Comment on “Photoreflectance study in the $E_1$ and $E_1 + \Delta_1$ transition regions of CdTe” [J. Appl. Phys. 87, 7360 (2000)]

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[Kaneta and Adachi$^1$ have recently presented a photoreflectance (PR) study of CdTe in the region of the “$E_1$” and “$E_1 + \Delta_1$” transitions as a function of temperature in the range of 77–300 K. As is acknowledged in the article these optical features are primarily excitonic in nature; the PR line shape fits are relevant to excitonic features, i.e., the exponent $n_j$ in Eq. (6) is taken to be 2.

The fact that the $E_1$ and $E_1 + \Delta_1$ optical transitions in diamond and zincblende semiconductors are mainly excitonic has been known for more than 30 years.$^2$ Therefore, as pointed out in Ref. 3 (an article that has been largely ignored) the energies of these features are not the critical point (CP) energies, as discussed in Ref. 1 and listed in Table I. These structures actually correspond to the CP energies minus the binding energy ($R_1$) of the related two-dimensional exciton, i.e., $E_1 - R_1$ and $(E_1 + \Delta_1) - R_1$. Reference 3 and the work of Wei et al.$^4$ have shown that $R_1$ in CdTe is quite substantial, i.e., about 150 meV.

As pointed out in a number of recent articles by the Brooklyn College group$^4$–$^9$ the so-called $E_1$ and $E_1 + \Delta_1$ optical transitions in these materials should actually be labeled $E_1 - R_1$ and $(E_1 + \Delta_1) - R_1$, respectively.

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$^2$See, for example, P. Y. Yu and M. Cardona, Fundamentals of Semiconductors (Springer, Heidelberg, 1996), and references therein.


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