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Rashba effects in bulk wurtzite materials CHIEH-LUNG WU, W.T. WANG, M.H. GAU, JIH-CHEN CHIANG, IKAI LO, H.F. KAO, Y.C. HSU, D.J. JANG, Department of Physics, National Sun Yat-sen University, Kaohsiung, Taiwan ROC., MENG-EN LEE, Department of Physics, National Kaohsiung Normal University, Yanchao, Kaohsiung County 82444, Taiwan ROC, CHUN-NAN CHEN, Department of Physics, Tamkang University, Tamsui, Taipei County 25137, Taiwan ROC — The spin-splitting energies in strained bulk wurtzite AlN are studied using the linear combination of atomic orbital method. It is found that strain and crystal field induce not only a Rashba linear-$k(\alpha_{wz})$ but also two Rashba cubic$-k$ terms (γ_R and λ_R) in the two-band $k \cdot p$, Hamiltonian $H_{SO}(\vec{k}) = (\alpha_{wz} - \gamma_R k_{//}^2 + \lambda_R k_z^2)(\sigma_x k_y - \sigma_y k_x) + H_{SO}^0$ where $H_{SO}^0 = (-\gamma_0 k_{//}^2 + \lambda_0 k_z^2)(\sigma_x k_y - \sigma_y k_x)$ generates a cone-shaped minimum-spin-splitting (MSS) surface and $\lambda_0/\gamma_0 \approx 4$. As tensilely biaxial strain increases, the shape of the MSS surface changes from a hexagonal hyperboloid of two sheets in unstrained AlN to a hexagonal cone, and eventually becomes a hyperboloid of one sheet.

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