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Nonradiative Auger recombination of biexcitons in CdSe/CdS core-shell nanocrystal quantum dots ROMAN VAXENBURG, George Mason University, Fairfax, VA 22030, USA, ANNA RODINA, Ioffe Institute, St. Petersburg, 194021, Russia, EFRAT LIFSHITZ, Technion Israel Institute of Technology, Haifa, 32000, Israel, ALEXANDER EFROS, Naval Research Laboratory, Washington, DC 20375, USA — Semiconductor nanocrystals are known for their applicative potential as light-emitting components in lasers and LEDs, as well as light absorbers in solar cells. The performance of these nanocrystal-based devices, however, strongly depends on the dissipative nonradiative Auger recombination. The study of dynamics of the Auger processes is therefore of key importance in connection with the performance of nanocrystals devices. Here we report on a theoretical study of the Auger recombination dynamics of biexcitons in CdSe/CdS core-shell nanocrystals. Biexcitons can decay by the Auger process via negative or positive trion recombination channels. We study the dependence of the rate of each one of these channels on the angular momentum of the initial biexciton state, nanocrystal geometry, and temperature. We observe that the overall dependence of the rates of both channels is strongly oscillating with nanocrystal geometry, indicating large differences in the Auger rates in nanocrystals of similar size. We find that the rate of the negative trion channel is independent of the initial biexciton angular momentum and is generally slower than the rate of the positive trion channel, which, in contrast, is sensitive to the biexciton angular momentum. Further, we demonstrate that by variation of temperature the Auger rate can be varied across a wide range of values.

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