Abstracts

5 GHz High-Temperature-Superconductor Resonators with High Q and Low Power Dependence up to 90 K

C. Wilker, Z.-Y. Shen, P. Pang, D.W. Face, W.L. Holstein, A.L. Matthews and D.B. Laubacher. "5 GHz High-Temperature-Superconductor Resonators with High Q and Low Power Dependence up to 90 K." 1991 Transactions on Microwave Theory and Techniques 39.9 (Sep. 1991 [T-MTT] (Special Issue on Microwave Applications of Superconductivity)): 1462-1467.

We have fabricated high-temperature superconducting films made of TIBaCaCuO (2212) and YBaCuO (123) by postdeposition annealing techniques on (100) LaAlO/sub 3/ substrates. These films, especially the TIBaCaCuO (2212), exhibit a unique combination of microwave properties: high temperature operation, high Q (low surface resistance), and low power dependence. Both types of films have measured surface resistances which are better than 1/10 that of copper at 20 GHz. (These low surface resistance values are realized below 98 K for TIBaCaCuO (2212) and below 84 K for YBaCuO (123).) Micrcrostrip resonators with a fundamental resonance frequency of 5 GHz were fabricated from these materials. The performance of our best resonator at 90 K (loaded Q >20000 at 5 GHz) was 50 times better than an analogous copper resonator (also measured at 90 K) and can handle more than 10 W of peak power in the resonator with only a small degradation of the Q. In addition, the shift of the resonator frequencies with temperature was fit to a two-fluid model. The parameters for TIBaCaCuO (2212) were T/sub c/ = 101.0 K and lambda/sub 0/ = 4700 Å and for YBaCuO (123) were T/sub c/= 91.1 K and lambda/sub 0/= 6800 Å.

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