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Beyond annealing: A revealing story of electron doped cuprate superconductors YOSHIHARU KROCKENBERGER, MASAFUMI HORIO, HIROSHI IRIE, HIDEKI YAMAMOTO, NTT Basic Research Labs — High superconducting transition temperatures are a unique feature of cuprate superconductors. The standard phase diagram randomly combines cuprates with various Cu coordinations, e.g., octahedral vs. square-planar, thus violates electron-hole symmetry arguments. In contrast to hole-doped cuprates, the concept of doping dependency is disobeyed on the electron-doped side. Doping alone fails to induce superconductivity and a process commonly referred to as "annealing" is required. We have shown that an elaborate annealing process, i.e. 2-step annealing process, is capable to induce superconductivity into $Pr_{2-x}Ce_xCuO_4$ with x as low as $x = 0.00$. Here we show that appropriate synthesis conditions allow for the growth of as-grown superconducting Pr_2CuO_4 and T′-La_2CuO_4 thin films by molecular beam epitaxy. We observe a hole-like Hall coefficient being linear up to high magnetic fields. Hence, high quality thin films of electron doped cuprate superconductors still show a positive Hall coefficient even at optimal doping level. Finally, the transition from a Mott insulator in T-La_2CuO_4 to a superconducting metal in T′-La_2CuO_4 at $x = 0.00$ is solely associated to the coordination of Cu.

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