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Direct Observation of the Bandwidth Control Mott Transition in the $NiS_{2-x}Se_x$ Multiband System H.C. XU, Y. ZHANG, M. XU, R. PENG, X.P. SHEN, State Key Laboratory of Surface Physics, Department of Physics, and Advanced Materials Laboratory, Fudan University, Shanghai 200433, PRC, V.N. STROCOV, M. SHI, M. KOBAYASHI, T. SCHMITT, Swiss Light Source, Paul Scherrer Institute, CH-5232 Villigen PSI, Switzerland, B.P. XIE*, D.L. FENG*, State Key Laboratory of Surface Physics, Department of Physics, and Advanced Materials Laboratory, Fudan University, Shanghai 200433, PRC — The bulk electronic structure of $NiS_{2-x}Se_x$ has been studied across the bandwidth-control Mott transition (BCMT) using soft x-ray angle-resolved photoemission spectroscopy. We show that Se doping does not alter the Fermi surface volume. When approaching the insulating phase with decreasing Se concentration, we observed that the Fermi velocity continuously decreases. Meanwhile, the weight of the coherent quasiparticle, which sits on a large incoherent spectrum, continuously decreases and is transferred to higher binding energies, until it suddenly disappears across the Mott transition. In the insulating phase, there is still finite spectral weight at the Fermi energy, but it is incoherent and dispersionless due to strong correlations. Our results provide a direct observation of the distinct characters of BCMT in a multiband non-half-filled system.

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