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Momentum-Space Dichotomy in the Metal-Insulator Transition in doped EuO DANIEL SHAI, ALEXANDER MELVILLE, JOHN HARTER, ERIC MONKMAN, DAWEI SHEN, DARRELL SCHLOM, KYLE SHEN, Cornell University — EuO possesses a wide variety of remarkable properties, most which can be accessed only upon carrier doping. In addition to its large ferromagnetic moment (S = 7/2), doped EuO exhibits a metal-insulator transition with a change in resistivity of over 10^{13} and highly spin polarized carriers. Furthermore, the ferromagnetic Curie temperature can be enhanced from 69 K in undoped EuO to over 200 K in carrier doped EuO. We present angle-resolved photoemission studies of $Eu_{1-x}Gd_xO$ thin films which elucidate the electronic structure and mechanism of the metal-insulator transition. Our ARPES studies verify that the exchange coupling between the Eu 4f moments and the delocalized Eu 5d states pushes the bottom of the majority-spin conduction band through E_F below T_C. We also reveal a surprising dichotomy between the delocalized carriers at the Brillouin zone boundary below T_C, and localized carriers around the zone center above T_C which are responsible for the respective low-temperature ferromagnetic metallic and high-temperature paramagnetic semiconducting behaviors observed in transport measurements.

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