We present time-resolved photoluminescence measurements of InAs/GaAs quantum dots showing a relevant interplay between recombination kinetics and thermalization processes. By time-resolved and steady-state measurements we experimentally demonstrate that the thermal population of optically inactive states fully accounts for the increase of the intrinsic radiative lifetime in quantum dots when the lattice temperature raises.
Experimental data are compared with model predictions for the electronic structure of the quantum dot, and the dark optical transitions involved in the thermalization nicely correspond to the first-hole-excited levels. In addition, the observation of thermalization between the electronic levels allows us to estimate the relaxation time to the ground state, which turns out to be in the ps time scale.