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Bulk superconductivity at 84 K in the strongly overdoped regime of cuprates ANDREA GAUZZI, YANNICK KLEIN, IMPMC-Sorbonne Universities, ELVEZIO MORENZONI, Paul Scherrer Institut, MIKKO NISULA, MAARIT KARPPINEN, Aalto University, MASSIMO MAREZIO, CRETA-CNRS, THEODORE H. GEBALLE, Stanford University — By means of magnetic susceptibility, specific heat and muon-spin relaxation (μSR) measurements, we report on bulk superconductivity at 84 K in high-pressure oxidized $Cu_{0.75}Mo_{0.25}Sr_2YCu_2O_{7.54}$. A record short apical Cu-O distance and a large excess of electronic specific heat at low temperature give evidence of hole overdoping, $p \approx 0.43$ hole/Cu, well beyond the superconducting dome relating T_c and p, considered universally valid for cuprates, where a normal Fermi liquid behavior is expected. On the other hand, the superfluid density measured by means of μSR is similar to that of optimally doped $YBa_2Cu_3O_{7-\delta}$, which indicates that the extra-holes do not contribute to superconductivity, thus leading to a phase separation between superconducting and normal carriers, or that Cooper pairs are strongly localized. In both cases, the unexpected observation of high T_c in the strongly overdoped regime constitutes a further open issue for the theoretical explanation of superconductivity in cuprates.

Andrea Gauzzi
IMPMC-Sorbonne Universities

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