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Preparation of undoped superconducting T'-RE_2CuO_4 by MBE with ex-situ post-reduction HIDEKI YAMAMOTO, NTT Basic Research Labs., OSAMU MATSUMOTO, MICHIO NAITO, Tokyo University of Agriculture and Technology — It has recently been revealed that the optimally-reduced end-member compounds T'-RE_2CuO_4 (RE = Pr, Nd, Sm, Eu, Gd) show superconductivity with T_c over 30K [1] although they are commonly believed as Mott insulators. The superconducting specimens were produced by metal organic decomposition (MOD) with elaborated reduction procedures, where the advantage of thin-films, large surface-to-volume ratio, is fully utilized to achieve the optimal oxygen configuration. Their single-crystalline thin films prepared by UHV-based process may have a further advantage of providing a good opportunity for elucidating the highly important controversy in these materials using powerful but surface-sensitive probes such as ARPES and STM. With this motivation in mind, we grew 100-nm-thick T'-RE_2CuO_4 (RE = Pr, Nd, Sm) films on $SrTiO_3$ substrates by MBE. The as-grown films were semiconducting. However, with a post-reduction treatment in a tubular furnace, which is essentially identical to that for the MOD films, the MBE films became metallic and showed superconductivity at $\sim$ 30K, indicating that the superconducting films are potentially obtainable through in-vacuo process by tuning up the reduction conditions. [1] O. Matsumoto et al., Physica C 468 (2008) 1148; M. Naito et al., J. Phys: Conf. Ser. 108 (2008) 012037.

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