exchanging indices j and k. Here, $\{\phi_{e_i}\}$ ($\{\phi_{h_j}\}$) are the electron (hole) single-particle wave functions, and $\bar{\epsilon}(\boldsymbol{r}, \boldsymbol{r}')$ is the (i.e., $\varepsilon_{e_{th+i}} \approx E_{th} = E_g$); (ii) $\varepsilon_{e_{th+i}}$ is well above threshold. Condition (i) corresponds to situations where the excess energy Δ is only enough to excite a valence electron from a state close to the band edge (h_1−h_4) into e_1. In case (ii), instead, Δ

Direct Carrier Multiplication by an Electron in the Presence of a Hole (Case II) (Figure 1b). To allow a comparison with case I above, we consider photogenerated electron−

the VBM, see Figure 2) found[36] in spherical dots between levels h_4 and h_5: in that energy range, there are no energy-conserving transitions $h_n \rightarrow e_i$ available to the DCM process; the next transition $h_5 \rightarrow e_1$ is more than 100 meV higher in energy (Figure 2). Instead, such a gap does not exist within deep hole states (the ones involved in the AC process); therefore, the AC lifetime is almost constant for all energies. As a consequence, τ_{DCM}, which is smaller than τ_{AC} for excess

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