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Extraordinary Doping Effects on Quasiparticle Scattering and Bandwidth in Iron-Based Superconductors DONGLAI FENG, Dept. of Physics, Fudan University — Iron-based superconductors exhibit very rich phenomena with doping. We systematically investigate the behavior of dopants in a variety of iron-based superconductors with angle-resolved photoemission spectroscopy (ARPES), we find that dopants modify the carrier density, introduce quasiparticle scattering, and vary the bandwidth in extraordinary ways [1]. Particularly, we find that instead of Fermi surface topology or carrier density, the bandwidth, which is closely related to electronic correlations, is likely the most universal electronic parameter to dominate superconductivity in various iron-pnictides and 11 and 122* types of iron-chalcogenides — superconductivity disappears when the bandwidth is tuned beyond a common range by either heterovalent or isovalent doping. This microscopic picture of doping facilitates a comprehensive and generic understanding of the rich phase diagram of various iron-based superconductors. Furthermore, our results highlight future directions to search for new iron-based superconductors with higher superconducting transition temperatures.

[1] X. R. Ye, et al, Phys. Rev. X 4, 031041 (2014).

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