Investigation of Spin Splittings and Rashba coefficients in Asymmetric AlSb/InAs/GaSb/AlSb Heterostructures

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We examine in detail the spin splitting mechanism that results form the removal of inversion symmetry in asymmetric heterojunction structures in the AlSb/InAs/GaSb/AlSb material system. We compute the contribution to the Rashba coefficient due to the interface asymmetry and we explore the variation in this coefficient and the splitting with the different layers' thicknesses. We find that the Rashba effect is particularly large in the broken gap AlSb/InAs/GaSb/AlSb quantum well structures. We find for the resulting two-dimensional electron gas (2DEG) in the optimized structure a theoretical value of the Rashba coefficient of α_R=51 10^{-10} eV cm. This is, to our knowledge, the largest predicted value for this parameter. Finally, we derive an expression, valid in the diffusive limit, for the spin polarization of the current resulting from a bias parallel to the plane of the quantum well.