

Measurements of Both of the Loss Tangent of Rutile(TiO_2) and the Microwave Surface Resistance of $\text{YBa}_2\text{Cu}_3\text{O}_{7-8}$ Films using Two Resonant Modes of a Rutile-loaded Resonator

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Generally, we use the dielectric-loaded cavity resonator method as a standard for measuring the microwave surface resistance of HTS films. In this method, one of the most important factors that limit the measurement sensitivity is the accuracy in the loss tangent($\tan\delta$) of the dielectric rod placed inside the cavity. Here we present our results for the R_s of $\text{YBa}_2\text{Cu}_3\text{O}_{7-8}$ films and the $\tan\delta$ of rutile, which were investigated using the 'so-called' two-tone method as suggested by Kobayashi et al. Procedures for identifying TE_{012} and TE_{021} modes, the modes of our interest, as well as other modes including HEM , TE and TM modes are presented for our rutile(TiO_2)-loaded cavity resonator with the TE_{012} and TE_{021} resonant frequencies appearing at 13.67~14.01 GHz. The $\tan\delta$ of rutile measured by the two-tone method is compared with that obtained by other measurement methods. Discussion on the applicability of the two-tone method follows.