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OAM and spin structure of Cu(111) and Au(111) surface state bands BEOMYOUNG KIM, PANJIN KIM, WONSIG JUNG, YEONGKWAN KIM, YOONYOUNG KOH, CHANGYOUNG KIM, Institute of Physics and Applied Physics, Yonsei University, Seoul 120-749, Korea, MASASHI ARITA, KENYA SHIMADA, HIROFUMI NAMATAME, MASAKI TANIGUCHI, Hiroshima Synchrotron Radiation Center, Hiroshima University, Higashi-Hiroshima, Hiroshima 739-0046, Japan, CHOONG H. KIM, JAEJUN YU, Department of Physics and Astronomy, Seoul National University, Seoul 151-747, Korea — We performed angle-resolved photoemission studies on Cu(111) and Au(111) surface states with circularly polarized light to investigate local orbital angular momentum (OAM) structures. Existence of OAM is confirmed, as predicted, to exist in systems with an inversion symmetry breaking. Cu(111) surface state bands are found to have chiral OAM in spite of very small spin-orbit coupling, consistent with the theoretical prediction. As for Au(111), we observe split bands for which OAM for the inner and outer bands are parallel, unlike the Bi2Se3 case. We also performed first-principles calculations and the results are found to be consistent with experimental results. Moreover, the majority of OAM is found to have *d*orbital origin while a small contribution comes from *p*orbitals. An effective Hamiltonian that incorporates the role of OAM is derived and is used to extract the spin and OAM structures. We discuss the evolution of angular momentum structures from a pure OAM system to a strongly spin-orbit-entangled state.

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