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Emergence of orbital angular momentum due to broken inversion symmetry and its contribution to Rashba-type splitting CHOONG H. KIM, Seoul National University, Seoul, Korea, JIN-HONG PARK, Sungkyunkwan University, Suwon, Korea, SEUNG RYONG PARK, University of Colorado at Boulder, Boulder, Colorado, USA, BEOM YOUNG KIM, Yonsei University, Seoul, Korea, JAEJUN YU, Seoul National University, Seoul, Korea, CHANGYOUNG KIM, Yonsei University, Seoul, Korea, JUNG HOON HAN, Sungkyunkwan University, Suwon, Korea — We demonstrate that the chiral orbital angular momentum (OAM) structure can emerge as a result of broken inversion symmetry especially at the metal surfaces. The surface-normal electric field is responsible for chiral OAM states even if spin-orbit interaction is negligible. Such chiral OAM structure can be measured by a circular dichroism (CD) in angle-resolved photoemission spectroscopy (ARPES). To confirm the existence of OAM and its detection by CD-ARPES, we perform simulation of CD-ARPES for Cu surface states by first-principles calculation and the results agree well with our CD-ARPES experiment. Addition of the spin-orbit interaction to the chiral OAM structure produces a chiral spin angular momentum (SAM) pattern and the corresponding Rashba-type band splitting. We assert that OAM polarization should be a more widespread feature than the chiral spin structure which requires strong spin-orbit coupling.

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