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Electronic Structure Determination of the Thermoelectric $CuRh_{1-x}Mg_xO_2$ using Soft X-Ray Spectroscopies ERIC MARTIN, PAOLO VILMERCATI, CHRISTINE CHENEY, Dept. of Physics and Astronomy, The University of Tennessee, TAKAO SASAGAWA, Materials and Structures Laboratory, Tokyo Institute of Technology, NORMAN MANNELLA, Dept. of Physics and Astronomy, The University of Tennessee — Magnesium-doped rhodium oxides with formula unit $CuRh_{1-x}Mg_xO_2$ and delafossite-type structure exhibit a high thermoelectric figure of merit at elevated temperatures. The electronic structure of $CuRh_{1-x}Mg_xO_2$ has been studied with x-ray emission spectroscopy (XES), x-ray absorption spectroscopy (XAS), and photoemission spectroscopy (PES). The data reveal that the states at the Fermi level are Rh-derived. Measurements carried out by changing the orientation of the linear photon polarization further indicate that the Rh states have a more localized character along the c-axis, consistent with the layered crystal structure. Given the similarity of the electronic configurations of Co and Rh, these data provide solid experimental evidence that the orbital degrees of freedom of the d^6 ionic configuration of the states rooted in transport are key for explaining the thermoelectric properties of oxide materials.

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