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Zero-Magnetic-Field Spin Splitting of Polaron's Ground State Energy Induced by Rashba Spin-Orbit Interaction

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Abstract: We study theoretically the ground state energy of a polaron near the interface of a polar-polar semiconductor by considering the Rashba spin-orbit (SO) coupling with the Lee-Low-Pines intermediate coupling method. Our numerical results show that the Rashba SO interaction originating from the inversion asymmetry in the heterostructure splits the ground state energy of the polaron. The electron areal density and vector dependence of the ratio of the SO interaction to the total ground state energy or other energy composition are obvious. One can see that even without any external magnetic field, the ground state energy can be split by the Rashba SO interaction, and this split is not a single but a complex one. Since the presents of the phonons, whose energy gives negative contribution to the polaron's, the spin-splitting states of the polaron are more stable than electron's.

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Key words: asymmetric heterostructures, spintronics, triangular potential approximation, Rashba spin-orbit interaction

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