OPTICAL ELECTRON PARAMETER SEMICONDUCTING NANOSTRUCTURES

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Problem: to not use the classical Kramers-Kronig integral transformation and to define all optical electron oscillation parameters for any energy point from semiconducting nanostructure experimental reflection spectra[a]. Within the untied oscillation model the calculation technique of all semiconducting heterostructure optical parameters by the intermediate functions ($\hbar \cdot \omega_\pi$, $\hbar \cdot \omega_n$, $\hbar \cdot \Gamma$) are the plasma, effective natural, radiant friction energies in eV, $2 \cdot \pi \cdot \hbar$ is the Planck constant) is presented. As an example the optical parameters of PbS, PbSe, PbTe and GaAs, GaP between 0 and 25 eV in any spectrum region are established. The consistent approximation approach of the reflectance factor R to real value is advanced. As a result, all heterostructure basic electron optical functions ($\hbar \cdot \omega_p$, $\hbar \cdot \omega_{pm}$, $\hbar \cdot \omega_c$, $\hbar \cdot \gamma$ are the plasma, plasma maximum, effective natural, radiant friction energies, ε_r, ε_ι, n_r, n_ι are the real and imaginary components of the dielectric ε and refractive index n functions, accordingly, $(\varepsilon_r)_{max}$, $(\varepsilon_r)_{min}$, $(\hbar \cdot \omega) \bullet \varepsilon_\iota$ is conductivity, $(\hbar \cdot \omega) \bullet n_\iota = (c \cdot \hbar/2) \bullet \alpha$, where c is the light velocity, α is absorption coefficient, $L = Im(-1/\varepsilon)$ are electron lossis, equal imaginary component of the minus reciprocal dielectric function ε, $\hbar \cdot \omega \bullet L = (\hbar \cdot \omega) \bullet Im(-1/\varepsilon)$ are effective electron lossis) calculated by the intermediate functions in any electron optical spectrum region. Then, for GaP experimental reflection spectra it is selected the point $\hbar^2 \cdot \omega^2 = 10.5625 \bullet 10^{-4}$, the intermediate parameters are $\hbar^2 \cdot \omega_\pi^2 = 10.5625 \bullet 10^{-4}$, $\hbar^2 \cdot \omega_n^2 = 9.03130933157 \bullet 10^{-4}$, $\hbar^2 \cdot \Gamma^2 = 1.875029665786 \bullet 10^{-4}$, the basic parameters are $\hbar^2 \cdot \omega_p^2 = 19.5902684716 \bullet 10^{-4}$, $\hbar^2 \cdot \omega_c^2 = 5.28479085993 \bullet 10^{-4}$, $\hbar^2 \cdot \gamma^2 = 0.79237637701 \bullet 10^{-4}$ (eV)^2. The R values calculated by electron parameters coincide with the experimental values $R(\hbar\omega)$ to within $10^{-6} \div 10^{-10}$ for 12 symbol computation. By presented method the nanostructure oscillation electron parameters are determined for device producing.

[a]N. P. Netesova, *NGS12 Proceedings*, Editors: J. Kono, Jean Leotin, Toulouse, France,**2**, 178-183, (3-7 July 2005)