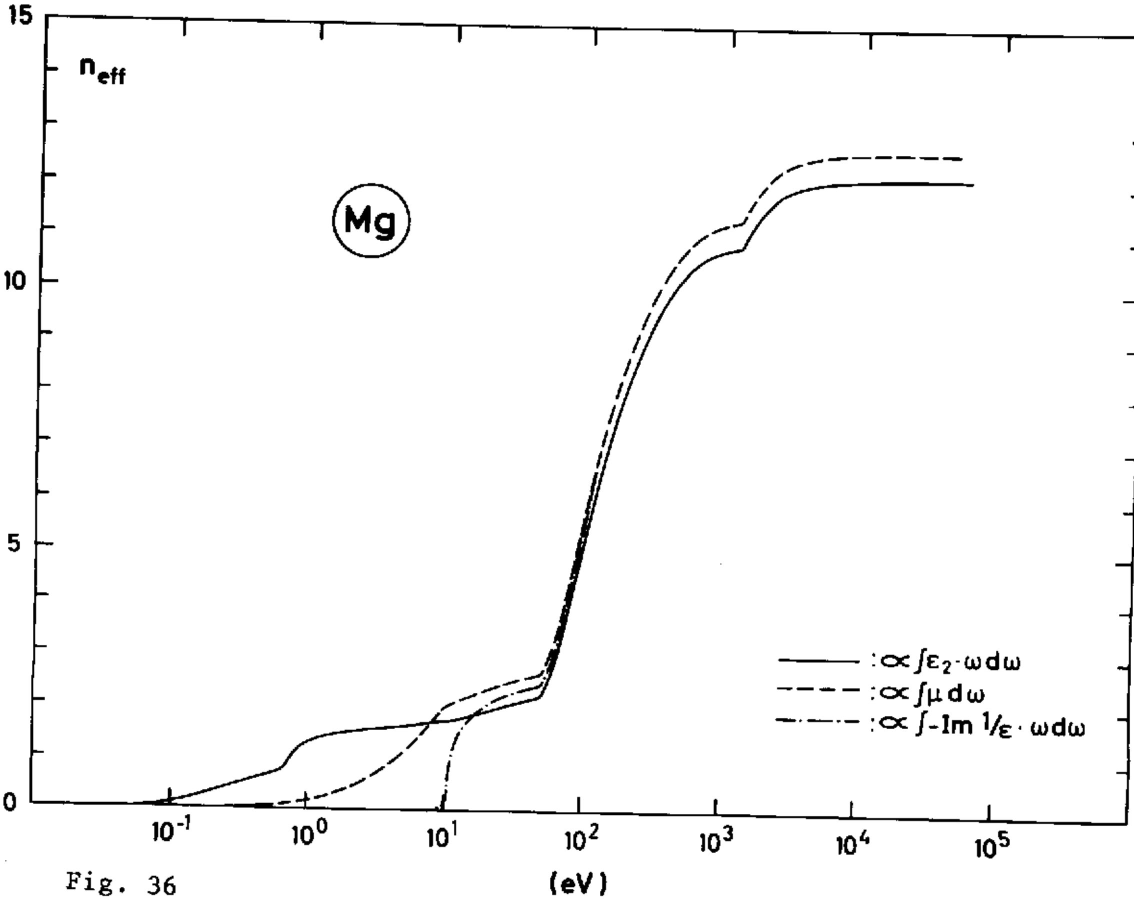
10
5
1
0
1.0
0.95
0.9
ε1
Al2O3
10^1
10^0
10^-1
10^-2
10^-2
10^-3
10^-4
10^-5
ε2
Al2O3
1
2
4
10
20
40
100
200
400
1000
(eV)

Fig. 34



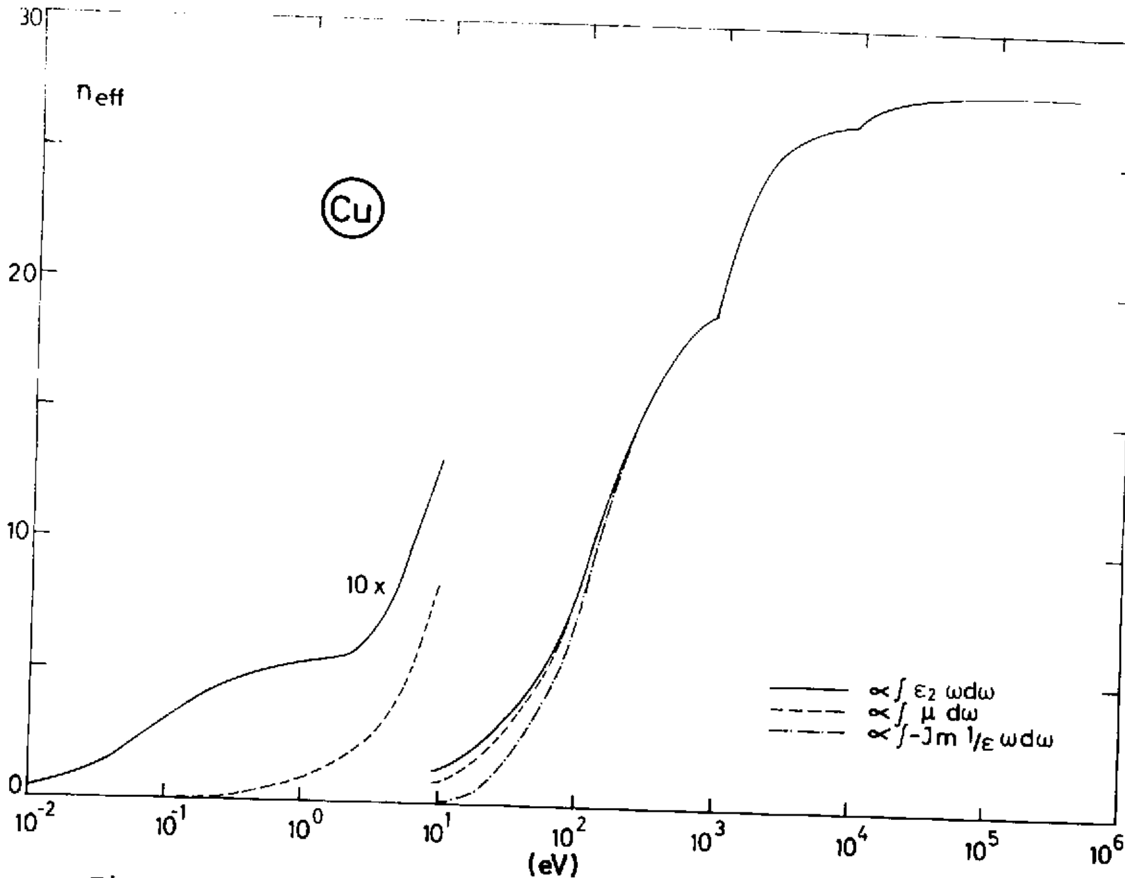
15
n_{eff}
Al
10
5
$\propto \int \varepsilon_2 \omega\, d\omega$
$\propto \int \mu\, d\omega$
$\propto \int -\mathrm{Im}\, 1/\varepsilon\, \omega\, d\omega$
10^{-1}
10^{0}
10^{1}
10^{2}
10^{3}
10^{4}
10^{5}
(eV)

Fig. 35



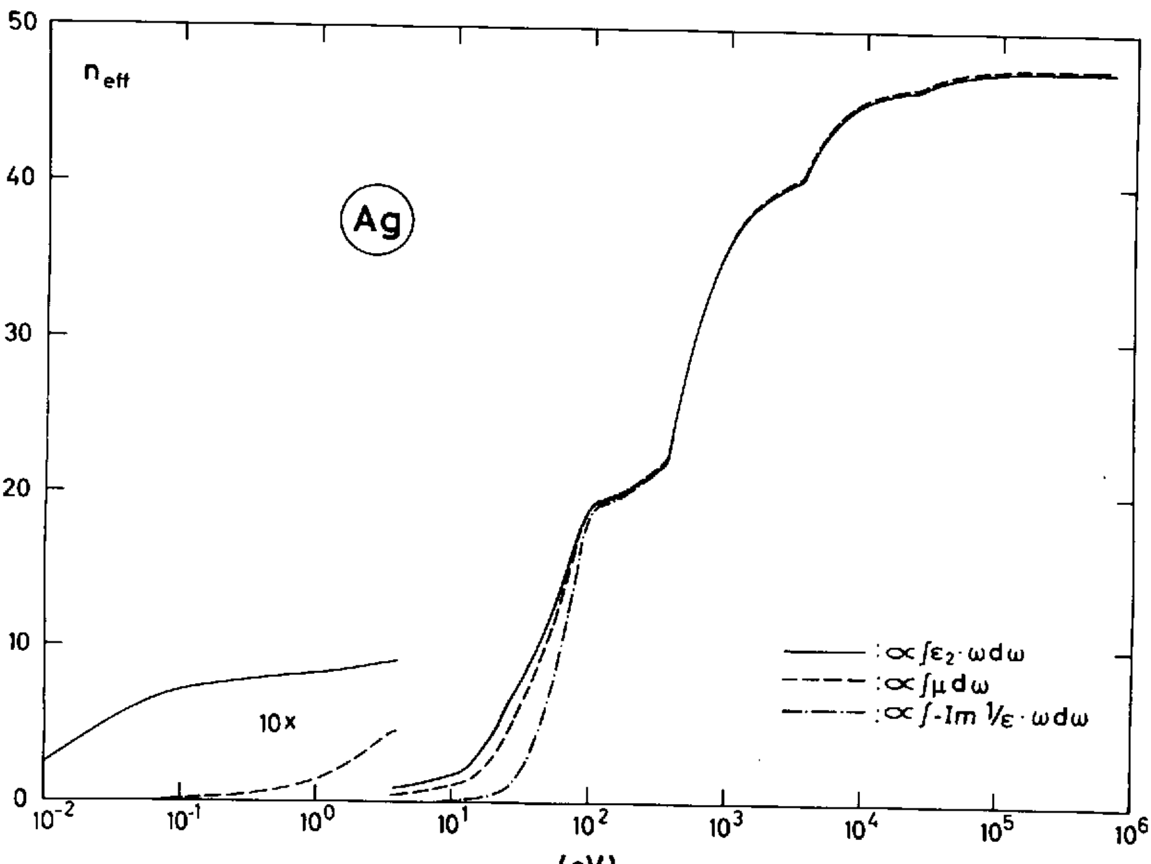
15
n_{eff}
Mg
10
5
0
$: \propto \int \varepsilon_2 \cdot \omega\, d\omega$
$: \propto \int \mu\, d\omega$
$: \propto \int -\mathrm{Im}\, 1/\varepsilon \cdot \omega\, d\omega$
10^{-1}
10^{0}
10^{1}
10^{2}
10^{3}
10^{4}
10^{5}
(eV)

Fig. 36



30
20
10
0
n_{eff}
Cu
10 x
$\propto \int \varepsilon_2 \, \omega d\omega$
$\propto \int \mu \, d\omega$
$\propto \int -\mathrm{Im}\, 1/\varepsilon \, \omega d\omega$
10^{-2} 10^{-1} 10^{0} 10^{1} 10^{2} 10^{3} 10^{4} 10^{5} 10^{6}
(eV)

Fig. 37



50
40
30
20
10
0
n_{eff}
Ag
10x
$: \propto \int \varepsilon_2 \cdot \omega d\omega$
$: \propto \int \mu \, d\omega$
$: \propto \int -\mathrm{Im}\, 1/\varepsilon \cdot \omega d\omega$
10^{-2} 10^{-1} 10^{0} 10^{1} 10^{2} 10^{3} 10^{4} 10^{5} 10^{6}
(eV)

Fig. 38

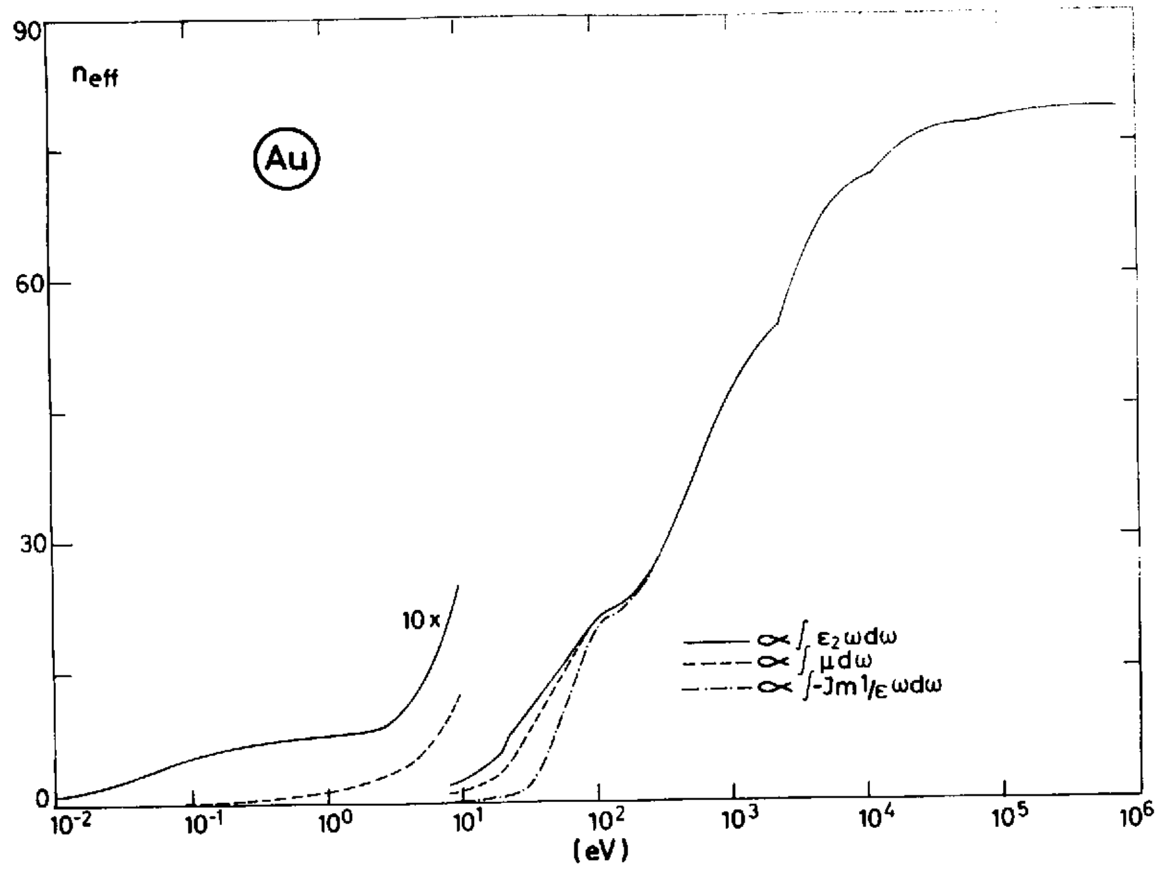

90
60
30
0
n_{eff}
Au
10x
$\propto \int \varepsilon_2 \omega d\omega$
$\propto \int \mu d\omega$
$\propto \int -Jm\, 1/\varepsilon\, \omega d\omega$
10^{-2}
10^{-1}
10^{0}
10^{1}
10^{2}
10^{3}
10^{4}
10^{5}
10^{6}
(eV)

Fig. 39

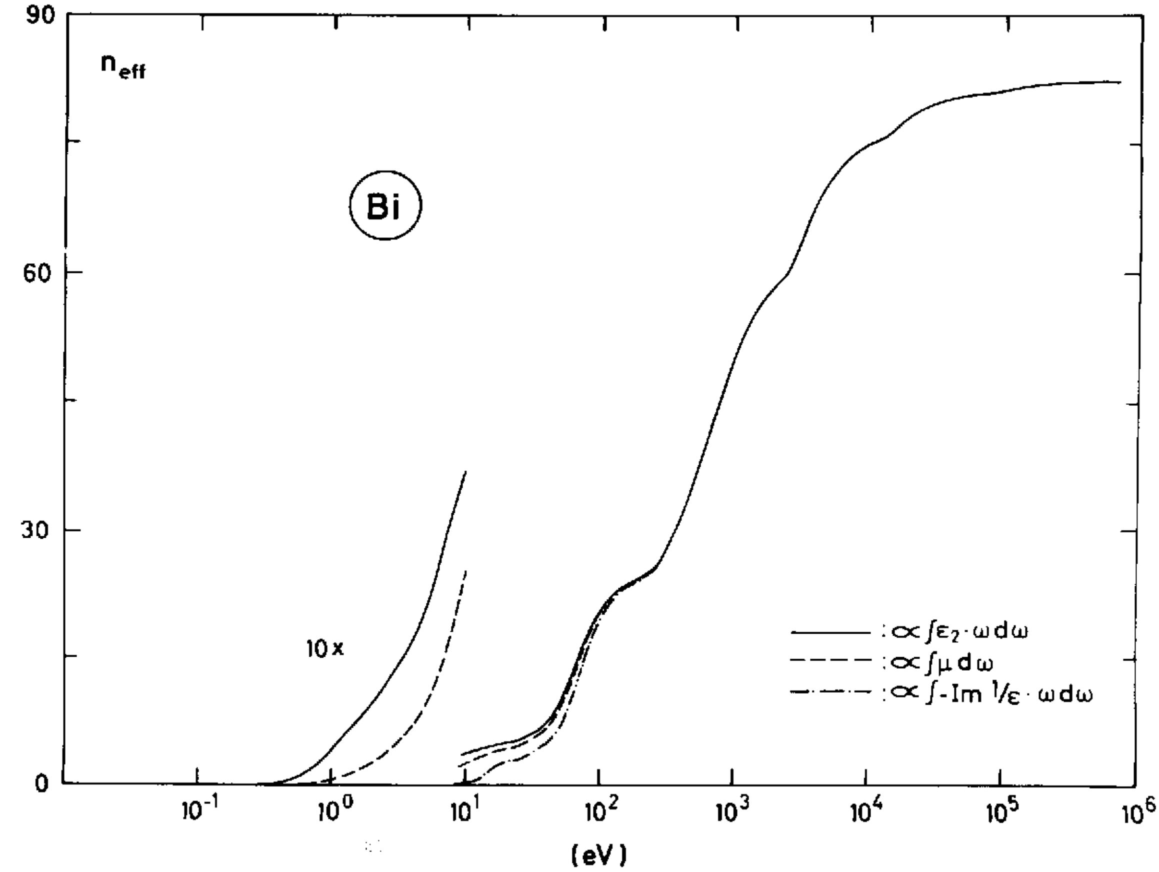

90
60
30
0
n_{eff}
Bi
10x
$: \propto \int \varepsilon_2 \cdot \omega d\omega$
$: \propto \int \mu d\omega$
$: \propto \int -Im\, 1/\varepsilon \cdot \omega d\omega$
10^{-1}
10^{0}
10^{1}
10^{2}
10^{3}
10^{4}
10^{5}
10^{6}
(eV)

Fig. 40

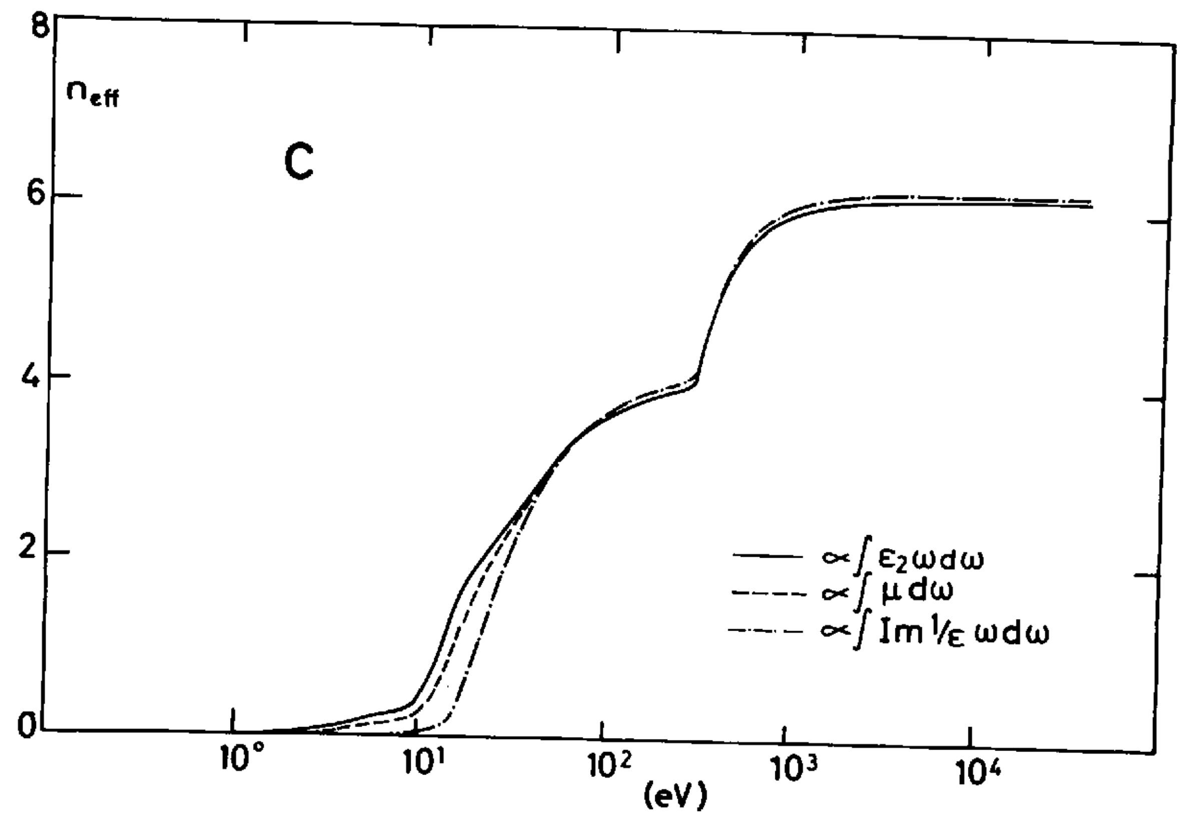

8
6
4
2
0
n_{eff}
C
10^0
10^1
10^2
10^3
10^4
(eV)
$\propto \int \varepsilon_2 \omega d\omega$
$\propto \int \mu d\omega$
$\propto \int Im \, ^1/_\varepsilon \, \omega d\omega$

Fig. 41

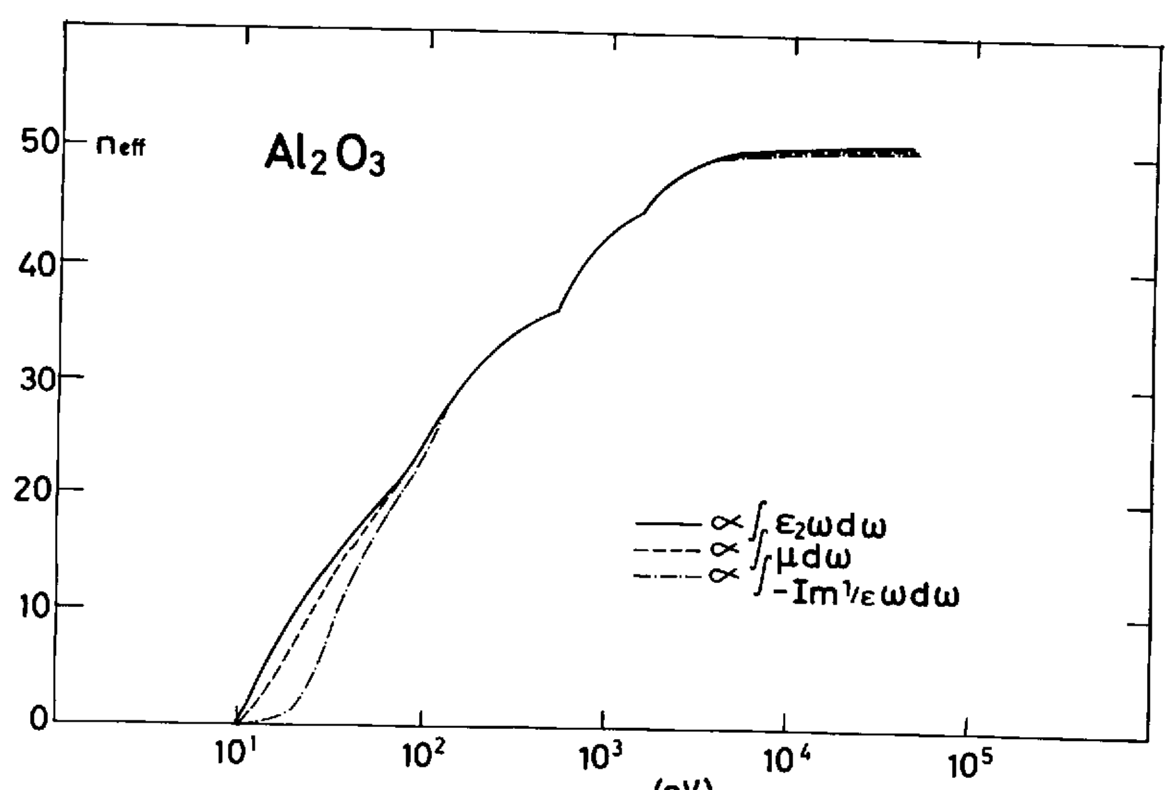
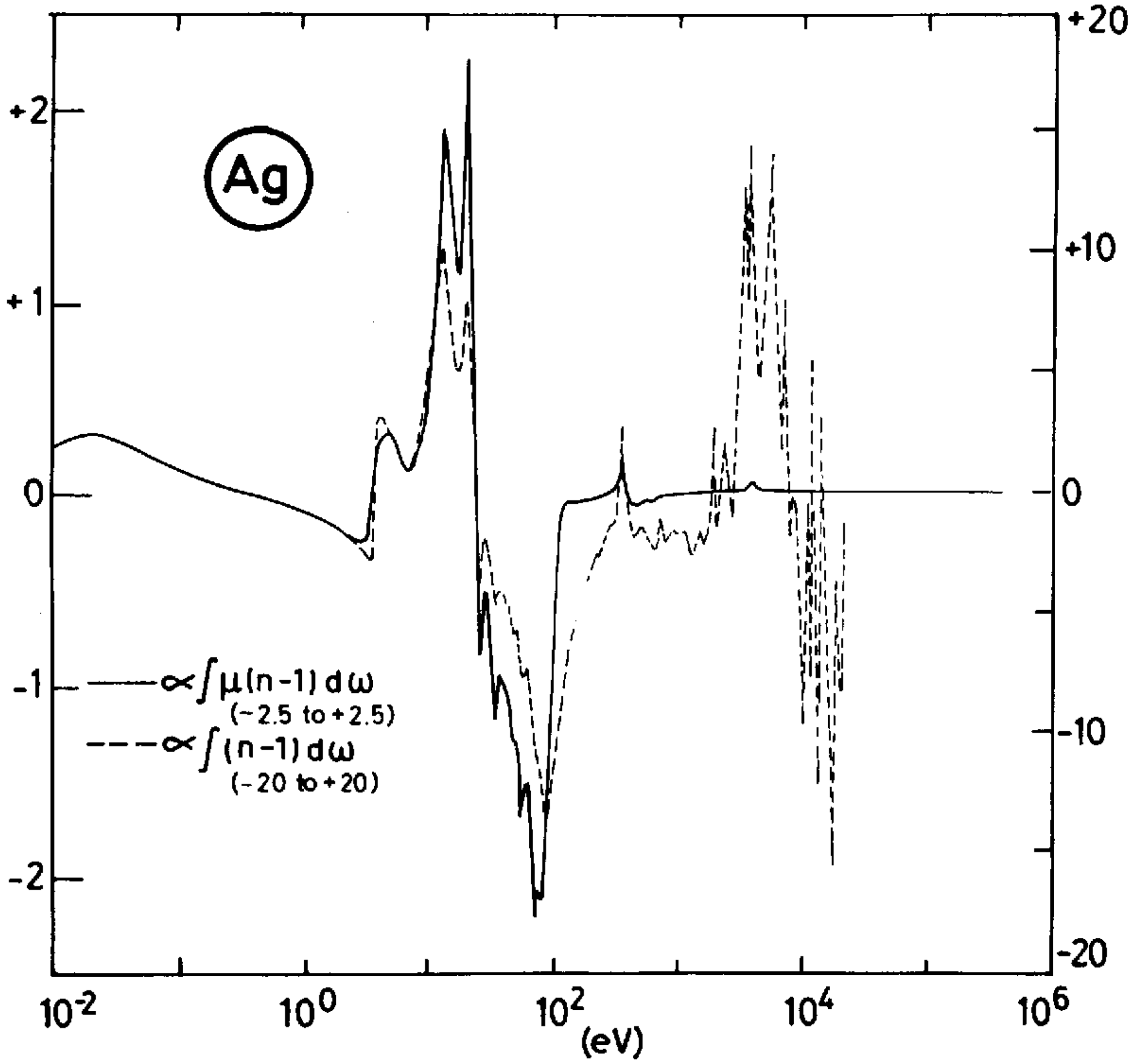

50
40
30
20
10
0
n_{eff}
Al_2O_3
10^1
10^2
10^3
10^4
10^5
(eV)
$\propto \int \varepsilon_2 \omega d\omega$
$\propto \int \mu d\omega$
$\propto \int -Im \, ^1/_\varepsilon \, \omega d\omega$

Fig. 42



Ag
+2
+1
0
-1
-2
+20
+10
0
-10
-20
∝∫μ(n-1)dω
(-2.5 to +2.5)
∝∫(n-1)dω
(-20 to +20)
10^-2
10^0
10^2
10^4
10^6
(eV)

Fig. 43