

§17. Basic Research on the Conduction-Cooled Oxide Superconducting Magnet wound with Parallel Conductors

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1. Introduction

To develop conduction-cooled oxide superconducting magnets, it is necessary to grasp the basic electromagnetic properties of oxide superconducting wires in detail. This year we investigated the field angular dependence of the ac loss in Bi2223 superconducting wires. We report the results.

2. Ac loss measurement

We measured the ac loss by using a saddle-shaped pickup coil as shown in Fig.1. Sample Bi2223 wires with a length of 60mm were inserted into the center of a pickup coil. Magnetic field angle was changed by rotating the sample around its axis as shown in Fig. 2. We prepared a single tape and an 8-tape stack to investigate the influence of stacking. The characteristics of sample Bi2223 wires are listed in Table 1. Ac loss measurement was carried out at 77K in LN₂.

3. Observed ac loss

Observed field amplitude dependencies of the ac losses are shown in Fig. 3. We can see that the penetration field of a single tape exposed to perpendicular field($\theta=90\text{deg.}$), which corresponds to the amplitude at the breaking point of the ac loss curve, is larger than that of a 8-tape stack. It is due to the demagnetization effect. The ac loss in the 8-tape stack decreases with decreasing field angle monotonically for any amplitude. The ac loss curve in the case of $\theta=15\text{deg.}$ has two breaking points. It seems to suggest that the ac losses are composed of the contributions of the perpendicular field component and parallel one.

Table 1 Characteristics of a Bi2223 sample wire

Width	4.2mm
Thickness	0.24mm
Matrix	Ag, Sheath:Ag+0.2wt%Mn
Ag ratio	1.5
I _c (77K, 0T)	110A
Number of filament	61
Twist	none

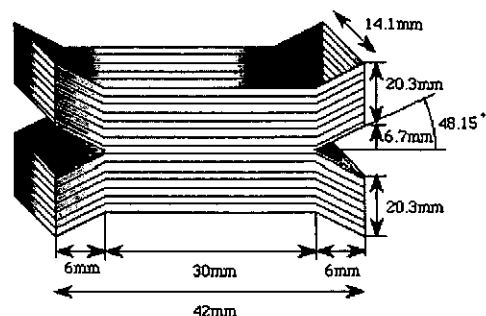


Fig.1 Dimensions of a saddle-shaped pickup coil.

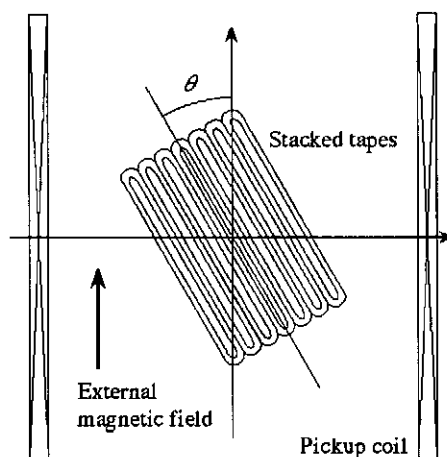


Fig.2 Cross section of the straight-part of a saddle-shaped pickup coil.

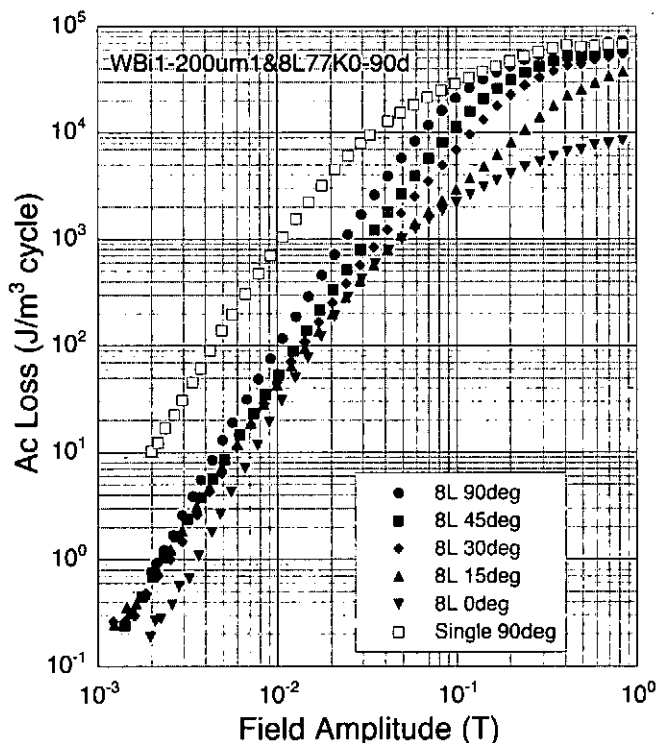


Fig.3 Amplitude dependence of the observed ac losses in a single Bi2223 tape and an 8-tape stack.