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Spin-orbit-induced spin-polarized surface states in one-atomic-layer Pb films on Si(111) HYUNGJUN LEE, HYOUNG JOON CHOI, Department of Physics and IPAP, Yonsei University — As a route to spintronics without magnetism, spin-orbit coupling (SOC) generates and manipulates the spin-polarized carriers, thereby providing key ingredients for spin field-effect transistors. Along this line, we investigated the spin-orbit induced effects in Pb monolayers on Si(111) substrates, modeled by $\sqrt{3} \times \sqrt{3}$ phase with Pb coverage of $4/3$ ML, based on first-principles calculations with the inclusion of SOC. We focus on the electronic structures of surface states with characteristic Rashba-type spin splitting and spin texture as well as the charge flow pattern by calculating the current density distribution for the spin-polarized surface states. We also discuss our results on the difference from the spin splitting in the Shockley surface states on Au(111) surface. This work was supported by the NRF of Korea (Grant No. 2011-0018306), and computational resources have been provided by KISTI Supercomputing Center (Project No. KSC-2012-C2-14).

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