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TUNNELING SPECTROSCOPY OF THE ELECTRON-DOPED CUPRATE SUPERCONDUCTOR $Pr_{2-x}Ce_xCuO_4$

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The properties of electron(n)-doped cuprate superconductors show significant deviations from those of their hold(p)-doped counterparts. Experiments prior to 2000 suggested an s-wave pairing symmetry as opposed to a d-wave pairing symmetry in hole-doped cuprates. Recent experiments have suggested that n-doped cuprates have a d-wave pairing symmetry. However, tunneling spectroscopy of these materials have not revealed a zero bias conductance peak (ZBCP), which is a classic signature of d-wave symmetry. We present the first tunneling spectroscopy data on n-doped $Pr_{2-x}Ce_xCuO_4$ (PCCO) using point contact junctions which show a systematic evolution of the ZBCP. This method of junction fabrication is important as it allows the barrier strength between the normal and the superconducting electrodes to be varied. We show that this is essential to observing the ZBCP. The n-doped cuprates have a low T_c (~25 K) and H_{c2} (~10 T). The low H_{c2} enables us to obtain the normal state in PCCO at low temperatures. We have used this to probe the density of states in the normal state of PCCO. We observe an anomalous gap even in the normal state.[1] This normal state gap (NSG) becomes smaller on the over-doped side. We discuss the behavior of this NSG in the context of the pseudogap which has been observed in hole-doped cuprates.

1. A. Biswas, P. Fournier, V. N. Smolyaninova, R. C. Budhani, J. S. Higgins, and R. L. Greene, *cond-mat*/0103634 (to appear in *Phys. Rev. B*).

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