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Spin-dependent refraction at the atomic step of transition-metal dichalcogenides MIKITO KOSHINO, TETSURO HABE, Tohoku Univ — We theoretically propose a spin-dependent electronic transport mechanism in the transition metal dichalcogenide, in which the spin-unpolarized electron beam is split into different directions depending on spins at an atomic domain boundary. Specifically, we calculate the electronic transmission across a boundary between monolayer and bilayer of the transition metal dichalcogenide, and demonstrate that up-spin and down-spin electrons entering the boundary are refracted and collimated to opposite directions. The phenomenon is attributed to the strong spin-orbit interaction, the trigonally-warped Fermi surface, and the different crystal symmetries between the monolayer and bilayer systems. The spin-dependent refraction suggests a potential application for a spin splitter, which spatially separates up-spin and down-spin electrons simply by passing the electric current through the boundary.

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