

The Disorder Effects in Ru Substituted BaFe_2As_2 : Realization of Superdiffusion Mechanism

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We investigate the disorder effects in Ru substituted BaFe_2As_2 using the recently developed Wannier function based effective Hamiltonian method for disordered system [1, 2]. Although the disordered Ru substitutions introduce strong scattering in the Fe bands, the states near the Fermi level are amazingly coherent. This unexpected “protection” of Fermi surfaces against impurity scattering is shown to originate from a strong interference between the correlated on-site and off-site impurity effects, a realization of superdiffusion previously proposed in 1D models. Finally, systematic effects of Ru substitution will be discussed, including the change of carrier density, the enhanced 3D characteristic, and the recent controversy on the doping evolution of the Fermi surfaces.

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[1] T. Berlijn, D. Volja, and W. Ku, Phys. Rev. Lett. **106**, 077005 (2011).

[2] W. Ku, T. Berlijn, and C. C. Lee, Phys. Rev. Lett. **104**, 216401 (2010).