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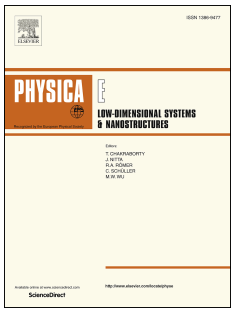

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Anisotropic optical absorption induced by Rashba spin-orbit coupling in monolayer phosphorene

Yuan Li[a,*], Xin Li[a], Qi Wan[a], R. Bai[b], Z. C. Wen[a]

[a] *Department of Physics, Hangzhou Dianzi University, Hangzhou, Zhejiang 310018, China*
[b] *Center for Integrated Spintronic Devices (CISD), Hangzhou Dianzi University, Hangzhou, Zhejiang 310018, China*

Abstract

We obtain the effective Hamiltonian of the phosphorene including the effect of Rashba spin-orbit coupling in the frame work of the low-energy theory. The spin-splitting energy bands show an anisotropy feature for the wave vectors along k_x and k_y directions, where k_x orients to ΓX direction in the k space. We numerically study the optical absorption of the electrons for different wave vectors with Rashba spin-orbit coupling. We find that the spin-flip transition from the valence band to the conduction band induced by the circular polarized light closes to zero with increasing the x-component wave vector when k_y equals to zero, while it can be significantly increased to a large value when k_y gets a small value. When the wave vector varies along the k_y direction, the spin-flip transition can also increase to a large value, however, which shows an anisotropy feature for the optical absorption. Especially, the spin-conserved transitions keep unchanged and have similar varying trends for different wave vectors. This phenomenon provides a novel route for the manipulation of the spin-dependent property of the fermions in the monolayer phosphorene.

Keywords: `Phosphorene`, Rashba spin-orbit coupling, Optical absorption

*Corresponding author
Email address: `liyuan@hdu.edu.cn` (Yuan Li)