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Strongly enhanced Rashba splitting in the perovskite tantalate-hafnate heterostructure SUK BUM CHUNG, Seoul Natl Univ, MINSUNG KIM, Ames Laboratory / Iowa State University — In addition to superconductivity and magnetism, one notable ingredient of the two-dimensional electron gas (2DEG) emerging at the transition metal oxide surface is the Rashba-Dresselhaus spin-orbit interaction, the momentum-dependent spin splitting due to the broken inversion symmetry and atomic spin-orbit coupling. However, it has not been understood how this splitting can be maximized in a physical system without applying external electric field. Here, we present a promising route to realize significant Rashba-type band splitting using thin film heterostructure. Based on a first-principles method and analytic model analysis, a tantalate layer on $BaHfO_3$ is shown to host a two-dimensional bands originating from Ta t_{2g} orbitals with strongly enhanced Rashba-Dresselhaus spin splittings at both the band minima and saddle points. A significant t_{2g}-e_g coupling that contributes to this enhanced splitting is likely to be a generic feature for the surface 2DEG of transition metal oxide with maximal inversion symmetry breaking. Our results could be important in realizing topological superconductivity and potentially useful for spintronics application.

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