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Spin lifetime dependence on spin injection orientation in strained silicon films[1] JOYDEEP GHOSH, DMITRI OSINTSEV, VIKTOR SVERDLOV, SIEGFRIED SELBERHERR, Institute for Microelectronics, TU Wien — Growing technological challenges and costs are guiding MOSFET scaling to an end. This accelerates the search of alternative devices principles, including concepts based on electron spin. As of the ongoing shift to thin silicon films and fins-based devices for the 14nm node and beyond, spin lifetime in such structures becomes a dominant issue. Large spin lifetime enhancement in (001) thin silicon films subjected to [110] uniaxial tensile stress was predicted for spin injected perpendicular to the film [1]. Here we find that the spin relaxation rate is further reduced and the spin lifetime is thus increased for spin injected in-plane. To explain the observed behavior we look at the spin relaxation hot spots. For an in-plane injection along OX the spin expectation value projections at the hot spots are: $\sigma_x = \sin^2(\arctan(p_x/p_y)), \sigma_y = -(p_y/p_x)\sigma_x, \sigma_z = 0$, while for spin injected perpendicular to the film the spin expectation value at the hot spots is zero, resulting in maximal spin randomization at any in-plane momentum (p_x, p_y). Therefore the spin relaxation rate is the strongest for spin injected perpendicularly explaining the spin relaxation time increase for an in-plane spin injection. 1.D.Osintsev *et al., Solid-State Electron.***90**, 34 (2013).

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