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Large Valley Splitting in Slightly Misaligned Uniaxially Strained Silicon Films VIKTOR SVERDLOV, Insitute for Microelectronics, TU Wien, OSKAR BAUMGARTNER, SIEGFRIED SELBERHERR, Institute for Microelectronics, TU Wien — We have numerically computed the subband structure in a thin silicon film by using the Hensel-Hasegawa-Nakayama model for the conduction band. It is demonstrated that unprimed subbands in a (001) films are not equivalent at small thicknesses. Application of tensile stress in [110] direction removes the subband degeneracy. For small stress the subband splitting is linear in shear strain. It is inversely proportional to the third power of the film thickness, in agreement with previous results. For a film slightly misaligned from the (001) direction the ground subband develops the two minima symmetrically situated around the point $k_x = k_y = 0$. In the magnetic field these two minima produce the two ladders of the Landau levels. Due to Zener tunneling between the two minima the difference between the cyclotron frequencies decays exponentially with the inverse magnetic field. This effect was previously interpreted as an exponential decrease in valley splitting due to disorientation. We show that for stress values employed by the semiconductor industry the large value for the valley splitting is recovered.

[X] Prefer Oral Session
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