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Effects of spin-orbit interaction on the electronic structures of 5d double perovskite A_2FeReO$_6$ (A=Ba and Ca) B.C. JEON, ReCOE, Seoul Nat'l. Univ. Korea, C.H. KIM, S.J. MOON, W.S. CHOI, Y.S. LEE, Soongsil Univ., Korea, J. YU, Seoul Nat'l. Univ., Korea, C.J. WON, Inha Univ., Incheon, Korea, J.H. JUNG, N. HUR, T.W. NOH, Seoul Nat'l. Univ., Korea — Recently, the role of spin-orbit coupling (SOC) in 5d transition metal oxides (TMOs) attracted a lot of attention. In 5d TMOs, the energy scale of the SOC is larger than that of 4d or 3d TMOs and it can induce novel Mott insulating state through the cooperation with the electron correlation.[1] We investigated the electronic structures of 5d double perovskite A_2FeReO$_6$ (A=Ba and Ca) using optical and x-ray absorption spectroscopy. The experimental spectra showed clear changes from metallic to insulating states, when the Ba ions were substituted with Ca ions. The observations are consistent with the results of density functional theory calculations when both the on-site Coulomb interaction U and the SOC are properly considered. Our study indicates that the subtle interplay of electron correlation, spin-orbit interaction, and lattice distortion can explain the electronic structures of A_2FeReO$_6$. [1] S.J. Moon *et al.*, Phys. Rev. Lett. **100**, 116404 (2008), B.J. Kim *et al.*, Phys. Rev. Lett. **101**, 076402 (2008)

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