Optical properties of the metals Al, Co, Cu, Au, Fe, Pb, Ni, Pd, Pt, Ag, Ti, and W in the infrared and far infrared

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Infrared optical constants collected from the literature are tabulated. The data for the noble metals and Al, Pb, and W can be reasonably fit using the Drude model. It is shown that $-\epsilon_1(\omega) = \epsilon_2(\omega) \simeq \omega_p^2/(2\omega_\tau^2)$ at the damping frequency $\omega = \omega_\tau$. Also $-\epsilon_1(\omega_\tau) \simeq -(1/2)\,\epsilon_1(0)$, where the plasma frequency is ω_p.

I. Introduction

Many measurements of the optical constants of metals have been made, primarily at near IR, visible, and UV wavelengths. Brandli and Sievers[1] have measured Au and Pb in the far IR. For the near and far IR we have compiled these data and have tabulated the real and imaginary parts of the dielectric function, ϵ_1 and ϵ_2, respectively, the index of refraction n and the extinction index k for each metal. Drude model[2] parameters giving a reasonable fit to the data are given for Au, Ag, Cu, Al, Pb, and W. In general, the Drude model is not expected to be appropriate for transition metals in the near and middle IR, but a good fit can be obtained for *W* with a Drude model dielectric function.

Weaver *et al.*[3] have compiled extensive tables or optical properties of metals which have been recently published. Most of their tables do not extend beyond 12-μm wavelength, while our compilation extends to the longest wavelength for which data are available. Another standard compilation is that of Haas and Hadley in the *AMERICAN INSTITUTE OF PHYSICS HANDBOOK.*[4] However, this includes data only up to 1967. Except for a few cases, the data presented here are more recent.

Bennett and Bennett[5] have shown that the Drude model fits the measured reflectance of gold, silver, and aluminum in the 3–30-μm wavelength range with one adjustable parameter; i.e., the Drude model parameters were obtained from the dc resistivity and fitted with one free electron per atom for gold and silver and 2.6 free electrons per atom for aluminum. Brandli and Sievers have shown that the Drude model is an excellent fit to their far IR measurements on lead and provides a good fit for gold with no adjustable parameters.

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Received 12 October 1982.
0003-6935/83/071099-21$01.00/0.

II. Definitions and Equations

In keeping with IR spectroscopic notation, all frequencies will be expressed in cm^{-1}. The complex dielectric function ϵ_c and the complex index of refraction n_c are defined as

$$\epsilon_c \equiv \epsilon_1 + i\epsilon_2 \equiv n_c^2 \equiv (n + ik)^2. \quad (1)$$

The Drude model dielectric function is

$$\epsilon_c = \epsilon_\infty - \frac{\omega_p^2}{\omega^2 + i\omega\omega_\tau}, \quad (2)$$

where ω, ω_p, and ω_τ have units of cm^{-1}. Separating the real and imaginary parts yields

$$\epsilon_1 = \epsilon_\infty - \frac{\omega_p^2}{\omega^2 + \omega_\tau^2}, \quad (3)$$

$$\epsilon_2 = \frac{\omega_p^2\,\omega_\tau}{\omega^3 + \omega\omega_\tau^2}. \quad (4)$$

In these equations, the plasma frequency[6] is

$$\omega_p(\text{cm}^{-1}) = \frac{1}{2\pi c}\left(\frac{4\pi Ne^2}{m^*\epsilon_\infty}\right)^{1/2}, \quad (5)$$

where N is the free electron density, e is the electron charge, m^* is the effective mass of the electrons, and ϵ_∞ is the high frequency dielectric constant. The damping frequency ω_τ expressed in cm^{-1} is

$$\omega_\tau(\text{cm}^{-1}) = \frac{1}{2\pi c\tau}, \quad (6)$$

where τ is the electron lifetime in seconds and c is the velocity of light. Note that for low frequencies

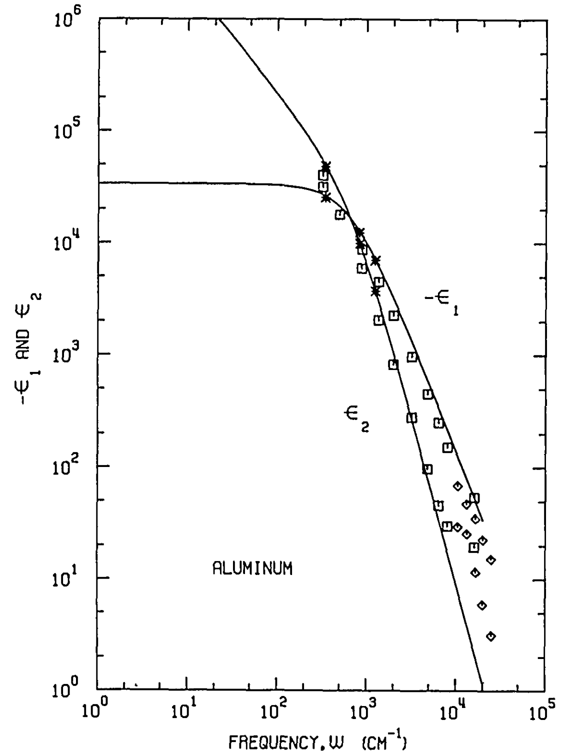


Fig. 1. Aluminum: $-\epsilon_1(\omega)$ and $\epsilon_2(\omega)$ vs frequency. The solid line is the Drude model. The data from Ref. 7 are: Shiles *et al.*, □ for both $-\epsilon_1$ and ϵ_2; Bennett and Bennett * for $-\epsilon_1$ and ϵ_2; Schulz, ◊ for $-\epsilon_1$ and ϵ_2.

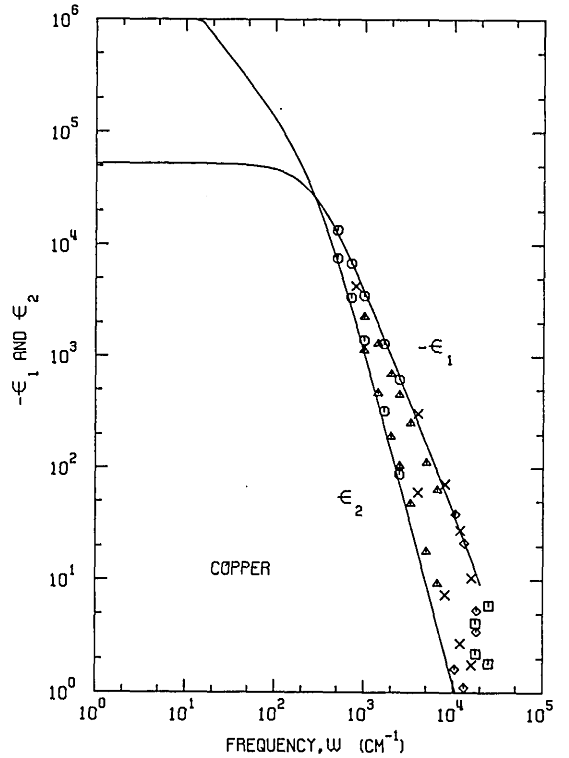


Fig. 2. Copper: $-\epsilon_1(\omega)$ and $\epsilon_2(\omega)$ vs frequency. The solid line is the Drude model. The data from Ref. 8 are: Schulz, ◊ for both $-\epsilon_1$ and ϵ_2; Lenham and Treherne, ✱ for $-\epsilon_1$ and ϵ_2; Robusto and Braunstein, □ for both; Hageman *et al.*, × for both; and Dold and Mecke, △ for both.

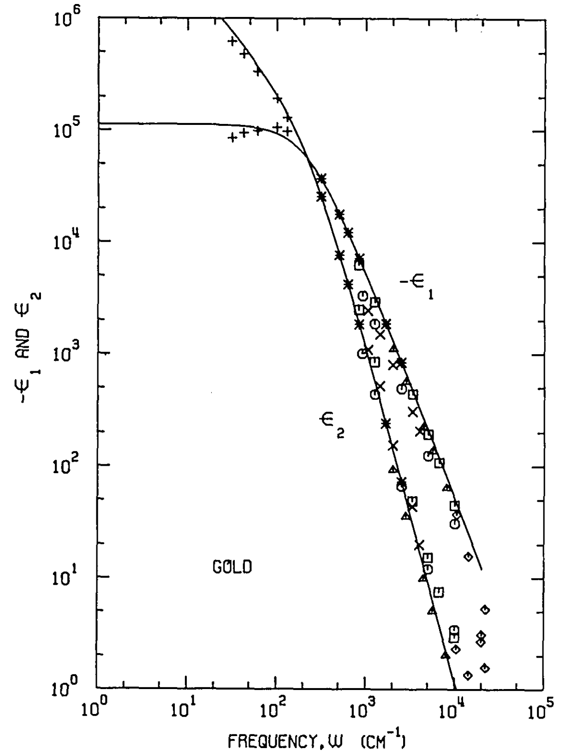


Fig. 3. Gold: $-\epsilon_1(\omega)$ and $\epsilon_2(\omega)$ vs frequency. The solid line is the Drude model. The data from Ref. 9 are: Bennett and Bennett, ✱ for both $-\epsilon_1$ and ϵ_2; Schulz, ◊ for both; Motulevich and Shubin, □ for both; Padalka and Shklyarevskii, ○ for both; Bolotin *et al.*, × for both; Brandli and Sievers, + for both; Weaver *et al.*, △ for both.

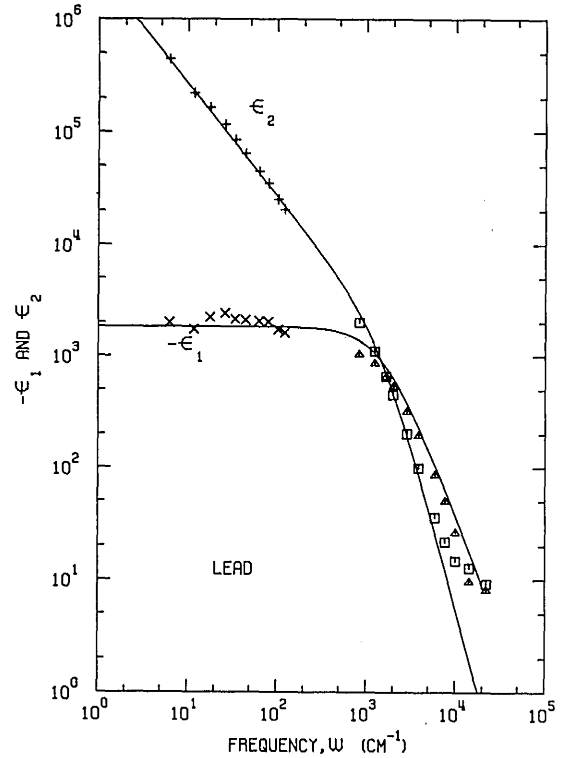


Fig. 4. Lead: $-\epsilon_1(\omega)$ and $\epsilon_2(\omega)$ vs frequency. The solid line represents the Drude model. The data from Ref. 10 are: Brandli and Sievers, × for $-\epsilon_1$ and + for ϵ_2; and Golovashkin and Motulevich, △ for $-\epsilon_1$ and □ for ϵ_2.

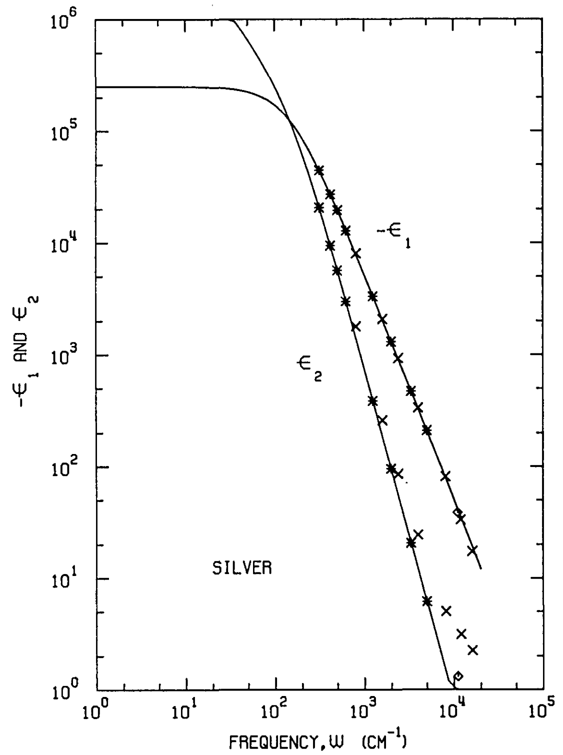


Fig. 5. Silver: $-\epsilon_1(\omega)$ and $\epsilon_2(\omega)$ vs frequency. The solid line is the Drude model. The data from Ref. 11 are: Bennett and Bennett, * for both $-\epsilon_1$ and ϵ_2; Schulz, ◊ for both; and Hagemann *et al.*, × for both.

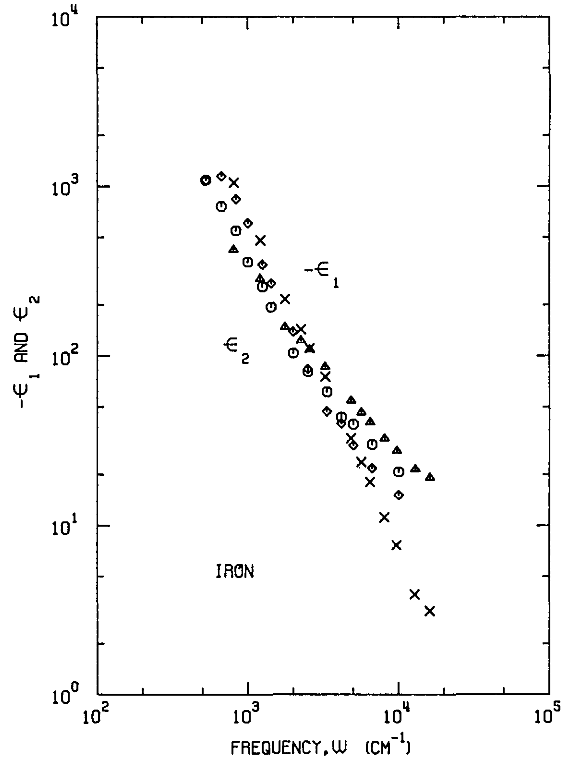


Fig. 7. Iron: $-\epsilon_1(\omega)$ and $\epsilon_2(\omega)$ vs frequency. The data from Ref. 13 are: Weaver *et al.*, × for $-\epsilon_1$ and Δ for ϵ_2; Bolotin et al., ◊ for $-\epsilon_1$ and O for ϵ_2.

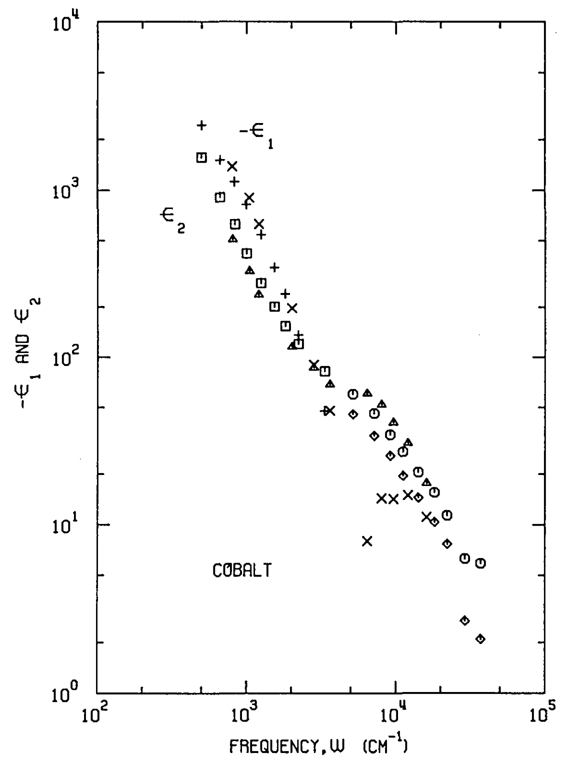


Fig. 6. Colbalt: $-\epsilon_1(\omega)$ and $\epsilon_2(\omega)$ vs frequency. The data from Ref. 12 are: Kirillova and Charikov, + for $-\epsilon_1$ and □ for ϵ_2; Johnson and Christy, ◊ for $-\epsilon_1$ and O for ϵ_2; and Weaver *et al*, × for $-\epsilon_1$ and Δ for ϵ_2.

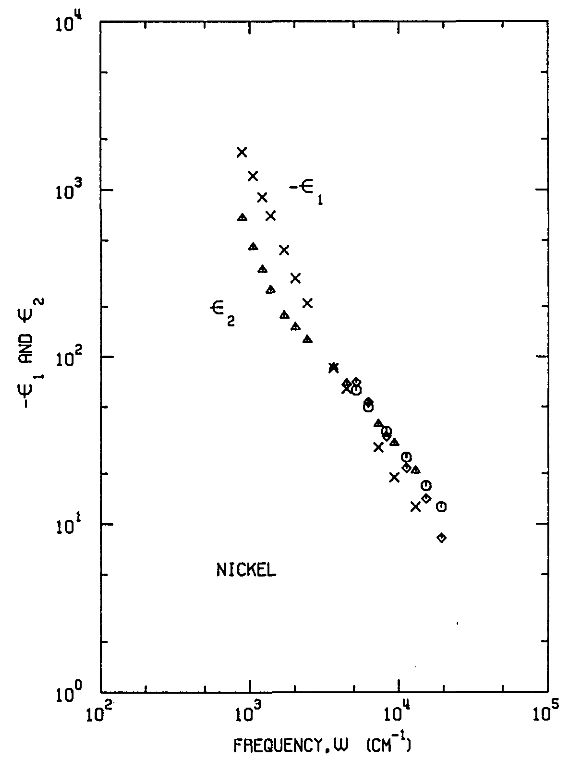


Fig. 8. Nickel: $-\epsilon_1(\omega)$ and $\epsilon_2(\omega)$ vs frequency. The data from Ref. 14 are: Lynch *et al.*, × for $-\epsilon_1$ and Δ for ϵ_2; Johnson and Christy, ◊ for $-\epsilon_1$ and O for ϵ_2.

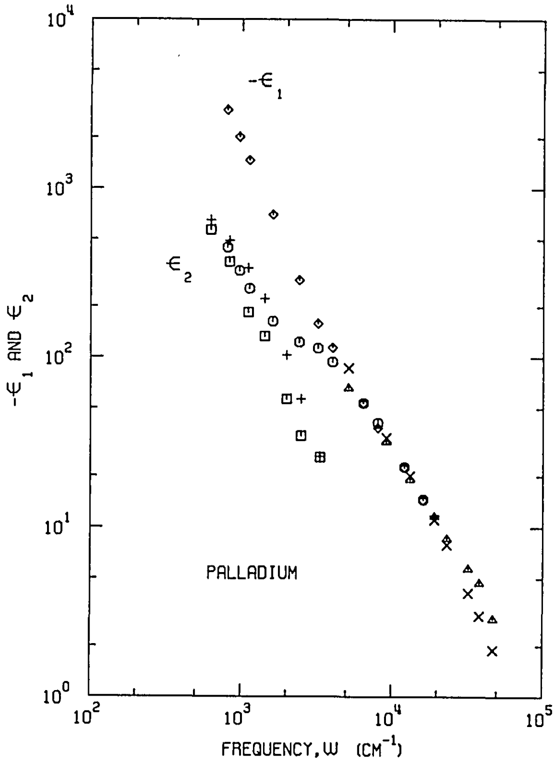


Fig. 9. Palladium: $-\epsilon_1(\omega)$ and $\epsilon_2(\omega)$ vs frequency. The data from Ref. 15 are: Weaver and Benbow, ◇ for $-\epsilon_1$ and O for ϵ_2; Bolotin *et al.*, + for $-\epsilon_1$ and □ for ϵ_2; Johnson and Christy, × for $-\epsilon_1$ and △ for ϵ_2.

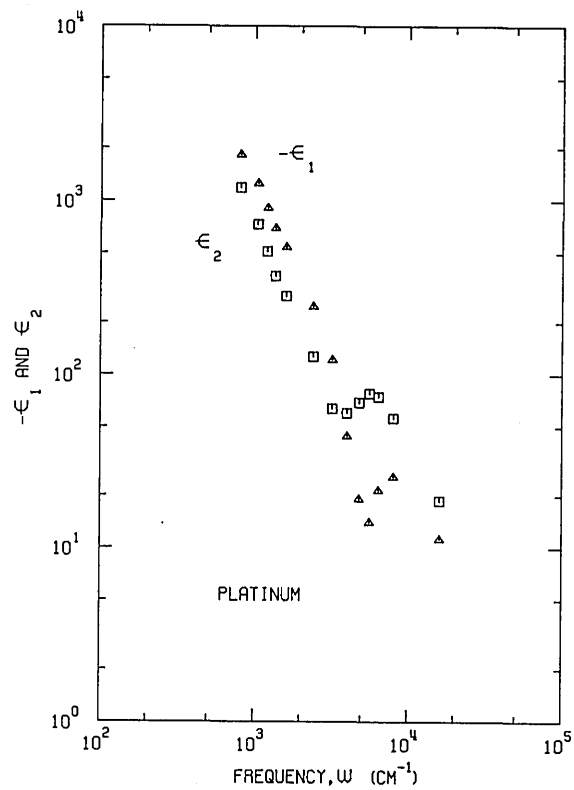


Fig. 10. Platinum: $-\epsilon_1(\omega)$ and $\epsilon_2(\omega)$ vs frequency. The data from Ref. 16 are Weaver *et al.*, △ for $-\epsilon_1$ and □ for ϵ_2.

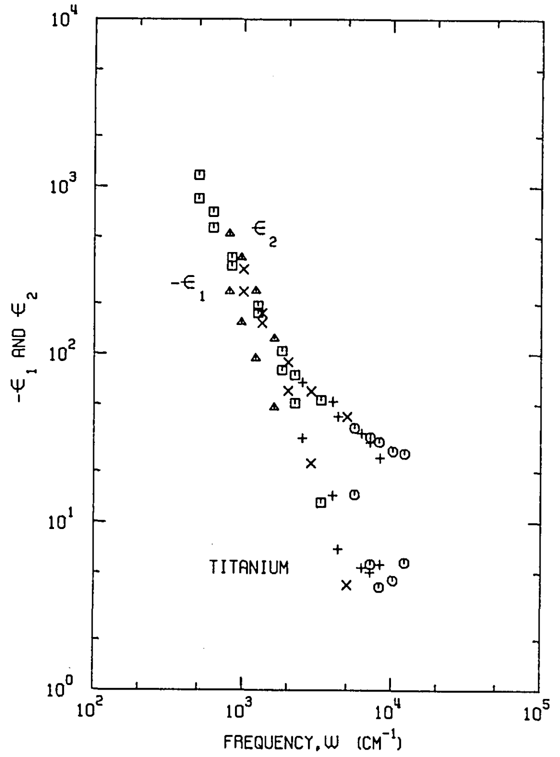


Fig. 11. Titanium: $-\epsilon_1(\omega)$ and $\epsilon_2(\omega)$ vs frequency. The data from Ref. 17 are: Kirillova and Charikov, □ for both $-\epsilon_1$ and ϵ_2; Lynch *et al.*, △ for both; Johnson and Christy, O for both; Kirillova and Charikov, + for both; Bolotin *et al.*, × for both.

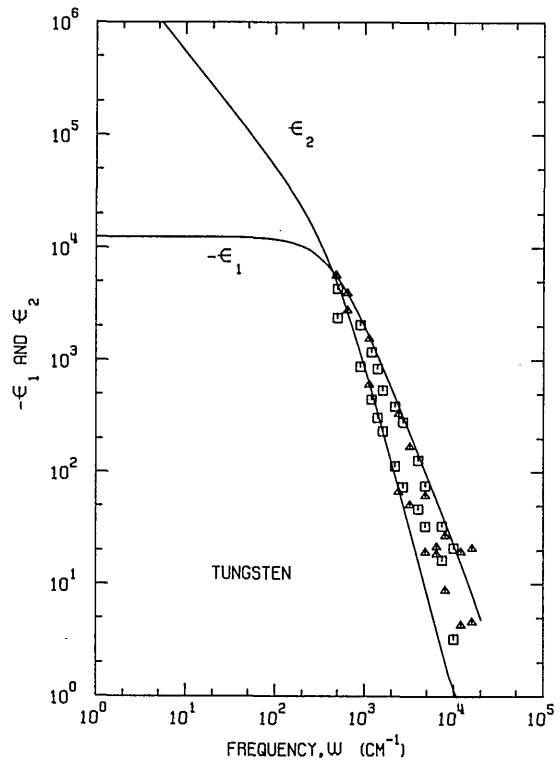


Fig. 12. Tungsten: $-\epsilon_1(\omega)$ and $\epsilon_2(\omega)$ vs frequency. The solid line is the Drude model. The data from Ref. 18 are: Nomerovannaya *et al.*, □ for both $-\epsilon_1$ and ϵ_2; Weaver *et al.*, △ for both.

TABLE 1. Al, ALUMINUM

E. Shiles, T. Sasaki, M. Inokuti, and D. Y. Smith, Phys. Rev. B 22, 1612 (1980)

ω(cm⁻¹)	λ(μm)	−ε1	ε2	n	k
3.23E+02	3.10E+01	3.18E+04	4.02E+04	9.86E+01	2.04E+02
3.39E+02	2.95E+01	3.01E+04	3.62E+04	9.22E+01	1.96E+02
3.71E+02	2.70E+01	2.68E+04	3.03E+04	8.26E+01	1.83E+02
4.03E+02	2.48E+01	2.43E+04	2.59E+04	7.50E+01	1.73E+02
4.36E+02	2.30E+01	2.14E+04	2.24E+04	6.93E+01	1.62E+02
4.68E+02	2.14E+01	1.95E+04	2.01E+04	6.52E+01	1.54E+02
5.00E+02	2.00E+01	1.80E+04	1.79E+04	6.07E+01	1.47E+02
5.32E+02	1.88E+01	1.66E+04	1.60E+04	5.67E+01	1.41E+02
5.81E+02	1.72E+01	1.50E+04	1.38E+04	5.20E+01	1.33E+02
6.45E+02	1.55E+01	1.32E+04	1.13E+04	4.58E+01	1.24E+02
7.10E+02	1.41E+01	1.18E+04	9.49E+03	4.09E+01	1.16E+02
7.74E+02	1.29E+01	1.05E+04	7.89E+03	3.62E+01	1.09E+02
8.87E+02	1.13E+01	8.77E+03	5.94E+03	3.02E+01	9.84E+01
1.05E+03	9.54E+00	6.93E+03	4.07E+03	2.35E+01	8.65E+01
1.21E+03	8.27E+00	5.58E+03	2.86E+03	1.86E+01	7.70E+01
1.37E+03	7.29E+00	4.51E+03	2.05E+03	1.49E+01	6.88E+01
1.61E+03	6.20E+00	3.39E+03	1.39E+03	1.17E+01	5.94E+01
2.02E+03	4.96E+00	2.25E+03	8.28E+02	8.59E+00	4.82E+01
2.42E+03	4.13E+00	1.63E+03	5.54E+02	6.76E+00	4.10E+01
2.82E+03	3.54E+00	1.24E+03	3.87E+02	5.44E+00	3.56E+01
3.23E+03	3.10E+00	9.71E+02	2.80E+02	4.45E+00	3.15E+01
4.84E+03	2.07E+00	4.53E+02	9.73E+01	2.27E+00	2.14E+01
6.45E+03	1.55E+00	2.52E+02	4.61E+01	1.44E+00	1.60E+01
8.07E+03	1.24E+00	1.54E+02	3.02E+01	1.21E+00	1.25E+01
1.21E+04	8.27E-01	6.15E+01	4.56E+01	2.75E+00	8.31E+00
1.61E+04	6.20E-01	5.42E+01	1.95E+01	1.30E+00	7.48E+00

TABLE 1. Al, ALUMINUM (Continued)

H. E. Bennett and J. M. Bennett, Optical Properties and Electronics Structure of Metals and Alloys, ed. F. Abeles (North-Holland, 1966), p. 175.

ω(cm⁻¹)	λ(μm)	−ε1	ε2	n	k
3.13E+02	3.20E+01	2.60E+04	5.56E+04	1.33E+02	2.09E+02
3.23E+02	3.10E+01	2.58E+04	5.31E+04	1.29E+02	2.06E+02
3.33E+02	3.00E+01	2.56E+04	5.08E+04	1.25E+02	2.03E+02
3.45E+02	2.90E+01	2.54E+04	4.84E+04	1.21E+02	2.00E+02
3.57E+02	2.80E+01	2.47E+04	4.59E+04	1.17E+02	1.96E+02
3.70E+02	2.70E+01	2.45E+04	4.36E+04	1.13E+02	1.93E+02
3.85E+02	2.60E+01	2.38E+04	4.12E+04	1.09E+02	1.89E+02
4.00E+02	2.50E+01	2.36E+04	3.91E+04	1.05E+02	1.86E+02
4.17E+02	2.40E+01	2.31E+04	3.64E+04	1.00E+02	1.82E+02
4.35E+02	2.30E+01	2.25E+04	3.42E+04	9.60E+01	1.78E+02
4.55E+02	2.20E+01	2.19E+04	3.18E+04	9.15E+01	1.74E+02
4.76E+02	2.10E+01	2.10E+04	2.93E+04	8.68E+01	1.69E+02
5.00E+02	2.00E+01	2.05E+04	2.71E+04	8.21E+01	1.65E+02
5.26E+02	1.90E+01	1.96E+04	2.47E+04	7.73E+01	1.60E+02
5.56E+02	1.80E+01	1.88E+04	2.24E+04	7.24E+01	1.55E+02
5.88E+02	1.70E+01	1.80E+04	2.02E+04	6.74E+01	1.50E+02
6.25E+02	1.60E+01	1.69E+04	1.79E+04	6.23E+01	1.44E+02
6.67E+02	1.50E+01	1.58E+04	1.58E+04	5.71E+01	1.38E+02
7.14E+02	1.40E+01	1.47E+04	1.37E+04	5.19E+01	1.32E+02
7.69E+02	1.30E+01	1.37E+04	1.18E+04	4.67E+01	1.26E+02
8.33E+02	1.20E+01	1.24E+04	9.88E+03	4.15E+01	1.19E+02
9.09E+02	1.10E+01	1.10E+04	8.06E+03	3.63E+01	1.11E+02
1.00E+03	1.00E+01	9.84E+03	6.49E+03	3.12E+01	1.04E+02
1.11E+03	9.00E+00	8.41E+03	5.02E+03	2.63E+01	9.54E+01
1.25E+03	8.00E+00	7.02E+03	3.72E+03	2.15E+01	8.65E+01

TABLE 1. Al, ALUMINUM (Continued)
L. G. Schulz, J. Opt. Soc. Am. 44, 357 (1954) and 362 (1954).

ω(cm^{-1})	λ(μm)	$-\epsilon_1$	ϵ_2	n	k
1.05E+04	9.50E-01	6.92E+01	2.98E+01	1.75E+00	8.50E+00
1.11E+04	9.00E-01	5.54E+01	3.02E+01	1.96E+00	7.70E+00
1.18E+04	8.50E-01	4.68E+01	2.97E+01	2.08E+00	7.15E+00
1.25E+04	8.00E-01	4.57E+01	2.81E+01	1.99E+00	7.05E+00
1.33E+04	7.50E-01	4.75E+01	2.56E+01	1.80E+00	7.12E+00
1.43E+04	7.00E-01	4.66E+01	2.17E+01	1.55E+00	7.00E+00
1.54E+04	6.50E-01	4.20E+01	1.64E+01	1.24E+00	6.60E+00
1.67E+04	6.00E-01	3.51E+01	1.16E+01	9.70E-01	6.00E+00
1.82E+04	5.50E-01	2.77E+01	8.09E+00	7.60E-01	5.32E+00
2.00E+04	5.00E-01	2.27E+01	5.95E+00	6.20E-01	4.80E+00
2.22E+04	4.50E-01	1.84E+01	4.23E+00	4.90E-01	4.32E+00
2.50E+04	4.00E-01	1.52E+01	3.14E+00	4.00E-01	3.92E+00

TABLE 2. Cu, COPPER
L. G. Schulz, J. Opt. Am. 44, 357 and 362 (1954).

ω(cm^{-1})	λ(μm)	$-\epsilon_1$	ϵ_2	n	k
1.05E+04	9.50E-01	3.87E+01	1.62E+00	1.30E-01	6.22E+00
1.11E+04	9.00E-01	3.43E+01	1.52E+00	1.30E-01	5.86E+00
1.18E+04	8.50E-01	2.99E+01	1.31E+00	1.20E-01	5.47E+00
1.25E+04	8.00E-01	2.57E+01	1.22E+00	1.20E-01	5.07E+00
1.33E+04	7.50E-01	2.13E+01	1.11E+00	1.20E-01	4.62E+00
1.43E+04	7.00E-01	1.74E+01	1.00E+00	1.20E-01	4.17E+00
1.54E+04	6.50E-01	1.33E+01	9.49E-01	1.30E-01	3.65E+00
1.67E+04	6.00E-01	9.40E+00	1.04E+00	1.70E-01	3.07E+00
1.82E+04	5.50E-01	5.34E+00	3.48E+00	7.20E-01	2.42E+00
2.00E+04	5.00E-01	5.08E+00	4.26E+00	8.80E-01	2.42E+00
2.22E+04	4.50E-01	4.08E+00	3.83E+00	8.70E-01	2.20E+00

TABLE 2. Cu, COPPER (Continued)
A. P. Lenham and D. M. Treherne, J. Opt. Soc. Am. 56, 683 (1966).

ω(cm^{-1})	λ(μm)	$-\epsilon_1$	ϵ_2	n	k
5.00E+02	2.00E+01	1.35E+04	7.61E+03	3.16E+01	1.20E+02
5.56E+02	1.80E+01	1.15E+04	6.11E+03	2.76E+01	1.11E+02
6.25E+02	1.60E+01	9.00E+03	4.64E+03	2.37E+01	9.78E+01
7.14E+02	1.40E+01	6.80E+03	3.36E+03	1.98E+01	8.48E+01
8.33E+02	1.20E+01	5.05E+03	2.29E+03	1.57E+01	7.28E+01
1.00E+03	1.00E+01	3.50E+03	1.40E+03	1.16E+01	6.03E+01
1.25E+03	8.00E+00	2.20E+03	7.28E+02	7.66E+00	4.75E+01
1.67E+03	6.00E+00	1.30E+03	3.24E+02	4.46E+00	3.63E+01
2.00E+03	5.00E+00	1.00E+03	1.40E+02	2.21E+00	3.17E+01
2.50E+03	4.00E+00	6.22E+02	8.80E+01	1.76E+00	2.50E+01

TABLE 2. Cu, Copper (Continued)
P. F. Robusto and Braunstein, Phys. Stat. Sol. (b) 107, 443 (1981).

ω(cm^{-1})	λ(μm)	$-\epsilon_1$	ϵ_2	n	k
1.56E+04	6.40E-01	7.69E+00	1.70E+00	3.04E-01	2.79E+00
1.67E+04	6.00E-01	5.98E+00	1.70E+00	3.44E-01	2.47E+00
1.79E+04	5.60E-01	4.09E+00	2.20E+00	5.26E-01	2.09E+00
1.92E+04	5.20E-01	3.71E+00	6.99E+00	1.45E+00	2.41E+00
2.08E+04	4.80E-01	3.10E+00	7.01E+00	1.51E+00	2.32E+00
2.27E+04	4.40E-01	2.39E+00	6.79E+00	1.55E+00	2.19E+00
2.50E+04	4.00E-01	1.81E+00	5.92E+00	1.48E+00	2.00E+00

TABLE 2. Cu, COPPER (Continued)
H. J. Hagemann, W. Gudat, and C. Kunz, J. Opt. Soc. Am. 65, 742 (1975).

ω(cm⁻¹)	λ(μm)	−ε1	ε2	n	k
8.07E+02	1.24E+01	4.24E+03	4.25E+03	2.97E+01	7.16E+01
4.03E+03	2.48E+00	3.08E+02	6.03E+01	1.71E+00	1.76E+01
8.07E+03	1.24E+00	7.17E+01	7.46E+00	4.40E-01	8.48E+00
1.21E+04	8.27E-01	2.76E+01	2.74E+00	2.60E-01	5.26E+00
1.37E+04	7.29E-01	1.96E+01	1.95E+00	2.20E-01	4.43E+00
1.41E+04	7.08E-01	1.80E+01	1.79E+00	2.10E-01	4.25E+00
1.45E+04	6.89E-01	1.63E+01	1.70E+00	2.10E-01	4.04E+00
1.49E+04	6.70E-01	1.48E+01	1.69E+00	2.20E-01	3.85E+00
1.53E+04	6.53E-01	1.34E+01	1.54E+00	2.10E-01	3.67E+00
1.61E+04	6.20E-01	1.04E+01	1.75E+00	2.70E-01	3.24E+00

TABLE 2. Cu, COPPER (Continued)
B. Dold and R. Mecke, Optik 22, 435 (1965).

ω(cm⁻¹)	λ(μm)	−ε1	ε2	n	k
1.00E+03	1.00E+01	2.27E+03	1.14E+03	1.16E+01	4.90E+01
1.11E+03	9.00E+00	1.99E+03	9.05E+02	9.90E+00	4.57E+01
1.25E+03	8.00E+00	1.66E+03	6.72E+02	8.10E+00	4.15E+01
1.43E+03	7.00E+00	1.31E+03	4.71E+02	6.40E+00	3.68E+01
1.67E+03	6.00E+00	9.99E+02	3.17E+02	4.95E+00	3.20E+01
2.00E+03	5.00E+00	6.95E+02	1.92E+02	3.60E+00	2.66E+01
2.50E+03	4.00E+00	4.56E+02	1.05E+02	2.45E+00	2.15E+01
3.33E+03	3.00E+00	2.54E+02	4.80E+01	1.50E+00	1.60E+01
5.00E+03	2.00E+00	1.12E+02	1.80E+01	8.50E-01	1.06E+01
6.67E+03	1.50E+00	6.37E+01	9.28E+00	5.80E-01	8.00E+00
8.00E+03	1.25E+00	4.46E+01	6.57E+00	4.90E-01	6.70E+00

TABLE 3. Au, GOLD
H. E. Bennett and J. M. Bennett, Optical Properties and Electronic Structure of Metals and Alloys edited by F. Abeles (North-Holland, Amsterdam, 1966), p. 175.

ω(cm⁻¹)	λ(μm)	−ε1	ε2	n	k
3.13E+02	3.20E+01	3.69E+04	2.54E+04	6.28E+01	2.02E+02
3.33E+02	3.00E+01	3.37E+04	2.17E+04	5.66E+01	1.92E+02
3.57E+02	2.80E+01	3.06E+04	1.84E+04	5.05E+01	1.82E+02
3.85E+02	2.60E+01	2.73E+04	1.53E+04	4.46E+01	1.71E+02
4.17E+02	2.40E+01	2.41E+04	1.24E+04	3.89E+01	1.60E+02
4.55E+02	2.20E+01	2.08E+04	9.89E+03	3.34E+01	1.48E+02
5.00E+02	2.00E+01	1.77E+04	7.67E+03	2.82E+01	1.36E+02
5.56E+02	1.80E+01	1.48E+04	5.78E+03	2.33E+01	1.24E+02
6.25E+02	1.60E+01	1.22E+04	4.19E+03	1.87E+01	1.12E+02
7.14E+02	1.40E+01	9.51E+03	2.86E+03	1.45E+01	9.86E+01
8.33E+02	1.20E+01	7.14E+03	1.84E+03	1.08E+01	8.52E+01
1.00E+03	1.00E+01	5.05E+03	1.09E+03	7.62E+00	7.15E+01
1.25E+03	8.00E+00	3.29E+03	5.68E+02	4.93E+00	5.76E+01
1.43E+03	7.00E+00	2.54E+03	3.83E+02	3.79E+00	5.05E+01
1.67E+03	6.00E+00	1.88E+03	2.42E+02	2.79E+00	4.34E+01
2.00E+03	5.00E+00	1.31E+03	1.41E+02	1.95E+00	3.62E+01
2.50E+03	4.00E+00	8.39E+02	7.25E+01	1.25E+00	2.90E+01
3.33E+03	3.00E+00	4.75E+02	3.07E+01	7.04E-01	2.18E+01

TABLE 3. Au, Gold (Continued)
L. G. Schulz, J. Opt. Soc. Am. 44, 357 and 362 (1954).

ω(cm⁻¹)	λ(μm)	−ε1	ε2	n	k
1.05E+04	9.50E-01	3.72E+01	2.32E+00	1.90E-01	6.10E+00
1.11E+04	9.00E-01	3.27E+01	2.06E+00	1.80E-01	5.72E+00
1.25E+04	8.00E-01	2.34E+01	1.55E+00	1.60E-01	4.84E+00
1.43E+04	7.00E-01	1.57E+01	1.35E+00	1.70E-01	3.97E+00
1.67E+04	6.00E-01	8.77E+00	1.37E+00	2.30E-01	2.97E+00
2.00E+04	5.00E-01	2.68E+00	3.09E+00	8.40E-01	1.84E+00
2.22E+04	4.50E-01	1.57E+00	5.26E+00	1.40E+00	1.88E+00

TABLE 3. Au, GOLD (Continued)
G. P. Motulevich and A. A. Shubin, Soviet Phys. JETP 20, 560 (1965).

ω(cm⁻¹)	λ(μm)	−ε1	ε2	n	k
8.33E+02	1.20E+01	6.24E+03	2.48E+03	1.54E+01	8.05E+01
1.00E+03	1.00E+01	4.42E+03	1.55E+03	1.15E+01	6.75E+01
1.25E+03	8.00E+00	2.92E+03	8.54E+02	7.82E+00	5.46E+01
1.67E+03	6.00E+00	1.72E+03	3.92E+02	4.70E+00	4.17E+01
2.00E+03	5.00E+00	1.23E+03	2.30E+02	3.27E+00	3.52E+01
2.50E+03	4.00E+00	7.74E+02	1.14E+02	2.04E+00	2.79E+01
3.33E+03	3.00E+00	4.40E+02	4.91E+01	1.17E+00	2.10E+01
4.00E+03	2.50E+00	2.99E+02	2.84E+01	8.20E-01	1.73E+01
5.00E+03	2.00E+00	1.93E+02	1.52E+01	5.46E-01	1.39E+01
6.67E+03	1.50E+00	1.08E+02	7.43E+00	3.57E-01	1.04E+01
1.00E+04	1.00E+00	4.50E+01	3.01E+00	2.24E-01	6.71E+00

TABLE 3. Au, GOLD (Continued)
V. G. Padalka and I. N. Shklyarevskii, Opt. Spectr. U.S.S.R. 11, 285 (1961).

ω(cm⁻¹)	λ(μm)	−ε1	ε2	n	k
9.09E+02	1.10E+01	3.31E+03	1.01E+03	8.71E+00	5.82E+01
1.00E+03	1.00E+01	2.80E+03	7.91E+02	7.41E+00	5.34E+01
1.11E+03	9.00E+00	2.32E+03	6.04E+02	6.21E+00	4.86E+01
1.25E+03	8.00E+00	1.87E+03	4.39E+02	5.05E+00	4.35E+01
1.43E+03	7.00E+00	1.45E+03	3.04E+02	3.97E+00	3.83E+01
1.67E+03	6.00E+00	1.08E+03	1.99E+02	3.01E+00	3.30E+01
2.00E+03	5.00E+00	7.62E+02	1.21E+02	2.19E+00	2.77E+01
2.50E+03	4.00E+00	4.91E+02	6.62E+01	1.49E+00	2.22E+01
3.33E+03	3.00E+00	2.78E+02	3.11E+01	9.30E-01	1.67E+01
5.00E+03	2.00E+00	1.25E+02	1.21E+01	5.40E-01	1.12E+01
1.00E+04	1.00E+00	3.10E+01	3.46E+00	3.10E-01	5.58E+00

TABLE 3. Au, GOLD (Continued)
G. A. Bolotin, A. N. Voloshinskii, M. M. Neskov, A. V. Sokolov, and B. A. Charikov, Phys. Met. and Met. 13, 823 (1962).

ω(cm⁻¹)	λ(μm)	−ε1	ε2	n	k
1.05E+03	9.50E+00	2.44E+03	1.10E+03	1.09E+01	5.06E+01
1.11E+03	9.00E+00	2.19E+03	9.58E+02	1.00E+01	4.79E+01
1.18E+03	8.50E+00	1.98E+03	8.86E+02	9.72E+00	4.56E+01
1.25E+03	8.00E+00	1.87E+03	6.95E+02	7.90E+00	4.40E+01
1.43E+03	7.00E+00	1.51E+03	5.22E+02	6.62E+00	3.94E+01
1.54E+03	6.50E+00	1.37E+03	4.10E+02	5.48E+00	3.74E+01
1.67E+03	6.00E+00	1.17E+03	3.25E+02	4.71E+00	3.45E+01
2.00E+03	5.00E+00	8.05E+02	1.54E+02	2.71E+00	2.85E+01
2.22E+03	4.50E+00	6.35E+02	1.15E+02	2.28E+00	2.53E+01
2.50E+03	4.00E+00	5.35E+02	8.72E+01	1.88E+00	2.32E+01
3.33E+03	3.00E+00	3.08E+02	4.40E+01	1.25E+00	1.76E+01
4.00E+03	2.50E+00	2.07E+02	1.99E+01	6.90E-01	1.44E+01

TABLE 3. Au, Gold (Continued)
G. Brandli and A. J. Sievers, Phy. Rev. B 5, 3550 (1972).

ω(cm⁻¹)	λ(μm)	−ε1	ε2	n	k
3.14E+01	3.18E+02	8.62E+04	6.23E+05	5.21E+02	5.98E+02
3.72E+01	2.69E+02	8.74E+04	5.37E+05	4.78E+02	5.62E+02
4.24E+01	2.36E+02	9.47E+04	4.81E+05	4.45E+02	5.41E+02
5.00E+01	2.00E+02	9.18E+04	4.00E+05	3.99E+02	5.01E+02
6.06E+01	1.65E+02	9.87E+04	3.37E+05	3.55E+02	4.74E+02
6.99E+01	1.43E+02	9.60E+04	2.82E+05	3.18E+02	4.44E+02
8.00E+01	1.25E+02	9.97E+04	2.47E+05	2.89E+02	4.28E+02
9.01E+01	1.11E+02	1.00E+05	2.15E+05	2.62E+02	4.11E+02
1.00E+02	1.00E+02	1.06E+05	1.93E+05	2.39E+02	4.04E+02
1.10E+02	9.09E+01	1.03E+05	1.68E+05	2.17E+02	3.88E+02
1.20E+02	8.33E+01	1.04E+05	1.49E+05	1.97E+02	3.78E+02
1.30E+02	7.69E+01	9.72E+04	1.30E+05	1.80E+02	3.60E+02
1.40E+02	7.14E+01	9.66E+04	1.14E+05	1.63E+02	3.51E+02
1.50E+02	6.67E+01	8.51E+04	1.00E+05	1.52E+02	3.29E+02

TABLE 3. Au, Gold (Continued)
J. H. Weaver, C. Krafka, D. W. Lynch, and E. E. Koch (with C. G. Olson), Physics Data, Optical Properties of Metals, (Fach-Information Zentrum, Kalsrube, FOR, 1981).

ω(cm⁻¹)	λ(μm)	−ε1	ε2	n	k
8.07E+02	1.24E+01	6.79E+03	1.35E+03	8.17E+00	8.28E+01
1.21E+03	8.27E+00	3.07E+03	4.12E+02	3.71E+00	5.56E+01
1.61E+03	6.20E+00	1.74E+03	1.78E+02	2.13E+00	4.17E+01
2.02E+03	4.96E+00	1.11E+03	9.29E+01	1.39E+00	3.34E+01
2.42E+03	4.13E+00	7.73E+02	5.51E+01	9.90E-01	2.78E+01
2.82E+03	3.54E+00	5.67E+02	3.57E+01	7.50E-01	2.38E+01
3.23E+03	3.10E+00	4.34E+02	2.46E+01	5.90E-01	2.08E+01
3.63E+03	2.76E+00	3.42E+02	1.74E+01	4.70E-01	1.85E+01
4.03E+03	2.48E+00	2.76E+02	1.30E+01	3.90E-01	1.66E+01
4.44E+03	2.25E+00	2.27E+02	9.95E+00	3.30E-01	1.51E+01
4.84E+03	2.07E+00	1.90E+02	7.72E+00	2.80E-01	1.38E+01
5.24E+03	1.91E+00	1.61E+02	6.09E+00	2.40E-01	1.27E+01
5.65E+03	1.77E+00	1.38E+02	5.17E+00	2.20E-01	1.18E+01
6.05E+03	1.65E+00	1.19E+02	4.15E+00	1.90E-01	1.09E+01
6.45E+03	1.55E+00	1.04E+02	3.68E+00	1.80E-01	1.02E+01
6.86E+03	1.46E+00	9.16E+01	3.06E+00	1.60E-01	9.57E+00
7.26E+03	1.38E+00	8.12E+01	2.70E+00	1.50E-01	9.01E+00
7.66E+03	1.31E+00	7.21E+01	2.38E+00	1.40E-01	8.49E+00
8.07E+03	1.24E+00	6.45E+01	2.09E+00	1.30E-01	8.03E+00
1.21E+04	8.27E-01	2.48E+01	7.97E-01	8.00E-02	4.98E+00
1.61E+04	6.20E-01	9.97E+00	8.22E-01	1.30E-01	3.16E+00

TABLE 4. Pb, LEAD
G. Brandli and A. J. Sievers, Phys. Rev. B 5, 3550 (1972).

ω(cm⁻¹)	λ(μm)	−ε1	ε2	n	k
6.25E+00	1.60E+03	1.99E+03	4.43E+05	4.69E+02	4.71E+02
1.17E+01	8.57E+02	1.74E+03	2.21E+05	3.31E+02	3.34E+02
1.78E+01	5.63E+02	2.21E+03	1.64E+05	2.85E+02	2.89E+02
2.61E+01	3.83E+02	2.40E+03	1.17E+05	2.39E+02	2.44E+02
3.38E+01	2.96E+02	2.14E+03	8.49E+04	2.03E+02	2.09E+02
4.41E+01	2.27E+02	2.10E+03	6.44E+04	1.77E+02	1.82E+02
5.38E+01	1.86E+02	2.09E+03	5.27E+04	1.59E+02	1.66E+02
6.28E+01	1.59E+02	2.05E+03	4.47E+04	1.46E+02	1.53E+02
7.19E+01	1.39E+02	2.01E+03	3.87E+04	1.35E+02	1.43E+02
7.96E+01	1.26E+02	2.02E+03	3.50E+04	1.28E+02	1.36E+02
8.92E+01	1.12E+02	1.85E+03	2.98E+04	1.18E+02	1.26E+02
1.02E+02	9.80E+01	1.71E+03	2.51E+04	1.08E+02	1.16E+02
1.12E+02	8.96E+01	1.64E+03	2.24E+04	1.02E+02	1.10E+02
1.21E+02	8.25E+01	1.61E+03	2.05E+04	9.72E+01	1.05E+02

TABLE 4. Pb, LEAD (Continued)
A. I. Golovashkin and G. P. Motulevich, Soviet Physics JETP 26, 881 (1968)

ω(cm⁻¹)	λ(μm)	−ε1	ε2	n	k
8.33E+02	1.20E+01	1.04E+03	1.99E+03	2.46E+01	4.05E+01
9.09E+02	1.10E+01	9.98E+02	1.82E+03	2.32E+01	3.92E+01
1.00E+03	1.00E+01	9.58E+02	1.57E+03	2.10E+01	3.74E+01
1.11E+03	9.00E+00	9.32E+02	1.34E+03	1.87E+01	3.58E+01
1.25E+03	8.00E+00	8.60E+02	1.10E+03	1.64E+01	3.36E+01
1.43E+03	7.00E+00	7.56E+02	8.71E+02	1.41E+01	3.09E+01
1.67E+03	6.00E+00	6.53E+02	6.58E+02	1.17E+01	2.81E+01
2.00E+03	5.00E+00	5.33E+02	4.48E+02	9.04E+00	2.48E+01
2.50E+03	4.00E+00	3.89E+02	2.74E+02	6.58E+00	2.08E+01
2.86E+03	3.50E+00	3.17E+02	2.01E+02	5.39E+00	1.86E+01
3.33E+03	3.00E+00	2.51E+02	1.40E+02	4.27E+00	1.64E+01
3.85E+03	2.60E+00	1.95E+02	9.94E+01	3.45E+00	1.44E+01
4.00E+03	2.50E+00	1.83E+02	8.95E+01	3.22E+00	1.39E+01
4.17E+03	2.40E+00	1.65E+02	8.00E+01	3.03E+00	1.32E+01
4.35E+03	2.30E+00	1.56E+02	7.27E+01	2.84E+00	1.28E+01
4.55E+03	2.20E+00	1.42E+02	6.42E+01	2.63E+00	1.22E+01
4.76E+03	2.10E+00	1.31E+02	5.78E+01	2.47E+00	1.17E+01
5.00E+03	2.00E+00	1.20E+02	5.20E+01	2.32E+00	1.12E+01
5.88E+03	1.70E+00	8.61E+01	3.58E+01	1.89E+00	9.47E+00
6.67E+03	1.50E+00	6.62E+01	2.72E+01	1.64E+00	8.30E+00
7.69E+03	1.30E+00	7.43E-01	5.19E+00	1.50E+00	1.73E+00
1.00E+04	1.00E+00	2.64E+01	1.47E+01	1.38E+00	5.32E+00
1.11E+04	9.00E-01	1.99E+01	1.31E+01	1.40E+00	4.68E+00
1.18E+04	8.50E-01	1.68E+01	1.25E+01	1.44E+00	4.35E+00
1.25E+04	8.00E-01	1.45E+01	1.23E+01	1.50E+00	4.09E+00
1.33E+04	7.50E-01	1.17E+01	1.21E+01	1.60E+00	3.78E+00
1.43E+04	7.00E-01	9.58E+00	1.27E+01	1.78E+00	3.57E+00
1.54E+04	6.50E-01	8.67E+00	1.34E+01	1.91E+00	3.51E+00
1.67E+04	6.00E-01	8.25E+00	1.32E+01	1.91E+00	3.45E+00
1.82E+04	5.50E-01	8.21E+00	1.24E+01	1.83E+00	3.40E+00
2.00E+04	5.00E-01	8.00E+00	1.12E+01	1.70E+00	3.30E+00
2.22E+04	4.50E-01	8.04E+00	9.16E+00	1.44E+00	3.18E+00

TABLE 5. Ag, SILVER
H. E. Bennett and J. M. Bennett in Optical Properties and Electronic Structure of Metals and Alloys, edited by F. Abeles (North-Holland, Amsterdam, 1966), p. 175.

ω(cm⁻¹)	λ(μm)	−ε1	ε2	n	k
3.13E+02	3.20E+01	4.44E+04	2.06E+04	4.78E+01	2.16E+02
3.33E+02	3.00E+01	3.98E+04	1.74E+04	4.26E+01	2.04E+02
3.57E+02	2.80E+01	3.55E+04	1.44E+04	3.76E+01	1.92E+02
3.85E+02	2.60E+01	3.10E+04	1.17E+04	3.28E+01	1.79E+02
4.17E+02	2.40E+01	2.71E+04	9.45E+03	2.83E+01	1.67E+02
4.55E+02	2.20E+01	2.31E+04	7.39E+03	2.40E+01	1.54E+02
5.00E+02	2.00E+01	1.95E+04	5.67E+03	2.01E+01	1.41E+02
5.56E+02	1.80E+01	1.59E+04	4.17E+03	1.64E+01	1.27E+02
6.25E+02	1.60E+01	1.28E+04	2.99E+03	1.31E+01	1.14E+02
7.14E+02	1.40E+01	9.90E+03	2.02E+03	1.01E+01	1.00E+02
8.33E+02	1.20E+01	7.34E+03	1.28E+03	7.46E+00	8.60E+01
1.00E+03	1.00E+01	5.14E+03	7.49E+02	5.21E+00	7.19E+01
1.25E+03	8.00E+00	3.32E+03	3.87E+02	3.35E+00	5.77E+01
1.43E+03	7.00E+00	2.55E+03	2.60E+02	2.57E+00	5.06E+01
1.67E+03	6.00E+00	1.88E+03	1.64E+02	1.89E+00	4.34E+01
2.00E+03	5.00E+00	1.31E+03	9.56E+01	1.32E+00	3.62E+01
2.50E+03	4.00E+00	8.34E+02	4.88E+01	8.44E-01	2.89E+01
3.33E+03	3.00E+00	4.71E+02	2.06E+01	4.74E-01	2.17E+01
5.00E+03	2.00E+00	2.10E+02	6.15E+00	2.12E-01	1.45E+01

TABLE 5. Ag, SILVER (Continued)
L. G. Schulz, J. Opt. Soc. Am. 44, p. 357 and 362 (1954).

ω(cm⁻¹)	λ(μm)	−ϵ1	ϵ2	n	k
1.05E+04	9.50E-01	4.30E+01	1.44E+00	1.10E-01	6.56E+00
1.11E+04	9.00E-01	3.87E+01	1.31E+00	1.05E-01	6.22E+00
1.18E+04	8.50E-01	3.42E+01	1.17E+00	1.00E-01	5.85E+00
1.25E+04	8.00E-01	2.97E+01	9.81E-01	9.00E-02	5.45E+00
1.33E+04	7.50E-01	2.55E+01	8.08E-01	8.00E-02	5.05E+00
1.43E+04	7.00E-01	2.13E+01	6.93E-01	7.50E-02	4.62E+00
1.54E+04	6.50E-01	1.76E+01	5.88E-01	7.00E-02	4.20E+00
1.67E+04	6.00E-01	1.41E+01	4.50E-01	6.00E-02	3.75E+00
1.82E+04	5.50E-01	1.10E+01	3.65E-01	5.50E-02	3.32E+00
2.00E+04	5.00E-01	8.23E+00	2.87E-01	5.00E-02	2.87E+00
2.22E+04	4.50E-01	5.55E+00	2.66E+00	5.50E-01	2.42E+00
2.50E+04	4.00E-01	3.72E+00	2.90E-01	7.50E-02	1.93E+00

TABLE 5. Ag, Silver (Continued)
H. J. Hageman, W. Gudat, and C. Kunz, J. Opt. Soc. Am. 65, 742 (1975).

ω(cm⁻¹)	λ(μm)	−ϵ1	ϵ2	n	k
8.07E+02	1.24E+01	8.05E+03	1.79E+03	9.91E+00	9.03E+01
1.61E+03	6.20E+00	2.08E+03	2.60E+02	2.84E+00	4.57E+01
2.42E+03	4.13E+00	9.29E+02	8.60E+01	1.41E+00	3.05E+01
3.23E+03	3.10E+00	5.23E+02	4.17E+01	9.10E-01	2.29E+01
4.03E+03	2.48E+00	3.35E+02	2.45E+01	6.70E-01	1.83E+01
8.07E+03	1.24E+00	8.15E+01	5.06E+00	2.80E-01	9.03E+00
1.21E+04	8.27E-01	3.35E+01	3.13E+00	2.70E-01	5.79E+00
1.61E+04	6.20E-01	1.74E+01	2.26E+00	2.70E-01	4.18E+00

TABLE 6. Co, COBALT
M. M. Kirillova and B. A. Charikov, Opt. Spectry. 17, 134 (1964).

ω(cm⁻¹)	λ(μm)	−ϵ1	ϵ2	n	k
5.00E+02	2.00E+01	2.44E+03	1.57E+03	1.52E+01	5.17E+01
5.26E+02	1.90E+01	2.18E+03	1.46E+03	1.49E+01	4.90E+01
5.88E+02	1.70E+01	1.84E+03	1.22E+03	1.35E+01	4.50E+01
6.67E+02	1.50E+01	1.51E+03	9.07E+02	1.12E+01	4.05E+01
7.14E+02	1.40E+01	1.34E+03	7.75E+02	1.02E+01	3.80E+01
8.33E+02	1.20E+01	1.12E+03	6.25E+02	9.00E+00	3.47E+01
9.09E+02	1.10E+01	9.97E+02	5.28E+02	8.10E+00	3.26E+01
1.00E+03	1.00E+01	8.20E+02	4.19E+02	7.10E+00	2.95E+01
1.11E+03	9.00E+00	6.97E+02	3.57E+02	6.56E+00	2.72E+01
1.25E+03	8.00E+00	5.42E+02	2.78E+02	5.80E+00	2.40E+01
1.43E+03	7.00E+00	4.08E+02	2.26E+02	5.40E+00	2.09E+01
1.54E+03	6.50E+00	3.45E+02	2.01E+02	5.20E+00	1.93E+01
1.67E+03	6.00E+00	2.81E+02	1.75E+02	5.00E+00	1.75E+01
1.82E+03	5.50E+00	2.40E+02	1.54E+02	4.76E+00	1.62E+01
2.00E+03	5.00E+00	1.94E+02	1.38E+02	4.70E+00	1.47E+01
2.22E+03	4.50E+00	1.36E+02	1.20E+02	4.78E+00	1.26E+01
2.50E+03	4.00E+00	9.89E+01	1.03E+02	4.70E+00	1.10E+01
3.33E+03	3.00E+00	4.78E+01	8.26E+01	4.88E+00	8.46E+00
4.00E+03	2.50E+00	3.48E+01	7.96E+01	5.10E+00	7.80E+00

TABLE 6. Co, COBALT (Continued)
P. B. Johnson and R. W. Christy, Phys. B 9, 5056 (1974).

ω(cm⁻¹)	λ(μm)	−ε1	ε2	n	k
5.16E+03	1.94E+00	4.57E+01	6.03E+01	3.87E+00	7.79E+00
6.21E+03	1.61E+00	3.97E+01	5.24E+01	3.61E+00	7.26E+00
7.18E+03	1.39E+00	3.41E+01	4.63E+01	3.42E+00	6.77E+00
8.23E+03	1.22E+00	2.98E+01	4.00E+01	3.17E+00	6.31E+00
9.19E+03	1.09E+00	2.59E+01	3.46E+01	2.94E+00	5.88E+00
1.02E+04	9.84E-01	2.25E+01	3.06E+01	2.78E+00	5.50E+00
1.12E+04	8.92E-01	1.96E+01	2.73E+01	2.65E+00	5.16E+00
1.22E+04	8.21E-01	1.74E+01	2.47E+01	2.53E+00	4.88E+00
1.32E+04	7.56E-01	1.58E+01	2.23E+01	2.40E+00	4.64E+00
1.42E+04	7.04E-01	1.45E+01	2.06E+01	2.31E+00	4.45E+00
1.52E+04	6.59E-01	1.32E+01	1.92E+01	2.25E+00	4.27E+00
1.62E+04	6.17E-01	1.21E+01	1.80E+01	2.19E+00	4.11E+00
1.72E+04	5.82E-01	1.11E+01	1.69E+01	2.13E+00	3.96E+00
1.82E+04	5.49E-01	1.04E+01	1.57E+01	2.05E+00	3.82E+00
1.92E+04	5.21E-01	9.66E+00	1.45E+01	1.97E+00	3.68E+00
2.02E+04	4.96E-01	9.07E+00	1.33E+01	1.88E+00	3.55E+00
2.12E+04	4.71E-01	8.35E+00	1.23E+01	1.81E+00	3.41E+00
2.22E+04	4.51E-01	7.73E+00	1.14E+01	1.74E+00	3.28E+00
2.32E+04	4.30E-01	7.26E+00	1.06E+01	1.67E+00	3.17E+00
2.42E+04	4.13E-01	6.71E+00	9.82E+00	1.61E+00	3.05E+00
2.52E+04	3.97E-01	6.12E+00	9.20E+00	1.57E+00	2.93E+00
2.62E+04	3.81E-01	5.61E+00	8.63E+00	1.53E+00	2.82E+00
2.72E+04	3.68E-01	5.09E+00	8.13E+00	1.50E+00	2.71E+00
2.82E+04	3.54E-01	4.59E+00	7.78E+00	1.49E+00	2.61E+00
2.92E+04	3.42E-01	4.16E+00	7.46E+00	1.48E+00	2.52E+00
3.02E+04	3.31E-01	3.82E+00	7.12E+00	1.46E+00	2.44E+00
3.12E+04	3.20E-01	3.51E+00	6.87E+00	1.45E+00	2.37E+00
3.22E+04	3.11E-01	3.26E+00	6.65E+00	1.44E+00	2.31E+00
3.32E+04	3.01E-01	2.99E+00	6.48E+00	1.44E+00	2.25E+00
3.42E+04	2.92E-01	2.72E+00	6.31E+00	1.44E+00	2.19E+00
3.52E+04	2.84E-01	2.51E+00	6.16E+00	1.44E+00	2.14E+00
3.62E+04	2.76E-01	2.29E+00	6.02E+00	1.44E+00	2.09E+00
3.72E+04	2.69E-01	2.09E+00	5.88E+00	1.44E+00	2.04E+00
3.82E+04	2.62E-01	1.97E+00	5.79E+00	1.44E+00	2.01E+00
3.92E+04	2.55E-01	1.78E+00	5.71E+00	1.45E+00	1.97E+00
4.02E+04	2.49E-01	1.62E+00	5.60E+00	1.45E+00	1.93E+00
4.12E+04	2.43E-01	1.52E+00	5.58E+00	1.46E+00	1.91E+00
4.22E+04	2.37E-01	1.41E+00	5.56E+00	1.47E+00	1.89E+00
4.32E+04	2.31E-01	1.34E+00	5.50E+00	1.47E+00	1.87E+00
4.42E+04	2.26E-01	1.36E+00	5.39E+00	1.45E+00	1.86E+00
4.52E+04	2.21E-01	1.38E+00	5.29E+00	1.43E+00	1.85E+00
4.62E+04	2.16E-01	1.40E+00	5.19E+00	1.41E+00	1.84E+00
4.72E+04	2.12E-01	1.41E+00	5.02E+00	1.38E+00	1.82E+00
4.82E+04	2.07E-01	1.32E+00	4.84E+00	1.36E+00	1.78E+00
4.92E+04	2.03E-01	1.32E+00	4.62E+00	1.32E+00	1.75E+00
5.02E+04	1.99E-01	1.26E+00	4.41E+00	1.29E+00	1.71E+00
5.12E+04	1.95E-01	1.20E+00	4.21E+00	1.26E+00	1.67E+00
5.22E+04	1.92E-01	1.19E+00	3.94E+00	1.21E+00	1.63E+00
5.32E+04	1.88E-01	1.18E+00	3.69E+00	1.16E+00	1.59E+00

TABLE 6. Co, COBALT (Continued)
J. H. Weaver, E. Colavita, D. W. Lynch and R. Rosei, Phys. Rev. B 19, 3850 (1979).

ω(cm⁻¹)	λ(μm)	−ε1	ε2	n	k
8.07E+02	1.24E+01	1.39E+03	5.08E+02	6.71E+00	3.79E+01
1.05E+03	9.54E+00	9.05E+02	3.29E+02	5.38E+00	3.06E+01
1.21E+03	8.27E+00	6.27E+02	2.37E+02	4.66E+00	2.55E+01
1.61E+03	6.20E+00	3.40E+02	1.33E+02	3.55E+00	1.88E+01
2.02E+03	4.96E+00	1.97E+02	1.16E+02	3.98E+00	1.46E+01
2.42E+03	4.13E+00	1.32E+02	9.83E+01	4.04E+00	1.22E+01
2.82E+03	3.54E+00	9.03E+01	8.68E+01	4.18E+00	1.04E+01
3.23E+03	3.10E+00	6.54E+01	7.74E+01	4.24E+00	9.13E+00
3.63E+03	2.76E+00	4.80E+01	6.89E+01	4.24E+00	8.12E+00
4.03E+03	2.48E+00	3.22E+01	6.34E+01	4.41E+00	7.19E+00
4.84E+03	2.07E+00	1.35E+01	6.02E+01	4.91E+00	6.13E+00
5.65E+03	1.77E+00	6.76E+00	6.13E+01	5.24E+00	5.85E+00
6.45E+03	1.55E+00	7.96E+00	6.09E+01	5.17E+00	5.89E+00
7.26E+03	1.38E+00	1.10E+01	5.88E+01	4.94E+00	5.95E+00
8.07E+03	1.24E+00	1.44E+01	5.23E+01	4.46E+00	5.86E+00
9.68E+03	1.03E+00	1.42E+01	4.08E+01	3.81E+00	5.36E+00
1.21E+04	8.27E-01	1.50E+01	3.08E+01	3.10E+00	4.96E+00
1.61E+04	6.20E-01	1.11E+01	1.77E+01	2.21E+00	4.00E+00

TABLE 7. Fe, Iron
J. H. Weaver, E. Colavita, D. W. Lynch, and R. Rosei, Phys. Rev. B 19, 3850 (1979).

ω(cm⁻¹)	λ(μm)	−ϵ1	ϵ2	n	k
8.07E+02	1.24E+01	1.05E+03	4.24E+02	6.41E+00	3.31E+01
1.05E+03	9.54E+00	6.79E+02	3.36E+02	6.26E+00	2.68E+01
1.21E+03	8.27E+00	4.82E+02	2.86E+02	6.26E+00	2.28E+01
1.37E+03	7.29E+00	3.82E+02	2.58E+02	6.28E+00	2.05E+01
1.61E+03	6.20E+00	3.19E+02	1.34E+02	3.68E+00	1.82E+01
1.77E+03	5.64E+00	2.16E+02	1.48E+02	4.80E+00	1.55E+01
1.94E+03	5.17E+00	1.88E+02	1.45E+02	4.96E+00	1.46E+01
2.10E+03	4.77E+00	1.62E+02	1.36E+02	4.98E+00	1.37E+01
2.26E+03	4.43E+00	1.43E+02	1.23E+02	4.78E+00	1.29E+01
2.42E+03	4.13E+00	1.21E+02	1.17E+02	4.87E+00	1.21E+01
2.58E+03	3.87E+00	1.11E+02	1.09E+02	4.73E+00	1.15E+01
2.74E+03	3.65E+00	9.69E+01	1.03E+02	4.70E+00	1.09E+01
2.90E+03	3.44E+00	8.71E+01	9.77E+01	4.68E+00	1.04E+01
3.06E+03	3.26E+00	8.00E+01	9.32E+01	4.63E+00	1.01E+01
3.23E+03	3.10E+00	7.55E+01	8.62E+01	4.42E+00	9.75E+00
4.03E+03	2.48E+00	4.72E+01	6.64E+01	4.14E+00	8.02E+00
4.84E+03	2.07E+00	3.29E+01	5.46E+01	3.93E+00	6.95E+00
5.65E+03	1.77E+00	2.38E+01	4.66E+01	3.78E+00	6.17E+00
6.45E+03	1.55E+00	1.80E+01	4.09E+01	3.65E+00	5.60E+00
7.26E+03	1.38E+00	1.42E+01	3.63E+01	3.52E+00	5.16E+00
8.07E+03	1.24E+00	1.12E+01	3.29E+01	3.43E+00	4.79E+00
8.87E+03	1.13E+00	1.03E+01	3.08E+01	3.33E+00	4.62E+00
9.68E+03	1.03E+00	7.65E+00	2.76E+01	3.24E+00	4.26E+00
1.05E+04	9.54E-01	6.58E+00	2.57E+01	3.16E+00	4.07E+00
1.13E+04	8.86E-01	5.24E+00	2.41E+01	3.12E+00	3.87E+00
1.21E+04	8.27E-01	4.91E+00	2.30E+01	3.05E+00	3.77E+00
1.29E+04	7.75E-01	3.96E+00	2.16E+01	3.00E+00	3.60E+00
1.37E+04	7.29E-01	3.51E+00	2.10E+01	2.98E+00	3.52E+00
1.45E+04	6.89E-01	3.45E+00	2.02E+01	2.92E+00	3.46E+00
1.53E+04	6.53E-01	3.00E+00	1.95E+01	2.89E+00	3.37E+00
1.61E+04	6.20E-01	3.11E+00	1.92E+01	2.86E+00	3.36E+00

TABLE 7. Fe, Iron (Continued)
G. A. Bolotin, M. M. Kirillova, and V. M. Mayevskiy, Phys. Met. Metall, 27(2) 31 (1969).

ω(cm⁻¹)	λ(μm)	−ϵ1	ϵ2	n	k
5.26E+02	1.90E+01	1.92E+03	1.09E+03	1.20E+01	4.54E+01
5.56E+02	1.80E+01	1.58E+03	9.52E+02	1.15E+01	4.14E+01
5.88E+02	1.70E+01	1.41E+03	8.70E+02	1.11E+01	3.92E+01
6.25E+02	1.60E+01	1.27E+03	8.04E+02	1.08E+01	3.72E+01
6.67E+02	1.50E+01	1.15E+03	7.62E+02	1.07E+01	3.56E+01
7.14E+02	1.40E+01	1.06E+03	7.18E+02	1.05E+01	3.42E+01
7.69E+02	1.30E+01	9.52E+02	6.63E+02	1.02E+01	3.25E+01
8.33E+02	1.20E+01	8.43E+02	5.47E+02	9.00E+00	3.04E+01
9.09E+02	1.10E+01	7.20E+02	4.48E+02	8.00E+00	2.80E+01
1.00E+03	1.00E+01	6.06E+02	3.58E+02	7.00E+00	2.56E+01
1.11E+03	9.00E+00	4.67E+02	2.98E+02	6.60E+00	2.26E+01
1.25E+03	8.00E+00	3.46E+02	2.56E+02	6.50E+00	1.97E+01
1.43E+03	7.00E+00	2.68E+02	1.94E+02	5.60E+00	1.73E+01
1.67E+03	6.00E+00	1.89E+02	1.35E+02	4.65E+00	1.45E+01
2.00E+03	5.00E+00	1.39E+02	1.04E+02	4.15E+00	1.25E+01
2.50E+03	4.00E+00	8.36E+01	8.10E+01	4.05E+00	1.00E+01
3.33E+03	3.00E+00	4.72E+01	6.16E+01	3.90E+00	7.90E+00
4.17E+03	2.40E+00	4.01E+01	4.37E+01	3.10E+00	7.05E+00
5.00E+03	2.00E+00	2.98E+01	3.97E+01	3.15E+00	6.30E+00
6.67E+03	1.50E+00	2.00E+01	3.02E+01	2.85E+00	5.30E+00
1.00E+04	1.00E+00	1.51E+01	2.08E+01	2.30E+00	4.52E+00

TABLE 8. Ni, NICKEL
D. W. Lynch, R. Rosei and J. H. Weaver, Solid State Commun. 9, 2195 (1971).

ω(cm⁻¹)	λ(μm)	−ε1	ε2	n	k
8.07E+02	1.24E+01	2.01E+03	8.74E+02	9.54E+00	4.58E+01
8.87E+02	1.13E+01	1.68E+03	6.79E+02	8.12E+00	4.18E+01
9.03E+03	1.11E+00	1.41E+03	5.44E+02	7.11E+00	3.83E+01
1.05E+03	9.54E+00	1.21E+03	4.55E+02	6.44E+00	3.53E+01
1.13E+03	8.86E+00	1.04E+03	3.82E+02	5.83E+00	3.28E+01
1.21E+03	8.27E+00	9.04E+02	3.33E+02	5.45E+00	3.06E+01
1.29E+03	7.75E+00	7.95E+02	2.86E+02	5.00E+00	2.86E+01
1.37E+03	7.29E+00	6.98E+02	2.51E+02	4.68E+00	2.68E+01
1.45E+03	6.89E+00	6.17E+02	2.25E+02	4.45E+00	2.52E+01
1.53E+03	6.53E+00	5.48E+02	2.05E+02	4.30E+00	2.38E+01
1.61E+03	6.20E+00	4.88E+02	1.85E+02	4.12E+00	2.25E+01
1.69E+03	5.90E+00	4.35E+02	1.76E+02	4.13E+00	2.13E+01
1.77E+03	5.64E+00	3.92E+02	1.66E+02	4.11E+00	2.02E+01
1.86E+03	5.39E+00	3.54E+02	1.60E+02	4.14E+00	1.93E+01
1.94E+03	5.17E+00	3.22E+02	1.53E+02	4.16E+00	1.84E+01
2.02E+03	4.96E+00	2.95E+02	1.50E+02	4.25E+00	1.77E+01
2.10E+03	4.77E+00	2.73E+02	1.46E+02	4.29E+00	1.71E+01
2.18E+03	4.59E+00	2.54E+02	1.42E+02	4.30E+00	1.65E+01
2.26E+03	4.43E+00	2.37E+02	1.38E+02	4.30E+00	1.60E+01
2.34E+03	4.28E+00	2.22E+02	1.32E+02	4.26E+00	1.55E+01
2.42E+03	4.13E+00	2.09E+02	1.26E+02	4.19E+00	1.51E+01
2.66E+03	3.76E+00	1.73E+02	1.13E+02	4.10E+00	1.38E+01
2.82E+03	3.54E+00	1.54E+02	1.05E+02	4.03E+00	1.31E+01
2.98E+03	3.35E+00	1.38E+02	9.84E+01	3.97E+00	1.24E+01
3.15E+03	3.18E+00	1.23E+02	9.12E+01	3.88E+00	1.18E+01
3.23E+03	3.10E+00	1.16E+02	8.78E+01	3.84E+00	1.14E+01
3.63E+03	2.76E+00	8.62E+01	8.56E+01	4.20E+00	1.02E+01
4.03E+03	2.48E+00	7.67E+01	7.77E+01	4.03E+00	9.64E+00
4.44E+03	2.25E+00	6.44E+01	6.96E+01	3.90E+00	8.92E+00
4.84E+03	2.07E+00	5.50E+01	6.41E+01	3.84E+00	8.35E+00
5.24E+03	1.91E+00	4.91E+01	5.84E+01	3.69E+00	7.92E+00
5.65E+03	1.77E+00	4.31E+01	5.37E+01	3.59E+00	7.48E+00
6.05E+03	1.65E+00	3.87E+01	4.98E+01	3.49E+00	7.13E+00
6.45E+03	1.55E+00	3.51E+01	4.61E+01	3.38E+00	6.82E+00
6.86E+03	1.46E+00	3.17E+01	4.26E+01	3.27E+00	6.51E+00
7.26E+03	1.38E+00	2.87E+01	3.96E+01	3.18E+00	6.23E+00
7.66E+03	1.31E+00	2.61E+01	3.72E+01	3.11E+00	5.98E+00
8.07E+03	1.24E+00	2.36E+01	3.51E+01	3.06E+00	5.74E+00
8.47E+03	1.18E+00	2.17E+01	3.34E+01	3.01E+00	5.55E+00
8.87E+03	1.13E+00	2.01E+01	3.20E+01	2.97E+00	5.38E+00
9.28E+03	1.08E+00	1.90E+01	3.05E+01	2.91E+00	5.24E+00
9.68E+03	1.03E+00	1.79E+01	2.91E+01	2.85E+00	5.10E+00
1.01E+04	9.92E-01	1.69E+01	2.78E+01	2.80E+00	4.97E+00
1.05E+04	9.54E-01	1.60E+01	2.66E+01	2.74E+00	4.85E+00
1.09E+04	9.18E-01	1.51E+01	2.54E+01	2.69E+00	4.73E+00
1.13E+04	8.86E-01	1.44E+01	2.45E+01	2.65E+00	4.63E+00
1.17E+04	8.55E-01	1.40E+01	2.36E+01	2.59E+00	4.55E+00
1.21E+04	8.27E-01	1.36E+01	2.26E+01	2.53E+00	4.47E+00
1.25E+04	8.00E-01	1.30E+01	2.17E+01	2.48E+00	4.38E+00
1.29E+04	7.75E-01	1.27E+01	2.09E+01	2.43E+00	4.31E+00

TABLE 8. Ni, Nickel (Continued)
B. Johnson and R. W. Christy, Phys. Rev. B 9, 5056 (1974).

ω(cm⁻¹)	λ(μm)	−ε1	ε2	n	k
5.16E+03	1.94E+00	7.06E+01	6.31E+01	3.47E+00	9.09E+00
6.21E+03	1.61E+00	5.35E+01	5.00E+01	3.14E+00	7.96E+00
7.18E+03	1.39E+00	4.14E+01	4.19E+01	2.96E+00	7.08E+00
8.23E+03	1.22E+00	3.36E+01	3.59E+01	2.79E+00	6.43E+00
9.19E+03	1.09E+00	2.81E+01	3.14E+01	2.65E+00	5.93E+00
1.02E+04	9.84E-01	2.47E+01	2.75E+01	2.48E+00	5.55E+00
1.12E+04	8.92E-01	2.16E+01	2.51E+01	2.40E+00	5.23E+00
1.22E+04	8.21E-01	1.96E+01	2.25E+01	2.26E+00	4.97E+00
1.32E+04	7.56E-01	1.78E+01	2.01E+01	2.13E+00	4.73E+00
1.42E+04	7.04E-01	1.60E+01	1.85E+01	2.06E+00	4.50E+00
1.52E+04	6.59E-01	1.42E+01	1.70E+01	1.99E+00	4.26E+00
1.62E+04	6.17E-01	1.22E+01	1.60E+01	1.99E+00	4.02E+00
1.72E+04	5.82E-01	1.06E+01	1.49E+01	1.96E+00	3.80E+00
1.82E+04	5.49E-01	9.35E+00	1.39E+01	1.92E+00	3.61E+00
1.92E+04	5.21E-01	8.27E+00	1.27E+01	1.85E+00	3.42E+00
2.02E+04	4.96E-01	7.25E+00	1.18E+01	1.82E+00	3.25E+00

TABLE 9. Pd, Palladium
J. H. Weaver and R. L. Bendow, Phys. Rev. B 12, 3509 (1975).

ω(cm⁻¹)	λ(μm)	−ε1	ε2	n	k
8.07E+02	1.24E+01	2.92E+03	4.47E+02	4.13E+00	5.42E+01
8.87E+02	1.13E+01	2.41E+03	3.79E+02	3.85E+00	4.92E+01
9.68E+02	1.03E+01	2.02E+03	3.25E+02	3.60E+00	4.51E+01
1.05E+03	9.54E+00	1.71E+03	2.79E+02	3.36E+00	4.15E+01
1.13E+03	8.86E+00	1.47E+03	2.55E+02	3.31E+00	3.85E+01
1.21E+03	8.27E+00	1.27E+03	2.24E+02	3.13E+00	3.58E+01
1.61E+03	6.20E+00	6.98E+02	1.63E+02	3.07E+00	2.66E+01
2.42E+03	4.13E+00	2.86E+02	1.23E+02	3.56E+00	1.73E+01
3.23E+03	3.10E+00	1.58E+02	1.13E+02	4.27E+00	1.33E+01
4.03E+03	2.48E+00	1.14E+02	9.38E+01	4.10E+00	1.14E+01
4.84E+03	2.07E+00	8.48E+01	7.57E+01	3.80E+00	9.96E+00
6.45E+03	1.55E+00	5.37E+01	5.40E+01	3.35E+00	8.06E+00
8.07E+03	1.24E+00	3.85E+01	4.12E+01	2.99E+00	6.89E+00
1.21E+04	8.27E-01	2.25E+01	2.27E+01	2.17E+00	5.22E+00
1.61E+04	6.20E-01	1.44E+01	1.46E+01	1.75E+00	4.18E+00

TABLE 9. Pd, PALLADIUM (Continued)
G. A. Bolotin, M. M. Kirilova, L. V. Nomerovannaya, and M. M. Noskov, Fiz. Metal. Metalloved 23, 463 (1967).

ω(cm⁻¹)	λ(μm)	−ε1	ε2	n	k
5.56E+02	1.80E+01	7.70E+02	6.84E+02	1.14E+01	3.00E+01
6.25E+02	1.60E+01	6.49E+02	5.69E+02	1.04E+01	2.75E+01
7.14E+02	1.40E+01	5.64E+02	4.74E+02	9.30E+00	2.55E+01
8.33E+02	1.20E+01	4.91E+02	3.67E+02	7.80E+00	2.35E+01
9.09E+02	1.10E+01	4.59E+02	3.11E+02	6.90E+00	2.25E+01
1.00E+03	1.00E+01	4.04E+02	2.56E+02	6.10E+00	2.10E+01
1.11E+03	9.00E+00	3.37E+02	1.84E+02	4.85E+00	1.90E+01
1.25E+03	8.00E+00	2.69E+02	1.53E+02	4.50E+00	1.70E+01
1.43E+03	7.00E+00	2.22E+02	1.33E+02	4.30E+00	1.55E+01
1.67E+03	6.00E+00	1.59E+02	8.32E+01	3.20E+00	1.30E+01
2.00E+03	5.00E+00	1.03E+02	5.67E+01	2.70E+00	1.05E+01
2.50E+03	4.00E+00	5.68E+01	3.45E+01	2.20E+00	7.85E+00
3.33E+03	3.00E+00	2.61E+01	2.58E+01	2.30E+00	5.60E+00

TABLE 9. Pd, PALLADIUM (Continued)
P. B. Johnson and R. W. Christy, Phys. Rev. B 9, 5056 (1974).

ω(cm⁻¹)	λ(μm)	−ε1	ε2	n	k
5.16E+03	1.94E+00	8.67E+01	6.61E+01	3.34E+00	9.89E+00
6.21E+03	1.61E+00	6.47E+01	5.17E+01	3.01E+00	8.59E+00
7.18E+03	1.39E+00	5.07E+01	4.28E+01	2.80E+00	7.65E+00
8.23E+03	1.22E+00	4.05E+01	3.67E+01	2.66E+00	6.90E+00
9.19E+03	1.09E+00	3.37E+01	3.19E+01	2.52E+00	6.33E+00
1.02E+04	9.84E-01	2.92E+01	2.76E+01	2.34E+00	5.89E+00
1.12E+04	8.92E-01	2.53E+01	2.45E+01	2.23E+00	5.50E+00
1.22E+04	8.21E-01	2.27E+01	2.14E+01	2.06E+00	5.19E+00
1.32E+04	7.56E-01	2.01E+01	1.91E+01	1.95E+00	4.89E+00
1.42E+04	7.04E-01	1.82E+01	1.73E+01	1.86E+00	4.65E+00
1.52E+04	6.59E-01	1.63E+01	1.59E+01	1.80E+00	4.42E+00
1.62E+04	6.17E-01	1.47E+01	1.47E+01	1.75E+00	4.21E+00
1.72E+04	5.82E-01	1.33E+01	1.35E+01	1.68E+00	4.02E+00
1.82E+04	5.49E-01	1.21E+01	1.26E+01	1.64E+00	3.84E+00
1.92E+04	5.21E-01	1.11E+01	1.16E+01	1.57E+00	3.68E+00
2.02E+04	4.96E-01	1.02E+01	1.08E+01	1.52E+00	3.54E+00
2.12E+04	4.71E-01	9.36E+00	9.90E+00	1.46E+00	3.39E+00
2.22E+04	4.51E-01	8.64E+00	9.19E+00	1.41E+00	3.26E+00
2.32E+04	4.30E-01	7.98E+00	8.60E+00	1.37E+00	3.14E+00
2.42E+04	4.13E-01	7.41E+00	8.06E+00	1.33E+00	3.03E+00
2.52E+04	3.97E-01	6.89E+00	7.62E+00	1.30E+00	2.93E+00
2.62E+04	3.81E-01	6.42E+00	7.13E+00	1.26E+00	2.83E+00
2.72E+04	3.68E-01	5.97E+00	6.80E+00	1.24E+00	2.74E+00
2.82E+04	3.54E-01	5.51E+00	6.52E+00	1.23E+00	2.65E+00
2.92E+04	3.42E-01	5.12E+00	6.27E+00	1.22E+00	2.57E+00
3.02E+04	3.31E-01	4.81E+00	6.00E+00	1.20E+00	2.50E+00
3.12E+04	3.20E-01	4.39E+00	5.86E+00	1.21E+00	2.42E+00
3.22E+04	3.11E-01	4.06E+00	5.69E+00	1.21E+00	2.35E+00
3.32E+04	3.01E-01	3.80E+00	5.50E+00	1.20E+00	2.29E+00
3.42E+04	2.92E-01	3.58E+00	5.26E+00	1.18E+00	2.23E+00
3.52E+04	2.84E-01	3.36E+00	5.14E+00	1.18E+00	2.18E+00
3.62E+04	2.76E-01	3.12E+00	5.07E+00	1.19E+00	2.13E+00
3.72E+04	2.69E-01	3.06E+00	4.87E+00	1.16E+00	2.10E+00
3.82E+04	2.62E-01	3.01E+00	4.68E+00	1.13E+00	2.07E+00
3.92E+04	2.55E-01	2.89E+00	4.51E+00	1.11E+00	2.03E+00
4.02E+04	2.49E-01	2.79E+00	4.30E+00	1.08E+00	1.99E+00
4.12E+04	2.43E-01	2.72E+00	4.06E+00	1.04E+00	1.95E+00
4.22E+04	2.37E-01	2.65E+00	3.82E+00	1.00E+00	1.91E+00
4.32E+04	2.31E-01	2.52E+00	3.61E+00	9.70E-01	1.86E+00
4.42E+04	2.26E-01	2.39E+00	3.40E+00	9.40E-01	1.81E+00
4.52E+04	2.21E-01	2.25E+00	3.24E+00	9.20E-01	1.76E+00
4.62E+04	2.16E-01	2.06E+00	3.09E+00	9.10E-01	1.70E+00
4.72E+04	2.12E-01	1.93E+00	2.94E+00	8.90E-01	1.65E+00
4.82E+04	2.07E-01	1.80E+00	2.78E+00	8.70E-01	1.60E+00

TABLE 10. Pt, Platinum
J. H. Weaver, Phys. Rev. B 11, 1416 (1975).

ω(cm⁻¹)	λ(μm)	−ε1	ε2	n	k
8.07E+02	1.24E+01	1.83E+03	1.18E+03	1.32E+01	4.47E+01
1.05E+03	9.54E+00	1.25E+03	7.28E+02	9.91E+00	3.67E+01
1.21E+03	8.27E+00	9.04E+02	5.10E+02	8.18E+00	3.12E+01
1.37E+03	7.29E+00	6.92E+02	3.68E+02	6.78E+00	2.72E+01
1.61E+03	6.20E+00	5.39E+02	2.83E+02	5.90E+00	2.40E+01
2.42E+03	4.13E+00	2.46E+02	1.27E+02	3.92E+00	1.62E+01
3.23E+03	3.10E+00	1.22E+02	6.40E+01	2.81E+00	1.14E+01
4.03E+03	2.48E+00	4.42E+01	6.03E+01	3.91E+00	7.71E+00
4.84E+03	2.07E+00	1.92E+01	6.93E+01	5.13E+00	6.75E+00
5.65E+03	1.77E+00	1.40E+01	7.80E+01	5.71E+00	6.83E+00
6.45E+03	1.55E+00	2.14E+01	7.48E+01	5.31E+00	7.04E+00
8.07E+03	1.24E+00	2.58E+01	5.63E+01	4.25E+00	6.62E+00
1.21E+04	8.27E-01	1.72E+01	2.96E+01	2.92E+00	5.07E+00
1.61E+04	6.20E-01	1.13E+01	1.87E+01	2.30E+00	4.07E+00

TABLE 10. Pt, PLATINUM (Continued)
J. H. Weaver, D. W. Lynch, and C. G. Olson, Phys. Rev. B 10, 501 (1974).

ω(cm⁻¹)	λ(μm)	−ε1	ε2	n	k
8.06E+02	1.24E+01	1.62E+03	9.28E+02	1.11E+01	4.18E+01
1.20E+03	8.30E+00	8.02E+02	4.16E+02	7.12E+00	2.92E+01
1.61E+03	6.20E+00	4.75E+02	2.30E+02	5.14E+00	2.24E+01
2.42E+03	4.13E+00	2.17E+02	1.02E+02	3.39E+00	1.51E+01
2.82E+03	3.54E+00	1.56E+02	7.19E+01	2.81E+00	1.28E+01
3.23E+03	3.10E+00	1.08E+02	5.24E+01	2.45E+00	1.07E+01
3.62E+03	2.76E+00	6.93E+01	4.77E+01	2.72E+00	8.76E+00
4.03E+03	2.48E+00	4.33E+01	5.47E+01	3.64E+00	7.52E+00
4.44E+03	2.25E+00	3.09E+01	5.59E+01	4.06E+00	6.88E+00
4.83E+03	2.07E+00	2.21E+01	6.01E+01	4.58E+00	6.56E+00
5.24E+03	1.91E+00	1.89E+01	6.26E+01	4.82E+00	6.49E+00
5.65E+03	1.77E+00	1.86E+01	6.35E+01	4.88E+00	6.51E+00
6.06E+03	1.65E+00	2.00E+01	6.32E+01	4.81E+00	6.57E+00
6.45E+03	1.55E+00	2.18E+01	6.11E+01	4.64E+00	6.58E+00
6.85E+03	1.46E+00	2.37E+01	5.74E+01	4.38E+00	6.55E+00
7.25E+03	1.38E+00	2.47E+01	5.28E+01	4.10E+00	6.44E+00
8.06E+03	1.24E+00	2.40E+01	4.49E+01	3.67E+00	6.12E+00
8.85E+03	1.13E+00	2.22E+01	3.87E+01	3.35E+00	5.78E+00
9.71E+03	1.03E+00	2.04E+01	3.35E+01	3.07E+00	5.46E+00
1.05E+04	9.50E-01	1.85E+01	2.96E+01	2.86E+00	5.17E+00
1.12E+04	8.90E-01	1.68E+01	2.63E+01	2.68E+00	4.90E+00
1.20E+04	8.30E-01	1.55E+01	2.35E+01	2.52E+00	4.67E+00
1.30E+04	7.70E-01	1.41E+01	2.13E+01	2.39E+00	4.45E+00
1.37E+04	7.30E-01	1.30E+01	1.93E+01	2.27E+00	4.26E+00
1.45E+04	6.90E-01	1.19E+01	1.77E+01	2.17E+00	4.08E+00
1.49E+04	6.70E-01	1.15E+01	1.70E+01	2.12E+00	4.00E+00
1.54E+04	6.50E-01	1.11E+01	1.64E+01	2.09E+00	3.93E+00
1.56E+04	6.40E-01	1.11E+01	1.57E+01	2.02E+00	3.89E+00
1.61E+04	6.20E-01	1.06E+01	1.49E+01	1.96E+00	3.80E+00

TABLE 11. Ti, TITANIUM
M. M. Kirillova and B. A. Charikov, Opt. Spectry 17, 134 (1964).

ω(cm⁻¹)	λ(μm)	−ε1	ε2	n	k
5.00E+02	2.00E+01	8.43E+02	1.17E+03	1.73E+01	3.38E+01
5.26E+02	1.90E+01	6.85E+02	1.04E+03	1.68E+01	3.11E+01
5.56E+02	1.80E+01	6.54E+02	8.82E+02	1.49E+01	2.96E+01
5.88E+02	1.70E+01	5.96E+02	7.67E+02	1.37E+01	2.80E+01
6.25E+02	1.60E+01	5.65E+02	7.05E+02	1.30E+01	2.71E+01
6.67E+02	1.50E+01	5.11E+02	6.14E+02	1.20E+01	2.56E+01
7.14E+02	1.40E+01	4.74E+02	5.25E+02	1.08E+01	2.43E+01
8.33E+02	1.20E+01	3.36E+02	3.77E+02	9.20E+00	2.05E+01
9.09E+02	1.10E+01	3.24E+02	3.38E+02	8.50E+00	1.99E+01
1.00E+03	1.00E+01	2.81E+02	2.90E+02	7.85E+00	1.85E+01
1.11E+03	9.00E+00	2.22E+02	2.42E+02	7.30E+00	1.66E+01
1.18E+03	8.50E+00	2.11E+02	2.24E+02	6.96E+00	1.61E+01
1.25E+03	8.00E+00	1.76E+02	1.94E+02	6.56E+00	1.48E+01
1.33E+03	7.50E+00	1.53E+02	1.75E+02	6.31E+00	1.39E+01
1.43E+03	7.00E+00	1.38E+02	1.58E+02	5.99E+00	1.32E+01
1.54E+03	6.50E+00	1.17E+02	1.37E+02	5.63E+00	1.22E+01
1.67E+03	6.00E+00	9.87E+01	1.22E+02	5.38E+00	1.13E+01
1.82E+03	5.50E+00	8.04E+01	1.04E+02	5.07E+00	1.03E+01
2.00E+03	5.00E+00	6.06E+01	8.94E+01	4.87E+00	9.18E+00
2.22E+03	4.50E+00	4.32E+01	7.51E+01	4.66E+00	8.06E+00
2.50E+03	4.00E+00	3.11E+01	6.78E+01	4.66E+00	7.27E+00
2.86E+03	3.50E+00	2.25E+01	6.00E+01	4.56E+00	6.58E+00
3.33E+03	3.00E+00	1.31E+01	5.33E+01	4.57E+00	5.83E+00
4.00E+03	2.50E+00	8.17E+00	4.93E+01	4.57E+00	5.39E+00

TABLE 11. Ti, TITANIUM (Continued)
D. W. Lynch, C. G. Olson, and J. H. Weaver, Phys. Rev. B 11, 3617 (1975).

ω(cm⁻¹)	λ(μm)	−ε1	ε2	n	k
8.07E+02	1.24E+01	5.21E+02	2.35E+02	5.03E+00	2.34E+01
9.68E+02	1.03E+01	3.76E+02	1.54E+02	3.90E+00	1.98E+01
1.05E+03	9.54E+00	3.20E+02	1.27E+02	3.49E+00	1.82E+01
1.21E+03	8.27E+00	2.38E+02	9.43E+01	3.00E+00	1.57E+01
1.61E+03	6.20E+00	1.24E+02	4.81E+01	2.12E+00	1.13E+01
1.69E+03	5.90E+00	1.08E+02	4.33E+01	2.04E+00	1.06E+01

TABLE 11. Ti, TITANIUM (Continued)
P. B. Johnson and R. W. Christy, Phys. Rev. B 9, 5056 (1974).

ω(cm⁻¹)	λ(μm)	−ε1	ε2	n	k
5.16E+03	1.94E+00	1.46E+01	3.64E+01	3.51E+00	5.19E+00
6.21E+03	1.61E+00	8.47E+00	3.47E+01	3.69E+00	4.70E+00
7.18E+03	1.39E+00	5.63E+00	3.21E+01	3.67E+00	4.37E+00
8.23E+03	1.22E+00	4.12E+00	3.00E+01	3.62E+00	4.15E+00
9.19E+03	1.09E+00	3.91E+00	2.81E+01	3.50E+00	4.02E+00
1.02E+04	9.84E-01	4.54E+00	2.66E+01	3.35E+00	3.97E+00
1.12E+04	8.92E-01	4.86E+00	2.61E+01	3.29E+00	3.96E+00
1.22E+04	8.21E-01	5.78E+00	2.57E+01	3.21E+00	4.01E+00

TABLE 11. Ti, TITANIUM (Continued)
M. M. Kirillova and B. A. Charikov, Phys. Met. 15, 138 (1963).

ω(cm⁻¹)	λ(μm)	−ε1	ε2	n	k
2.50E+03	4.00E+00	3.17E+01	6.79E+01	4.65E+00	7.30E+00
2.86E+03	3.50E+00	2.29E+01	6.01E+01	4.55E+00	6.60E+00
3.33E+03	3.00E+00	1.44E+01	5.21E+01	4.45E+00	5.85E+00
4.00E+03	2.50E+00	8.20E+00	4.62E+01	4.40E+00	5.25E+00
4.17E+03	2.40E+00	9.17E+00	4.61E+01	4.35E+00	5.30E+00
4.35E+03	2.30E+00	6.94E+00	4.25E+01	4.25E+00	5.00E+00
4.55E+03	2.20E+00	7.36E+00	4.20E+01	4.20E+00	5.00E+00
5.00E+03	2.00E+00	7.12E+00	3.93E+01	4.05E+00	4.85E+00
5.56E+03	1.80E+00	4.76E+00	3.73E+01	4.05E+00	4.60E+00
5.88E+03	1.70E+00	5.81E+00	3.42E+01	3.80E+00	4.50E+00
6.25E+03	1.60E+00	5.36E+00	3.38E+01	3.80E+00	4.45E+00
6.45E+03	1.55E+00	6.56E+00	3.33E+01	3.70E+00	4.50E+00
6.67E+03	1.50E+00	4.48E+00	3.31E+01	3.80E+00	4.35E+00
6.90E+03	1.45E+00	4.37E+00	3.15E+01	3.70E+00	4.25E+00
7.14E+03	1.40E+00	5.04E+00	2.98E+01	3.55E+00	4.20E+00
7.41E+03	1.35E+00	3.75E+00	2.80E+01	3.50E+00	4.00E+00
7.69E+03	1.30E+00	4.84E+00	2.75E+01	3.40E+00	4.05E+00
8.00E+03	1.25E+00	8.47E+00	2.90E+01	3.30E+00	4.40E+00
8.33E+03	1.20E+00	5.60E+00	2.42E+01	3.10E+00	3.90E+00

TABLE 11. Ti, TITANIUM (Continued)
G. A. Bolotin, A. N. Voloshinskii, M. M. Neskov, A. V. Sokolov, and B. A. Charikov, Phys. Met. and Met. 13, 823 (1962).

ω(cm⁻¹)	λ(μm)	−ε1	ε2	n	k
1.00E+03	1.00E+01	2.36E+02	3.21E+02	9.01E+00	1.78E+01
1.05E+03	9.50E+00	2.19E+02	2.93E+02	8.56E+00	1.71E+01
1.11E+03	9.00E+00	2.18E+02	2.51E+02	7.56E+00	1.66E+01
1.18E+03	8.50E+00	2.11E+02	2.24E+02	6.96E+00	1.61E+01
1.25E+03	8.00E+00	1.76E+02	1.94E+02	6.56E+00	1.48E+01
1.33E+03	7.50E+00	1.53E+02	1.75E+02	6.31E+00	1.39E+01
1.43E+03	7.00E+00	1.38E+02	1.58E+02	5.99E+00	1.32E+01
1.54E+03	6.50E+00	1.17E+02	1.37E+02	5.63E+00	1.22E+01
1.67E+03	6.00E+00	9.87E+01	1.22E+02	5.38E+00	1.13E+01
1.82E+03	5.50E+00	8.04E+01	1.04E+02	5.07E+00	1.03E+01
2.00E+03	5.00E+00	6.06E+01	8.94E+01	4.87E+00	9.18E+00
2.22E+03	4.50E+00	4.34E+01	7.52E+01	4.66E+00	8.07E+00
2.50E+03	4.00E+00	3.11E+01	6.78E+01	4.66E+00	7.27E+00
2.86E+03	3.50E+00	2.25E+01	6.00E+01	4.56E+00	6.58E+00
3.33E+03	3.00E+00	1.31E+01	5.33E+01	4.57E+00	5.83E+00
4.00E+03	2.50E+00	8.17E+00	4.93E+01	4.57E+00	5.39E+00
5.00E+03	2.00E+00	4.24E+00	4.24E+01	4.38E+00	4.84E+00

$$\epsilon_1(0) \to -\left(\frac{\omega_p}{\omega_\tau}\right)^2 . \qquad (7)$$

The dc conductivity σ_0 is related to ω_p and ω_τ by

$$\sigma_0 = \omega_p^2/(4\pi\omega_\tau) \qquad (8)$$

with σ_0 having units of cm^{-1}. This can be expressed in terms of the dc resistivity ρ_0:

$$\sigma_0(\mathrm{cm}^{-1}) = 1/[2\pi c\rho_0(s)] = (9 \times 10^{11})/[2\pi c\rho_0(\Omega\ \mathrm{cm})]. \qquad (9)$$

To analyze the data of Brandli, and Sievers[1] it is convenient to write the surface impedance $Z(\omega)$ for the Drude model[2]:

$$Z(\omega) \equiv R(\omega) + iX(\omega) = \frac{4\pi}{c}(1+i)\left(\frac{\omega\omega_\tau}{2\omega_p^2}\right)^{1/2}\left(1 + i\frac{\omega}{\omega_\tau}\right)^{1/2} . \qquad (10)$$

We shall need only $R(\omega)$:

$$R(\omega) = \frac{4\pi}{c}\left(\frac{\omega\omega_\tau}{2\omega_p^2}\right)^{1/2}\left[-\frac{\omega}{\omega_\tau} + \left(1 + \frac{\omega^2}{\omega_\tau^2}\right)^{1/2}\right]^{1/2} . \qquad (11)$$

III. Determination of Drude Model Parameters

All data in the form of n and k were changed to ϵ_1 and ϵ_2. Equations (3) and (4) were solved for ω_τ, eliminating ω_p:

$$\omega_\tau = \frac{\omega\epsilon_2}{(1-\epsilon_1)} . \qquad (12)$$

This equation was solved to determine ω_τ using ϵ_1 and ϵ_2 at some frequency ω. Then ω_p was obtained from

$$\omega_p^2 = (1-\epsilon_1)\,(\omega^2 + \omega_\tau^2). \qquad (13)$$

This was done for several values of ω to obtain several pairs of ω_τ and ω_p, which produce the curve with the best eyeball fit to the data.

TABLE 12. W, TUNGSTEN

L. V. Nomerovannaya, M. M. Kirillova, and M.M. Noskov, Opt. Spectry. 17, 134 (1964).

ω(cm⁻¹)	λ(μm)	−ε1	ε2	n	k
5.00E+02	2.00E+01	4.32E+03	2.38E+03	1.75E+01	6.80E+01
5.26E+02	1.90E+01	3.70E+03	2.05E+03	1.63E+01	6.30E+01
5.56E+02	1.80E+01	3.56E+03	1.90E+03	1.54E+01	6.16E+01
5.88E+02	1.70E+01	3.37E+03	1.80E+03	1.50E+01	6.00E+01
6.25E+02	1.60E+01	3.32E+03	1.91E+03	1.60E+01	5.98E+01
6.67E+02	1.50E+01	3.19E+03	1.69E+03	1.45E+01	5.83E+01
7.14E+02	1.40E+01	2.94E+03	1.43E+03	1.28E+01	5.57E+01
7.69E+02	1.30E+01	2.65E+03	1.13E+03	1.07E+01	5.26E+01
8.33E+02	1.20E+01	2.42E+03	1.10E+03	1.09E+01	5.04E+01
9.09E+02	1.10E+01	2.05E+03	8.80E+02	9.50E+00	4.63E+01
1.00E+03	1.00E+01	1.65E+03	6.85E+02	8.25E+00	4.15E+01
1.05E+03	9.50E+00	1.51E+03	5.85E+02	7.40E+00	3.95E+01
1.11E+03	9.00E+00	1.36E+03	5.49E+02	7.30E+00	3.76E+01
1.18E+03	8.50E+00	1.18E+03	4.48E+02	6.40E+00	3.50E+01
1.21E+03	8.25E+00	1.13E+03	4.10E+02	6.00E+00	3.42E+01
1.25E+03	8.00E+00	1.07E+03	4.06E+02	6.10E+00	3.33E+01
1.29E+03	7.76E+00	1.01E+03	3.49E+02	5.40E+00	3.23E+01
1.33E+03	7.50E+00	9.34E+02	3.19E+02	5.15E+00	3.10E+01
1.38E+03	7.25E+00	8.43E+02	3.07E+02	5.20E+00	2.95E+01
1.43E+03	7.00E+00	7.72E+02	3.03E+02	5.35E+00	2.83E+01
1.48E+03	6.75E+00	6.68E+02	2.85E+02	5.40E+00	2.64E+01
1.54E+03	6.50E+00	5.90E+02	2.49E+02	5.03E+00	2.48E+01
1.60E+03	6.25E+00	5.42E+02	2.33E+02	4.90E+00	2.38E+01
1.67E+03	6.00E+00	4.87E+02	2.19E+02	4.85E+00	2.26E+01
1.74E+03	5.75E+00	5.00E+02	2.05E+02	4.50E+00	2.28E+01
1.82E+03	5.50E+00	4.82E+02	2.01E+02	4.48E+00	2.24E+01
1.90E+03	5.25E+00	4.80E+02	1.83E+02	4.11E+00	2.23E+01
2.00E+03	5.00E+00	4.37E+02	1.48E+02	3.48E+00	2.12E+01
2.11E+03	4.75E+00	3.81E+02	1.32E+02	3.33E+00	1.98E+01
2.22E+03	4.50E+00	3.88E+02	1.13E+02	2.85E+00	1.99E+01
2.27E+03	4.40E+00	3.85E+02	1.05E+02	2.65E+00	1.98E+01
2.38E+03	4.20E+00	3.55E+02	9.50E+01	2.50E+00	1.90E+01
2.44E+03	4.10E+00	3.48E+02	8.65E+01	2.30E+00	1.88E+01
2.50E+03	4.00E+00	3.30E+02	8.16E+01	2.23E+00	1.83E+01
2.56E+03	3.90E+00	3.15E+02	7.95E+01	2.22E+00	1.79E+01
2.70E+03	3.70E+00	2.81E+02	7.44E+01	2.20E+00	1.69E+01
2.78E+03	3.60E+00	2.68E+02	6.60E+01	2.00E+00	1.65E+01
2.94E+03	3.40E+00	2.35E+02	7.19E+01	2.32E+00	1.55E+01
3.03E+03	3.30E+00	2.17E+02	6.73E+01	2.26E+00	1.49E+01
3.13E+03	3.20E+00	2.08E+02	6.48E+01	2.22E+00	1.46E+01
3.23E+03	3.10E+00	1.97E+02	6.25E+01	2.20E+00	1.42E+01
3.33E+03	3.00E+00	1.84E+02	7.18E+01	2.60E+00	1.38E+01
3.45E+03	2.90E+00	1.76E+02	6.89E+01	2.55E+00	1.35E+01
3.57E+03	2.80E+00	1.80E+02	6.26E+01	2.30E+00	1.36E+01
3.70E+03	2.70E+00	1.54E+02	5.29E+01	2.10E+00	1.26E+01
3.85E+03	2.60E+00	1.39E+02	5.16E+01	2.15E+00	1.20E+01
4.00E+03	2.50E+00	1.28E+02	4.71E+01	2.05E+00	1.15E+01
4.17E+03	2.40E+00	1.28E+02	4.95E+01	2.15E+00	1.15E+01

TABLE 12. W, TUNGSTEN (Continued)

ω(cm⁻¹)	λ(μm)	−ε1	ε2	n	k
4.35E+03	2.30E+00	9.80E+01	4.04E+01	2.00E+00	1.01E+01
4.55E+03	2.20E+00	8.85E+01	3.65E+01	1.90E+00	9.60E+00
4.76E+03	2.10E+00	7.58E+01	3.29E+01	1.85E+00	8.90E+00
5.00E+03	2.00E+00	6.09E+01	2.80E+01	1.75E+00	8.00E+00
5.26E+03	1.90E+00	4.86E+01	2.90E+01	2.00E+00	7.25E+00
5.56E+03	1.80E+00	4.12E+01	2.84E+01	2.10E+00	6.75E+00
5.71E+03	1.75E+00	3.89E+01	2.62E+01	2.00E+00	6.55E+00
5.88E+03	1.70E+00	3.34E+01	2.58E+01	2.10E+00	6.15E+00
6.02E+03	1.66E+00	3.27E+01	2.98E+01	2.40E+00	6.20E+00
6.25E+03	1.60E+00	3.88E+01	3.51E+01	2.60E+00	6.75E+00
6.45E+03	1.55E+00	2.51E+01	2.80E+01	2.50E+00	5.60E+00
6.67E+03	1.50E+00	2.08E+01	3.13E+01	2.90E+00	5.40E+00
6.90E+03	1.45E+00	1.75E+01	3.09E+01	3.00E+00	5.15E+00
7.14E+03	1.40E+00	1.73E+01	3.36E+01	3.20E+00	5.25E+00
7.41E+03	1.35E+00	1.64E+01	3.30E+01	3.20E+00	5.16E+00
7.69E+03	1.30E+00	1.53E+01	3.23E+01	3.20E+00	5.05E+00
8.33E+03	1.20E+00	1.15E+01	2.85E+01	3.10E+00	4.60E+00
9.09E+03	1.10E+00	9.78E+00	2.61E+01	3.01E+00	4.34E+00
1.00E+04	1.00E+00	3.25E+00	2.10E+01	3.00E+00	3.50E+00

TABLE 12. W, TUNGSTEN (Continued)
J. H. Weaver, D. W. Lynch and C. G. Olson, Phys. Rev. B 12, 1293 (1975).

ω(cm⁻¹)	λ(μm)	−ε1	ε2	n	k
4.84E+02	2.07E+01	5.68E+03	5.71E+03	3.45E+01	8.29E+01
5.65E+02	1.77E+01	4.75E+03	3.91E+03	2.65E+01	7.39E+01
6.45E+02	1.55E+01	3.83E+03	2.73E+03	2.09E+01	6.53E+01
7.26E+02	1.38E+01	3.31E+03	2.04E+03	1.70E+01	6.00E+01
8.07E+02	1.24E+01	2.80E+03	1.54E+03	1.41E+01	5.47E+01
9.68E+02	1.03E+01	2.05E+03	9.37E+02	1.01E+01	4.64E+01
1.13E+03	8.86E+00	1.56E+03	6.09E+02	7.58E+00	4.02E+01
1.29E+03	7.75E+00	1.21E+03	4.18E+02	5.92E+00	3.53E+01
1.61E+03	6.20E+00	7.86E+02	2.19E+02	3.87E+00	2.83E+01
2.42E+03	4.13E+00	3.32E+02	6.71E+01	1.83E+00	1.83E+01
3.23E+03	3.10E+00	1.70E+02	5.11E+01	1.94E+00	1.32E+01
4.03E+03	2.48E+00	1.09E+02	2.95E+01	1.40E+00	1.05E+01
4.84E+03	2.07E+00	6.19E+01	1.93E+01	1.21E+00	7.96E+00
5.65E+03	1.77E+00	3.50E+01	1.95E+01	1.59E+00	6.13E+00
6.61E+03	1.51E+00	1.57E+01	2.18E+01	2.36E+00	4.61E+00
7.26E+03	1.38E+00	1.00E+01	2.76E+01	3.11E+00	4.44E+00
8.07E+03	1.24E+00	8.80E+00	2.71E+01	3.14E+00	4.32E+00
1.21E+04	8.27E-01	-4.33E+00	1.94E+01	3.48E+00	2.79E+00
1.61E+04	6.20E-01	-4.61E+00	2.08E+01	3.60E+00	2.89E+00

Table 13. Optical Parameters Found using a Drude Model Fit of the Experimental Dielectric Functions for Six Metals for which the Dielectric Functions could be Fit; here ω_f is the Frequency at which the Fit is Forced, and $-\epsilon_1(0)$ is $-\epsilon_1(\omega)$ at dc; the Crossover Frequency Applies to $-\epsilon_1 \equiv \epsilon_2$.

	ω_f(cm^{-1}) for fit of data in IR	ω_τ(cm^{-1}) IR fit	ω_p(cm^{-1}) IR fit	$-\epsilon_1(0) = -(\omega_p/\omega_\tau)^2$	ω_τ(cm^{-1}) from dc resistivities and ω_p	ω_τ(cm^{-1}) crossover on $-\epsilon_1$, ϵ_2 plot
Noble Metals and Al and Pb						
Al	1.11×10^3	6.47×10^2	1.19×10^5	3.37×10^4	6.45×10^2	7.00×10^2
Cu	2.00×10^3	2.78×10^2	6.38×10^4	5.27×10^4	1.15×10^2	2.55×10^2
Au	8.06×10^2	2.16×10^2	7.25×10^4	1.13×10^5	1.93×10^2	2.16×10^2
Pb	5.00×10^1	1.45×10^3	6.20×10^4	1.33×10^3	1.35×10^3	1.55×10^3
Ag	1.00×10^3	1.45×10^2	7.25×10^4	2.50×10^5	1.41×10^2	1.52×10^2
Transition Metals						
W	8.06×10^2	4.33×10^2	4.84×10^4	1.25×10^4	2.16×10^2	4.30×10^2

The one exception to this process was the measurements of Brandli and Sievers[1] for Au and Pb. They reported values of $R(\omega)/Z_0$ where $Z_0 = (4\pi)/c$. For the far IR, Eq. (11) reduces to

$$\frac{R(\omega)}{Z_0} = \left(\frac{\omega\omega_\tau}{2\omega_p^2}\right)^{1/2}. \tag{14}$$

ω_τ was obtained from this data using ω_n from the near IR fit. This value of ω_τ was used for gold and lead rather than the ω_τ obtained from the near IR fit.

We note from Eq. (12) the frequency for which $-\epsilon_1(\omega) = \epsilon_2(\omega)$ is very nearly $\omega = \omega_\tau$ since $-\epsilon_1 \gg 1$. With $\omega = \omega_\tau$ both components ($-\epsilon_1$ and ϵ_2) of the dielectric function are $\omega_p^2/(2\omega_\tau^2)$. Thus the Drude parameters, ω_τ and ω_p, can be determined at the crossover from $\omega = \omega_\tau$ and the value of the dielectric function. Note that $-\epsilon_1(0) \simeq \omega_p^2/\omega_\tau^2$; so $-\frac{1}{2}\epsilon_1(0) \simeq -\epsilon_1(\omega_\tau)$.

IV. Data

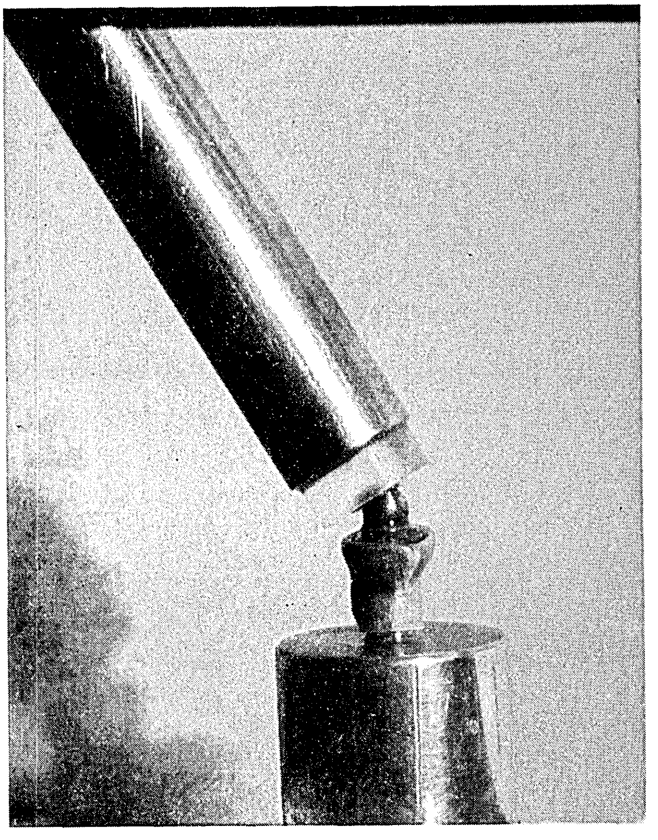
Figures 1–12 are plots of $-\epsilon_1(\omega)$ and $\epsilon_2(\omega)$ for the twelve metals. The high frequency termination occurs where the Drude model becomes invalid. The solid lines are calculated from the Drude model with the parameters listed in Table 13. Tables 1–12 present the collected values of ϵ_1, ϵ_2, n and k. Table 13 summarizes the Drude model parameters from our fit (for Ag, Au, Cu, Al, Pb, and W) as well as ω_τ calculated from ω_p and the AIP Handbook[19] values of the dc resistivity. Dielectric functions for all metals considered in this article except Pb have been tabulated by Weaver *et al.* for the UV, visible, and near IR.

Finally, we disclaim any physical signficance for the Drude model. The intent is only to parametrize the optical constants for these metals even when there is some question as to the physical meaning of the parameters. The transition metals show interband transitions and cannot be fit with a Drude model in the IR (with the exception of *W*). Even the noble metals in the IR can have small interband contributions to the dielectric constants.[20]

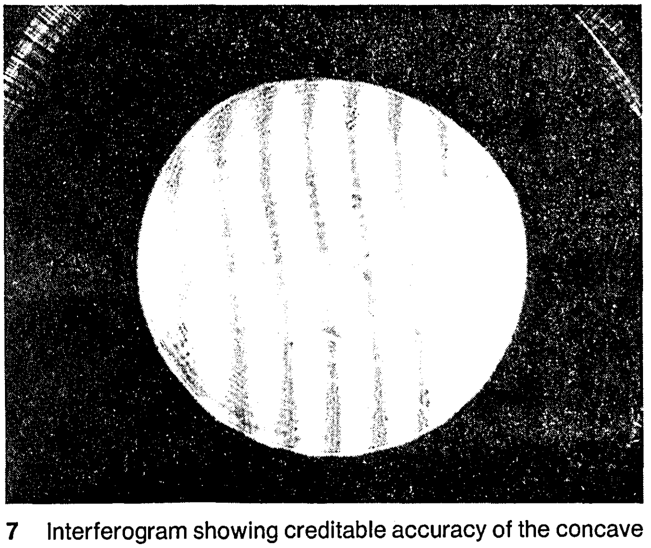
References

1. G. Brandli and A. J. Sievers, Phys. Rev. B **5**, 3550 (1972).
2. P. Drude, *Theory of Optics* (Longmans, Green, New York, 1922; Dover, New York, 1968). A more modern reference is F. Wooten, *Optical Properties of Solids* (Academic, New York, 1972), p. 52. For the Drude model and surface impedance see B. Donovan, *Elementary Theory of Metals* (Pergamon, New York, 1967), p. 220.
3. J. H. Weaver, C. Krafka, D. W. Lynch, and E. E. Koch, "Part 1: The Transition Metals," "Part 2, Noble Metals, Aluminum, Scandium, Yttrium, the Lanthanides, and the Actinides," in *Physics Data, Optical Properties of Metals* (Fachinformationszentrum 7514 Eggenstein-Leopoldshafen 2, Karlsruhe, Federal Republic of Germany, 1981).
4. G. Haas and L. Hadley, in *American Institute of Physics Handbook*, D. E. Gray, Ed. (McGraw-Hill, New York, 1972), p. 6–118.
5. H. E. Bennett and J. M. Bennett, in *Optical Properties and Electronic Structure of Metals and Alloys*, F. Abeles, Ed., (North-Holland, Amsterdam; Wiley, New York, 1966), Sec. II.6, p. 175. For Ag, Au, and AL for ω, they estimated 145, 216, and 663 cm^{-1}, respectively.
6. For a single carrier type (electrons) the plasma frequency ω_p is as given in Eq. (5) where the dielectric constant is ϵ_∞ (the contribution from the core electrons at high frequencies). Often $m^* = m$ and $\epsilon_\infty = 1$ are assumed. For discussion see H. Ehrenreich and M. H. Cohen, Phys. Rev. **115**, 786 (1959); the last paragraph on p. 790 is most relevant.
7. Al: E. Shiles, T. Sasaki, M. Inokuti, and D. Y. Smith, Phys. Rev. B **22**, 1612 (1980); H. E. Bennett and J. M. Bennett, *Optical Properties and Electronic Structure of Metals and Alloys*, F. Abeles, Ed. (North Holland, Amsterdam, 1966), p. 175; L. G. Schulz, J. Opt. Soc. Am. **44**, 357, 362 (1954).
8. Cu: L. G. Schulz, J. Opt. Soc. Am. **44**, 357, 362 (1954); A. P. Lenham and D. M. Treherne, J. Opt. Soc. Am. **56**, 683 (1966); P. F. Robusto and R. Braunstein, Phys. Status Solidi B **107**, 443 (1981); H. J. Hageman, W. Gudat, and C. Kunz, J. Opt. Soc. Am. **65**, 742 (1975); B. Dold and R. Mecke, Optik **22**, 435 (1965).
9. Au: H. E. Bennett and J. M. Bennett, *Optical Properties and Electronic Structure of Metals and Alloys*, F. Abeles, Ed. (North-Holland, Amsterdam, 1966), p. 75; L. G. Schulz, J. Opt. Soc. Am. **44**, 357, 362 (1954); G. P. Motulevich and A. A. Shubin, Sov. Phys. JETP **20**, 560 (1965); V. G. Padalka and I. N. Shklyarevskii, Opt. Spectrosc. **11**, 285 (1961); G. A. Bolotin, A. N. Voloshinskii, M. M. Kirilbra, M. M. Neskov, A. V. Sokolov, and B. A. Charikov, Fiz. Met. Metalloved. **13**, 823 (1962); G. Brändli and A. J. Sievers, Phys. Rev. B **5**, 3550 (1972).
10. Pb: G. Brandli and A. J. Sievers, Phys. Rev. B **5**, 3550 (1972); A. I. Golovashkin and G. P. Motulevich, Sov. Phys. JETP **26**, 881 (1968).
11. Ag: H. E. Bennett and J. M. Bennett, in *Optical Properties and Electronic Structure of Metals and Alloys* F. Abeles, Ed. (North-Holland, Amsterdam, 1966), p. 175; L. G. Schulz, J. Opt. Soc. Am. **44**, 357, and 362 (1954); H. J. Hagemann, W. Endat, and C. Kunz, J. Opt. Soc. Am. **65**, 742 (1975).
12. Co: M. M. Kirillova and B. A. Charikov, Opt. Spectrosc. **17**, 134 (1964); P. B. Johnson and R. W. Christy, Phys. Rev. B **9**, 5056 (1974); J. H. Weaver, E. Colavita, D. W. Lynch, and R. Rosei, Phys. Rev. B **19**, 3850 (1979).
13. Fe: J. H. Weaver, E. Colavita, D. W. Lynch, and R. Rosei, Phys. Rev. B **19**, 3850 (1979); G. A. Bolotin, M. M. Krillova, and V. M. Mayevskiy, Phys. Met. Mettalogr. USSR **27**, No. 2, 31 (1969).
14. Ni: D. W. Lynch, R. Rosei, and J. H. Weaver, Solid State Commun. **9**, 2195 (1973); P. B. Johnson and R. W. Christy, Phys. Rev. B **9**, 5056 (1974).
15. Pd: J. H. Weaver and R. L. Benbow, Phys. Rev. B **12**, 3509 (1975); G. A. Bolotin, M. M. Kirillova, L. V. Nomerovannaya, and M. M. Noskov, Fiz. Met. Mettalloved. **23**, 463 (1967); P. B. Johnson and R. W. Christy, Phys. Rev. B **9**, 5056 (1974).
16. Pt: J. H. Weaver, Phys. Rev. B **11**, 1416 (1975); J. H. Weaver, C. G. Olson, and D. W. Lynch, Phys. Rev. B **10**, 501 (1974).
17. Ti: M. M. Kirillova and B. A. Charikov, Opt. Spectrosc. **17**, 134 (1964); D. W. Lynch, C. G. Olson, and J. H. Weaver, Phys. Rev. B **11**, 3617 (1975); P. B. Johnson and R. W. Christy, Phys. Rev. B **9**, 5056 (1974); M. M. Kirillova and B. A. Charikov, Phys. Met. **15**, 138 (1963); G. A. Bolotin, A. N. Voloshinskii, M. M. Noskov, A. V. Sokolov, and B. A. Charikov, Phys. Met. Metallogr. USSR **13**, 823 (1962).
18. W: L. V. Nomerovannaya, M. M. Kirillova, and M. M. Noskov, Opt. Spectrosc. **17**, 134 (1964); J. H. Weaver, D. W. Lynch, and C. G. Olson, Phys. Rev. B **12**, 1293 (1975).
19. J. Babiskin and J. R. Anderson, in *American Institute of Physics Handbook*, (McGraw-Hill, New York, 1972), p. 9–39.
20. G. R. Parkins, W. E. Lawrence, and R. W. Christy, Phys. Rev. B **23**, 6408 (1981).

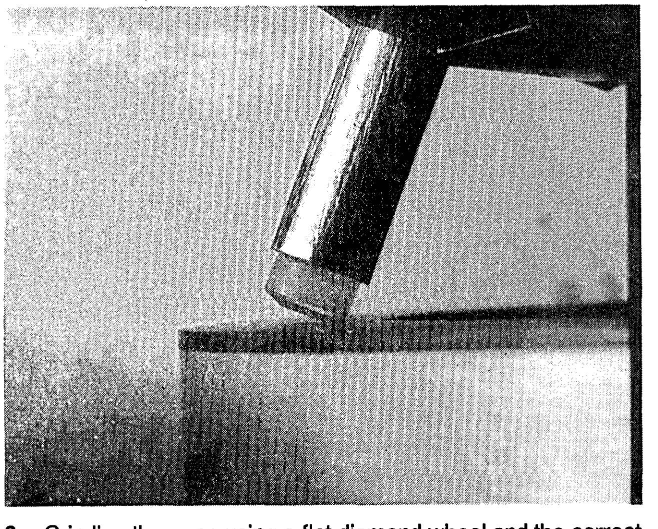
This work was partially supported by the U.S. Army, DAAK-11-82-C-0052. We gratefully acknowledge the valuable advice of Jean M. Bennett, David Begley, David Bryan, Kul Bhasin, and W. F. Parks.



6 Close-up of polishing setup.



7 Interferogram showing creditable accuracy of the concave surface.



8 Grinding the cone using a flat diamond wheel and the correct tilt angle. The work rotates at 100 rpm, the diamond wheel at 5000 surface ft/min.