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Atomistic theory of spin relaxation in self-assembled (In, Ga)As/GaAs quantum dots at zero magnetic field LIXIN HE, Univ. Sci & Tech. of China, HAI WEI, MING GONG, G.-C. GUO — We investigated the spin-flip time (T_1) of electrons and holes mediated by acoustic phonons in self-assembled In(Ga)As/GaAs quantum dots at zero magnetic field, using an atomistic pseudopotential method. At low magnetic field, the first-order process is suppressed, and the second-order process becomes dominant. We find that the spin-phonon-interaction induced spin relaxation time is 40 - 80 s for electrons, and 1 -20 ms for holes at 4.2 K. The calculated hole-spin relaxation times are in good agreement with recent experiments, which suggests that the two-phonon process is the main relaxation mechanism for hole-spin relaxation in the self-assembled quantum dots at zero field. We further clarify the structural and alloy composition effects on the spin relaxation in the quantum dots.

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