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In-plane and c-axis optical spectroscopy study on 122 Fe-pnictides

NAN LIN WANG, Institute of Physics, Chinese Academy of Sciences — I present the in-plane and the c-axis optical spectroscopy investigations on 122 Fe-pnictides. For the parent compound $BaFe_2As_2$, the in-plane measurement revealed two different energy gaps in the SDW state, whereas for the c-axis polarized measurement only the energy gap at smaller energy scale could be clearly observed. We suggest different driving mechanisms for the formation of the two energy gaps. The large energy gap is caused by the nesting between disconnected 2D cylinder-like electron and hole Fermi surfaces. It is the main driving force for the SDW instability. The small energy gap is the one formed on the 3D Fermi surface due to the presence of reduced magnetic Brillouin zone which crosses the 3D Fermi surface. It is the consequence of the establishment of the magnetic order. For the doped superconducting 122 samples, the in-plane optical measurement revealed a formation of full superconducting energy gap, whereas the c-axis optical measurement indicated a large residual quasiparticle population down to very low temperature. Those quasiparticles contribute specifically to the c-axis transport. We suggest that there exist horizontal nodes in the superconducting gap in regions of the 3D Fermi surface that contribute dominantly to the c-axis optical conductivity. Work done with Z. G. Chen, W. Z. Hu, B. Cheng, G. Li, J. Dong, T. Dong, R. H. Yuan, P. Zheng, G. F. Chen, J. L. Luo, Z. Fang, X. Dai, C. L. Zhang and P. Dai.

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