Valley Structure and Giant Spin Splitting in Lead Salts Nanowires

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— We employ tight-binding method and $k \cdot p$ theory to analyze valley structure of PbSe nanowires grown along the [111] direction and having unit cells of different point symmetry: $D_{3d}$, $D_3$, and $C_{2h}$. We show that, while all three nanowire symmetries exhibit large valley splittings of electronic subbands, the $D_3$ wires are of special interest, as they possess a screw axis which results in appreciable spin-dependent splittings of electronic subbands, linear in one-dimensional wave vector.

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