ABSTRACT

Non-destructive measurement of Residual Resistivity Ratio (RRR) and Critical Temperature (Tc) for thin film superconductors using Planar Transformers is studied.

The performances of above two configurations are discussed. Measurements for RRR and Tc are also carried out using the standard 4-probe method.

INTRODUCTION

Studies on thin film Nb coated cavities on copper substrate are progressing at a rapid rate.

The use of Nb coating on a copper base to form an SRF cavity has allowed making use of high thermal conductivity and physical properties of copper.

Nb coating on Cu cavities reduces the possibilities of thermal quench by redistributing the heat at a much faster rate.

Quality of thin film is can be judged from its Residual Resistivity Ratio (RRR) value.

The RRR can be defined as ratio of resistivity of material at room temperature and to the resistivity near Critical Temperature (Tc).

RRR is usually measured using 4 probe resistivity measurement from the coated samples.

The 4-probe resistivity measurement, measured quantity is the resistance averaged over the sample length

Planar Transformers are used to measure RRR of the samples.

This method gives local resistivity measurements.

DESIGNED PLANAR TRANSFORMERS

Two different configurations were tested to determine which configuration is more suited

Known AC current is fed into the primary coil P1. The AC voltage induced in the secondary coil S1 is measured

When the sample undergoes transition from normal to superconducting state, the electromagnetic waves are totally reflected and hence there will be a sudden change in the measured voltage

Configuration 1 has both the primary and secondary coils on the same PCB board.

Modular and highly local measurements can be made with Configuration

Higher frequency of operation is required as the inductance value of the primary and a similar coil as secondary

The magnitude of the transition jump (Uj) is indicative of the residual resistance of the sample

Uj values for peak Un/Us were also analyzed

DEPOSITION PARAMETERS

<table>
<thead>
<tr>
<th>Parameters</th>
<th>Values</th>
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<tbody>
<tr>
<td>Sputtering Gas</td>
<td>Argon</td>
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<tr>
<td>Base pressure (Torr)</td>
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<tr>
<td>Working Pressure(Torr)</td>
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<td>Power (Watts)</td>
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<tr>
<td>Voltage (V)</td>
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<tr>
<td>Current (mA)</td>
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</tbody>
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REFERENCES

