

Essence of Pseudogap and Oscillation in High-Temperature Cuprate Superconductor Junction of Pseudogap State

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Abstract: This paper gives methods to calculate the pairing temperature T^* , at which a pseudogap is opened, and the superconducting temperature T_c , at which superconductivity appears, in the high- T_c cuprates, and demonstrates directly that at $T_c < T < T^*$ the pseudogap is the gap of Cooper pair without long-range phase coherence, and at $T < T_c$ there is long-range phase coherence between Cooper pairs. Based on the above clear physical picture on the pseudogap state and our mechanism for the ac Josephson effect, this paper proposes that there should be a novel oscillatory current in P-I-P junction, induced by a constant bias on the junction. Here, P represents the high- T_c cuprates in the pseudogap state, where Cooper pairs do not have long-range phase coherence, and I represents the thin insulating barrier. This paper conjectures that there is a possible high-temperature superconductivity in the heavily underdoped high- T_c cuprates.

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Key words: pseudogap, high- T_c cuprate, oscillation

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