

ABSTRACT

Title : Fabrication of High- T_c SQUID and Simulation on Magnetic Flux Guide

Pages : 79

School : National Kaohsiung University of Applied Sciences

Department : Graduate Institute of Mechanical and precision Engineering

Time : July, 2014

Degree : Master

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Keywords : SQUID, Fluxguide,

In this thesis, we investigated the superconducting quantum interference device (SQUID) magnetometer with fluxguide for vector magnetic field measurement. The $\text{YBa}_2\text{Cu}_3\text{O}_{7-x}$ (YBCO) thin films were grown on strontium titanate (SrTiO_3) substrates by radio frequency magnetron sputtering. Parameters of sputtering of YBCO thin film were tested several times for obtaining the highest critical transition temperature (T_c) from resistance-temperature measurement. YBCO thin films grown on bicrystal SrTiO_3 substrates were patterned by photolithograph and wet etching to form the layout of SQUID magnetometers. The devices were placed in a cryogenic electrical-property measurement probe with 96 switchable channels for characterization of voltage-current and voltage-field curves. The fluxguide can deflect the in-plane magnetic flux toward the out-of-plane direction. According to the 2D simulation result, a high efficiency in flux deflection can be achieved when the aspect ratio of rectangular fluxguide is above 1.3. This result was used to design cross-shaped and a square-shaped fluxguides. The simulation shows that the efficiency for deflecting the in-plane magnetic flux into the out-of-plane direction can be more than 75% with these fluxguides. The results of this study can help to achieve the novel three-axis SQUID magnetometer.