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Research note

Spin-polarized photocurrent in armchair TMD nanoribbons

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Abstract

In the present study, we introduce a concept to generate the spin-polarized current in armchair transition metal dichalcogenide nanoribbons (TMDNs) by using light irradiation. For simulating the opto-spin current, we use electron-photon interaction in non-equilibrium Green's function methods. Because of the intrinsic spin-orbit coupling, light irradiation produces spin-photocurrent in TMDNs without applying any external magnetic element. Moreover, transverse electric field modifies the magnitude and position of optical absorption peaks, as well as the magnitude of the spin-photocurrent. Finally, the fully spin-polarized photocurrent, the high quantum efficiency with a maximum of approximately 50%, the wide-wavelength-range operation from ultraviolet to infrared and optical spin-filtering effects are tunable with transverse electric field indicate the high performance of this spin-photodetector based on armchair TMDNs, thereby paving the way toward the improved design and performance of this photodetector in spin-optoelectronics.

Keywords: spin-optoelectronic, transition metal dichalcogenide nanoribbons, quantum efficiency, full spin polarization

For full article, refer to the Persian section