Abstracts

Design of sapphire rod resonators to measure the surface resistance of high temperature superconductor films

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Sapphire rod resonators of three types, as proposed in the IEC/TC90/WG8, have been commonly used to measure the surface resistance R/sub s/ of high temperature (high-T/sub c/) superconducting (HTS) films. One is called an open-type resonator, where a sapphire rod having diameter D and length L is placed between two parallel HTS films, and the other is called a closed-type resonator, where the sapphire rod is set in a cavity constructed from two HTS films and a copper ring having diameter d and height h. Some mode charts for these resonators are calculated from the rigorous analysis based on the mode matching method, taking account of an uniaxial-anisotropic characteristic of a sapphire rod. An optimum dimension of a sapphire rod resonator is designed from the mode charts so as to separate the TE/sub 011/ mode from the other modes. Moreover, it is verified that the radiations of the leaky state TM modes influence the unloaded Q/sub u/ values of the open-type resonator. As a result, the closed-type sapphire resonator having a dimension ratio X/sup 2/=(D/L)/sup 2/ of 4 and diameter ratio S=d/D of 4 should be used.

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