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Dresselhaus Effect in Bulk Wurtzite Structures WAN-TSANG WANG, Department of Physics, Center of Nanoscience and Nanotechnology, National Sun Yat-Sen University, Kaohsiung, Taiwan, YIA-CHUNG CHANG, Research Center for Applied Sciences, Academia Sinica, Taipei, Taiwan, JIH-CHEN CHIANG, YU-CHI HSU, Department of Physics, Center of Nanoscience and Nanotechnology, National Sun Yat-Sen University, Kaohsiung, Taiwan — The wurtzite bulk inversion asymmetry (WBIA) terms in the$k \cdot p$Hamiltonian have been derived from the linear combination of atomic orbital method, and the analytic form of Dresselhaus effect is obtained via an eight-band$k \cdot p$Hamiltonian. It is found that WBIA terms lead to not only a spin-degenerate line (along the kz axis) but also a minimum-spin-splitting surface. Furthermore, they can induce large spin splitting energies in wide-gap wurtzite materials such as GaN. Consequently, the D'yakonov-Perel' (DP) spin-relaxation mechanism can be effectively suppressed for all spin components in the [001] wurtzite quantum wells (QWs) at a resonance condition through appropriate sample design or the application of a suitable gate bias. Therefore, wurtzite QWs (e.g., InN/GaN or GaN/AlN) are potential candidates for spintronic devices such as the resonance spin lifetime transistor.

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