curves, as illustrated in Fig. 9. The solid lines in Fig. 9 are the theory curves with $L/\Lambda=30$ at 100°K and with L/Λ varying with temperature as determined by the previous equation using the data and assumptions as described above.

The relative position of the theoretical curves in the light-intensity scale shown in Fig. 9 requires that $\tau_n^2C_s$ vary as $T^{-5/2}$. If the capture cross section for electrons is also temperature-independent so that τ_n varies as $T^{-1/2}$ then C_s would vary as $T^{-3/2}$. The vertical placement of the theoretical curves in Fig. 9 was determined by assuming that $\tau_n \propto T^{-1/2}$ and that the electron mobility as a function of temperature was that for the highest mobility samples reported by Spear and Mort. The variation of the mobility with temperature is different for various samples depending on the amount of impurity scattering. If the impurity scattering was relatively more important, then τ_n would have to vary slightly more rapidly with temperature for the model to correlate with the experimental data. Preliminary results of measurements of the small-signal transient response indicate that τ_n may vary with temperature somewhat more rapidly than $T^{-1/2}$.

IV. SUMMARY

The fact that the slope of the curve of log(photocurrent) versus log(light intensity) shows a transition from a sublinear value to a value near unity going from surface excitation to volume excitation indicates that surface recombination effects are playing a major role in determining the steady state characteristics. Our results show that the photocurrent–light-intensity characteristic cannot be fitted by a power law response of constant exponent. When presented on a log-log plot, the data show pronounced curvature which is a very slowly varying function of the light intensity.

When this sublinear behavior is analyzed as a function of temperature, it is found that a bulk-trapping model cannot be used to explain the results. Instead, an ambipolar diffusion model making use of bimolecular surface recombination has been developed to explain the experimental observations. This model has been shown to be successful in explaining not only the sublinear behavior at one temperature, but most features of the steady-state response from 100–300°K. The model also predicts the transition in the steady-state behavior going from strongly absorbed to weakly absorbed light. The model provides a method for determining a value for the ambipolar diffusion length which is calculated for one of our typical samples at $L=6.2\times10^{-4}$ cm. The diffusion model may also be used to obtain information about the surface recombination velocity.

It is also possible to obtain a quantitative correlation between the volume sensitivity and the spectral response of the photocurrent. For low-sensitivity samples, the volume recombination path will dominate since the volume lifetime is short and one expects no peak in the photocurrent at the absorption edge. For samples with a high-volume sensitivity, surface recombination will be important, hence one expects a peak in the spectral photoresponse at the absorption edge. Since the surface recombination is bimolecular, the size of the peak will also depend on the relative light intensity and temperature.

Erratum

Study of Optical Effects Due to an Induced Polarization Third Order in the Electric Field Strength, P. D. MAKER AND R. W. TERHUNE [Phys. Rev. **137**, A801 (1965)]. The right-hand sides of Eq. (22), of the second part of Eq. (23), and of Eq. (34) should all be multiplied by a factor of 2.