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Direct carrier multiplication due to inverse Auger scattering in CdSe quantum dots

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Many optoelectronic devices could achieve much higher efficiencies if the excess energy of electrons excited well above the conduction band minimum could be used to promote other valence electrons across the gap rather than being lost to phonons. It would then be possible to obtain two

used in the calculation of the decay rates are computed with the semi-empirical nonlocal pseudopotential method described in Refs. 17 and 20, solved within a plane-wave basis, including spin–orbit effects. Electron and hole levels are labeled with increasing and, respectively, decreasing energy as e_i and h_j, with $i,j=1,2,\ldots$, where $e_1=e_{\mathrm{cbm}}$ and $h_1=h_{\mathrm{vbm}}$

energy levels above threshold. The AC lifetimes are obtained by summing over 30 deep hole final states $\{h_n\}$, whose energy is centered around $\epsilon_{h_1} - E_g$.

Bulk versus dot. We find (insets in Figs. 2 and 3) that the