Abstracts

The Coplanar Resonator Technique for Determining the Surface Impedance of YBa/sub 2/Cu/sub 3/O/sub 7-delta/ Thin Films

A. Porch, M.J. Lancaster and R.G. Humphreys. "The Coplanar Resonator Technique for Determining the Surface Impedance of YBa/sub 2/Cu/sub 3/O/sub 7-delta/ Thin Films." 1995 Transactions on Microwave Theory and Techniques 43.2 (Feb. 1995 [T-MTT]): 306-314.

We describe how coplanar microwave resonators fabricated from patterned thin films of YBa/sub 2/Cu/sub 3/O/sub 7-delta/ (YBCO) can be used to measure the ab-plane microwave surface impedance Z/sub s/ = R/sub s/ + jX/sub s/ of the films, in particular the absolute value and temperature dependence of the magnetic penetration depth lamda. The current distribution of the resonator is calculated by modelling the resonator as a network of coupled transmission lines of rectangular cross-sections; this is then used to estimate the ab-plane lambda(T) from the measurements of resonators of different geometries patterned onto the same film. We obtain values of lambda(0) in the range 150-220 nm. The unloaded quality factors of the linear resonators at 7.95 GHz are around 45000 at 15 K and around 6500 at 77 K. We estimate the corresponding values of the intrinsic R/sub s/ at 7.95 GHz to be 23 µOmega and 110 µOmega at 15 K and 77 K, respectively. These values are comparable with those of other high quality unpatterned YBCO films reported in the literature. Z/sub s/ for the best optimised films appears to be insensitive to the effects of patterning.

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