Superconducting Fluctuation and Electric Transport Properties Revealed from the Phase Diagram of Ca-doped Cuprates

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In this study, we analyzed the temperature-dependent transport properties of Ca-doped YBCO films with various oxygen contents from overdoped region to underdoped region. The second derivative of the temperature-dependent resistivity reveals a rich phase diagram, including the superconducting fluctuation region and pseudogap phase. These experimental results are consistent with the estimation of the fluctuation theory based on a model of the Ginzburg-Landau type. Amplitude fluctuations of Cooper pairs in the vicinity of the transition temperature provide a clear framework in which to understand dynamic properties such as the large Nernst signal observed in disordered superconducting films.