Relação do prata calculado (por fora) usando a fonte Theory Of Surface Plasmon Resonance OURO = Au = GOLD

Obtain an expression for the electrical permittivity of a metal ε(ω) in the low−frequency regime in the free electron model. Using this expression determine the electrical permittivity of Au, Ag and Cu for a frequency of 10 GHz (microwave region). Tip get the necessary parameters for calculations from reported literature.

Constantes + Tabela:

$n=5.9\cdot 10^{28}$

$\sigma(ouro)=4.3\cdot 10^{7}$ $\rho=\frac{1}{4.3\cdot 10^{7}}$ ▸ 23.2558E-9

$e^{2}=$ exponencial

$\omega=2\cdot\pi\cdot 1\cdot 10^{9}$ ▸ $2000000000\cdot\pi$

Fonte:

Design and Application of Plasmonic Devices - A Thesis

PLASMONICS: FUNDAMENTALS AND APPLICATIONS - STEFAN A. MAIER

Eq:

$$\varepsilon(\omega)=1-\frac{(\omega p)^{2}}{\omega^{2}+i\cdot\gamma\cdot\omega}$$

$$\varepsilon(\omega)=1-\frac{5.94988E-4}{(2000000000\cdot\pi)^{2}+i\cdot 4.09411E51\cdot 2000000000\cdot\pi}$$ ▸ 1.E0+23.1296E-66· i

Calculos:

$$\omega p^{2}=\frac{4\cdot\pi\cdot q^{2}}{m}$$ plasma frequency

$$\omega p = \sqrt{\frac{4 \cdot \pi \cdot \left(1.602 \cdot 10^{-19}\right)^2}{9.11 \cdot 10^{-31}}} \blacktriangleright 594.988E-6$$

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frequência do plasma:

$$\omega p^2 = \frac{n \cdot e^2}{\varepsilon o \cdot m}$$

$$\omega p = \sqrt{\frac{5.9 \cdot 10^{28} \cdot e^2}{8.8541878176 \cdot 10^{-12} \cdot 9.11 \cdot 10^{-31}}} \blacktriangleright 232.481E33$$

$$\gamma = \frac{n \cdot e}{me \cdot \sigma}$$ Theory Of Surface Plasmon Resonance SPR

$$\gamma = \frac{5.9 \cdot 10^{28} \cdot e^1}{9.11 \cdot 10^{-31} \cdot 4.3 \cdot 10^7} \blacktriangleright 4.09411E51$$

Estou usando a fequencia angular tradicional

Confirmar se esta ou outra forma

https://www.brainkart.com/article/Solved-Problems--Conducting-Materials_6818/

Verifica qual valor tal é o correto

$$\tau = \frac{\sigma \cdot m}{n \cdot e^2}$$

$$\tau = \frac{4.3 \cdot 10^7 \cdot 9.11 \cdot 10^{-31}}{5.9 \cdot 10^{28} \cdot e^2} \blacktriangleright 89.8557E-54$$

ou

Design and Application of Plasmonic Devices - A Thesis

$$\tau = \frac{m}{\rho \cdot n \cdot q^2}$$

$$\tau = \frac{9.11 \cdot 10^{-31}}{\frac{1}{4.3 \cdot 10^{7}} \cdot 5.9 \cdot 10^{28} \cdot \left(1.602 \cdot 10^{-19}\right)^2} \blacktriangleright 25.8708\text{E}-15$$

Fonte: Optical properties of the metals Al, Co, Cu, Au, Fe, Pb, Ni, Pd, Pt, Ag, Ti, and W in the infrared and far infrared M. A. Ordal, L.

$$\omega\tau\left(cm^{-1}\right) = \frac{1}{2 \cdot \pi \cdot c \cdot \tau}$$

$$\omega\tau\left(cm^{-1}\right) = \frac{1}{2 \cdot \pi \cdot 300 \cdot 10^{6} \cdot \tau}$$

$$\sigma o = \frac{\omega p^2}{4 \cdot \pi \cdot \omega\tau}$$

Metal	Electron density (m^{-3})
Aluminum	6.0×10^{28}
Copper	8.5×10^{28}
Iron	8.5×10^{28}
Gold	5.9×10^{28}
Silver	5.8×10^{28}

Relações entre os termos da constante dielétrica e o índice de refração

Constante dielétrica — Índice de refração

$\varepsilon=\varepsilon 1+i\varepsilon 2=\tilde{n}^2$ — $\tilde{n}=n+ik$

$\varepsilon 1=n^2-k^2$

$\varepsilon 2=2\cdot n\cdot k$

$$n^2=\frac{\varepsilon 1}{2}+\frac{1}{2}\cdot\sqrt{\varepsilon 1^2+\varepsilon 2^2}$$

$$k=\frac{\varepsilon 2}{2\cdot n}$$