Abstract Submitted
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Importance of matrix element effects in the scanning tunneling spectra of $Bi_2Sr_2CaCu_2O_{8+\delta}$[1] ARUN BANSIL, Northeastern University, JOUKO NIEMINEN, TUT, Finland and Northeastern University, ROBERT MARKIEWICZ, HSIN LIN, Northeastern University — Scanning tunneling microscopy/spectroscopy (STM/STS) techniques have entered the realm of high-Tc's impressively by offering atomic scale real space resolution and meV resolution in bias voltages. STM/STS spectra, however, represent a complex mapping of electronic states of interest related to the CuO2 planes, since the tunneling current must reach the tip after being filtered through the overlayers (e.g. SrO and BiO in Bi2212). We have developed a Green function approach for realistic modeling of STM/STS spectra of the cuprates, where the tunneling current is evaluated directly including the effect of overlayers, with all orbitals within a few eV's of the Fermi energy E_F accounted for. Our computations show the presence of strong matrix element effects, which lead to significant differences between the dI/dV spectra and the local density of states (LDOS) of CuO2 planes. For instance, the $d_{x^2-y^2}$ signal is found to be dominated by non-vertical hopping between the CuO_2 and BiO layers. A substantial electron-hole anisotropy of the tunneling spectrum, which is in accord with experiments, is naturally explained by the contribution from d_{z^2} and other orbitals below E_F.

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