Photocharging dynamics in colloidal CdS quantum dots visualized by electron spin coherence

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We use a time-resolved technique with three laser pulses (pump, orientation and probe) to study the photocharging dynamics with picosecond resolution on a long timescale ranging from ps to ms in CdS colloidal quantum dots. The detection is based on measuring the coherent spin dynamics of electrons, allowing us to distinguish the type of carrier in the dot core (electron or hole). We find that although initially negative photocharging happens because of fast hole trapping on surface states, eventually it evolves to positive photocharging due to electron trapping and hole detrapping. The positive photocharging lasts up to hundreds of microseconds at room temperature.

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