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M2Po2B-03 [34]: Chemical solution deposition of Y1Ba2Cu3O7-x thin films on SrTiO3 substrates

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Conventionally the fabrication of superconducting thin films is carried out by tedious processes and requires expensive equipment. Here we report the growth of YBa₂Cu₃O_{7-x} (YBCO) thin films on SrTiO₃ substrates by the low-cost chemical solution deposition technique [1]. The preparation includes the precipitation of yttrium, barium and copper acetates in oxalic acid; and directly dripping onto SrTiO₃ ([100] orientation) substrates. The epitaxial growth of the deposited layer was carried out by calcination and thermal treatments at 840 and 860 °C. The surface morphology was inspected by optical microscopy. X-ray diffraction (XRD) confirms the preferential epitaxial growth (001) of the YBCO crystallites, especially after thermal treatment at 860 °C. Both samples show a superconducting critical temperature of 90 K. The estimation of the critical current density (JC) of the samples was measured indirectly from their respective hysteresis cycles following the Bean equation [2] at 10 K. For the sample treated at 840 °C, JC was 19 x 10⁴ A/cm², while for the sample obtained at 860 °C JC was 17 x 10⁹ A/cm², indicating that a thermal treating of 840 °C is enough to obtain a versatile YBCO thin film.

[1] Yuanqing Chen et al. (2016). High Critical Current Density of YBa₂Cu₃O_{7-x} Superconducting Films Prepared through a DUVassisted Solution Deposition Process. Scientific Reports. DOI: 10.1038/srep38257.

[2] J. Narayan, A. Bhaumik y R. Sachan., Journal of Applied Physics Vol 123 2018 135304.

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