

Low Temperature STM/STS on Pb-doped $\text{Bi}_2\text{Sr}_2\text{CaCu}_2\text{O}_y$ Superconductors

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Abstract

Surfaces of Pb-doped Bi2212 single crystals were probed by low temperature scanning tunneling microscopy/spectroscopy (LT-STM/STS). The LT-STM clearly images the phase separation between modulated (M-) and unmodulated (UM-) regions, similar to the TEM observation. The former exhibits a superstructure with a periodicity of 7 nm along the b-axis, while in the latter the structure is substantially distorted. Below T_c , the both phases show an almost identical superconducting gap structure with $\delta \sim 40$ meV. Above T_c , however, we found the tendency that the UM-region is characterized by a larger pseudo gap with a deeper dip structure around the zero bias. This result is consistent with the expectation that the UM-region contains a higher Pb amount. From the present STM/STS observations, it is concluded that the difference in normal state property is one of the important factors to decide the J_c parameters, at least, in Bi-based high temperature superconductors.