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Equi-spin-splitting distribution near the minimum-spin-splitting surface under biaxial strains in bulk wurtzite materials HSIU-FEN KAO, IKAI LO, JIH-CHEN CHIANG, C.L. WU, W.T. WANG, Department of Physics, Center for Nanoscience and Nanotechnology, National Sun Yat-sen University, Kaohsiung 80424, Taiwan, MENG-EN LEE, Department of Physics, National Kaohsiung Normal University, Yanchao, Kaohsiung 82444, Taiwan, CHUN-NAN CHEN, Department of Physics, Tamkang University, Tamsui, New Taipei City 25137, Taiwan, Y.C. HSU, Department of Physics, Center for Nanoscience and Nanotechnology, National Sun Yat-sen University, Kaohsiung 80424, Taiwan — The spin-splitting energies in biaxially strained bulk wurtzite materials are calculated using the linear combination of atomic orbital method, and the equi-spin-splitting distributions in k-space near the minimum-spin-splitting (MSS) surfaces are illustrated. These data are compared with those derived analytically using the two-band $\mathbf{k} \cdot \mathbf{Dp}$ (2KP) model. It is found the results from these two methods are in good agreement for small k. However, the ellipsoidal MSS surface under compressively biaxial strain predicted by the 2KP model does not exist, due to the data points are far from the Γ point in this case. As a result, from compressively to tensilely biaxial strain, only three types of shapes of the MSS surface exist in the wurtzite Brillouin zone; that is, a hyperboloid of two sheets, a hexagonal cone and a hyperboloid of one sheet.

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