Spin-polarized electron states in a quantum film based on narrow-band semiconductors\textsuperscript{1} LEONID ISAEV, YONG JOE, ARKADY SATANIN, Ball State University, Muncie, IN, SERGIO ULLOA, Ohio University, Athens, OH — Narrow-gap semiconductors (NGS) with strong spin-orbit interactions are promising materials as a source of polarized electrons. Electron states in NGS are described by the Dirac-type equation with Hamiltonian parameters determined by the Kane interband matrix element [1]. Modern epitaxial technology makes it possible to create quantum films (QF) (or quantum wells) with a given spatial dependence of the composition, \textit{i.e.} control of the position-dependence of the energy gap. The electron dispersion in a homogeneous QF with same boundaries still keeps the spin degeneracy [2]. In the present work it is shown that the position dependent gap leads to spin-splitting of the electron dispersion in a QF. For a film with a linear spatial gap variation in the transverse direction, the solution of the Dirac equation can be found exactly. Near the gap the proposed spin-orbit mechanism approximately reduces to Rashba’s term with the loop in dispersion. The electron polarization degree for a QF based on a Pb\textsubscript{1-x}Sn\textsubscript{x}Te system is calculated. [1] J. O. Dimmock \textit{et al}, Phys. Rev. 16, 1193 (1966). [2] S.Yu. Potapenko and A. M. Satanin, Sov. Phys. Solid State 26, 1067 (1984).

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