An effort to remove the Cu-rich layer in double coated YBa$_2$Cu$_3$O$_{7-\delta}$ thick film derived from MOD method

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Abstract: Copper aggregation onto the surface of YBCO thick film during the pyrolysis and crystallization process for metallorganic deposition (MOD) has been reported by many groups and is considered as a barrier for the $c$-axis epitaxial growth of multi layered YBCO film, which is required for high-performance YBCO superconducting film preparation. In the present work, a Cu-rich layer of about 50 nm at the upper part of the pyrolytic precursor film is observed, evidencing the copper aggregation during the heat treatment process. Two techniques including chemical etching and magnet enhanced reactive ion etching are employed to remove the Cu-rich layer before the second coating step, so that well textured YBCO thick film with high performance is more likely to be obtained. Our results show that both techniques are effective to remove the Cu-rich layer, and the texture, as well as the critical current density ($J_c$) is improved slightly. The reason for the absence of significant improvement of the texture and critical current density may be partly contributed by the interfusion of incidental elements and the damage to the surface morphology during the etching process, implying an optimization for the etching techniques is needed.

Key words: copper aggregation, Cu-rich layer, YBCO thick film, MOD, etching