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FERMIOLOGY OF THE UNDOPED CUPRATE SUPERCONDUCTOR Pr_2CuO_4 ROSS MCDONALD, LANL, NICHOLAS BREZNAY, UC Berkeley, YOSHIHARU KROCKENBERGER, NTT, KIMBERLY MODIC, ZENGWEI ZHU, LANL, IAN HAYES, NITYAN NAIR, TONI HELM, UC Berkeley, HIROSHI IRIE, HIDEKI YAMAMOTO, NTT, JAMES ANALYTIS, UC Berkeley — Unconventional, high temperature superconductivity consistently appears in the vicinity of suppressed phase transitions, leading to the suggestion that quantum criticality is vital to the physics of these systems. A confounding factor in identifying the role of quantum criticality in the electron-doped cuprates is the competing influence of chemical doping and oxygen stoichiometry. Recent advances in molecular beam epitaxy and preparation of cuprate thin films indicate that annealing can be employed to optimize Tc via the control of apical oxygen occupancy. For $Pr_2CuO_{4\pm\delta}$ the resulting square planar coordinated structure exhibits a 25 K superconducting transition in the absence of Cerium doping. Using these films and ultra high magnetic fields (>90 T) enables measurements of magnetic quantum oscillations – the first observation of their kind for a cuprate thin film. The oscillation frequency is consistent with the reconstructed Fermi surface of the bulk electron-doped cuprate $Nd_{2-x}Ce_xCuO_4$. Furthermore, we observe a mass enhancement, suggesting that tuning these materials via oxygen stoichiometry enables exploration of underlying quantum criticality, providing a new axis with which to explore the physics underlying the electron doped side of the cuprate phase diagram.

Ross McDonald
LANL

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