MLF Experimental Report	提出日 Date of Report Aug 27, 2016
課題番号 Project No. 2015A0130 実験課題名 Title of experiment Instrumentation of a new jig and uniaxial strain dependence of critical current in the BSCCO superconducting wires 実験責任者名 Name of principal investigator Kozo Osamura 所属 Affiliation Research Institute for Applies Sciences	装置責任者 Name of responsible person Harjo Stefanus 装置名 Name of Instrument/（BL No.） BL-19 (TAKUMI) 実施日 Date of Experiment March 4 9:00 – March 7 9:00, 2016

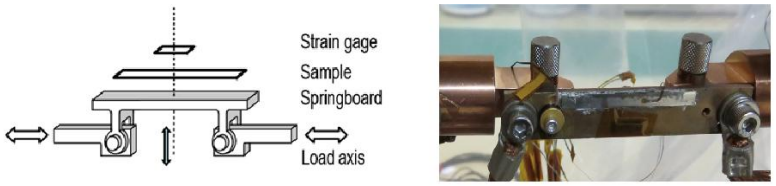
試料、実験方法、利用の結果得られた主なデータ、考察、結論等を、記述して下さい。（適宜、図表添付のこと）
Please report your samples, experimental method and results, discussion and conclusions. Please add figures and tables for better explanation.

1. 試料 Name of sample(s) and chemical formula, or compositions including physical form.

1. BSCCO tapes including $(Bi, Pb)_2Sr_2Ca_2Cu_3O_{10}$, Ag matrix and Ni alloy reinforcing member
2. REBCO tapes including $(Y, Gd)Ba_2Cu_3O_x$ layer, Hastelloy substrate and Cu stabilizer

2. 実験方法及び結果（実験がうまくいかなかった場合、その理由を記述してください。）
Experimental method and results. If you failed to conduct experiment as planned, please describe reasons.

In order to measure local strain over the wide range from *compressive* to *tensile* applied strains, we designed an unique jig including springboard as shown in Fig. 1(b) which is the same springboard for the critical current measurement as shown in Fig. 1(a). Here applying compressive or tensile



(a) SB for critical current measurement (b) SB for diffraction experiment

Fig. 1 Jigs for uniaxial strain measurements

load along the load axis, the sample strains towards tensile or compressive direction. Instead of this test method using springboard, another method was employed where the sample is attached directly to the load axis and the intrinsic tensile strain is applied to the sample.

2. 実験方法及び結果（つづき） Experimental method and results (continued)

(1) Experiment by using the springboard:

As shown in Fig. 2, it was succeeded to measure the diffraction profile by using the jig as shown in Fig. 1(b). As shown in Fig. 2, however, both diffraction peaks from BSCCO tape and Cu-Be springboard overlapped each other. So we need to select another material for the springboard in order to avoid such overlapping.

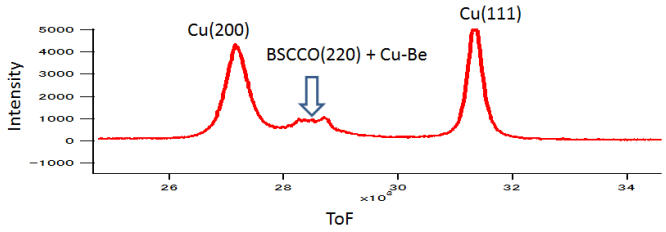


Fig. 2 Diffraction profile from the BSCCO tape attached on the Cu-Be springboard

(2) Experiments by using the intrinsic tensile jig:

We succeeded to measure directly the local strain exerted on $(Bi, Pb)_2Sr_2Ca_2Cu_3O_{10}$, superconducting filaments in two kinds of type H and type NX BSCCO wires as shown in Fig. 3(a). When applying the tensile stress, the local strain A_{BSCCO} increases linearly as shown by a straight line and then saturates and becomes constant. This saturation indicates that the superconducting filaments start to fracture gradually. When comparing the tensile stresses when the saturation starts to happen, the saturation point nearly at 400 MPa is larger at 77 K comparing with the RT data.

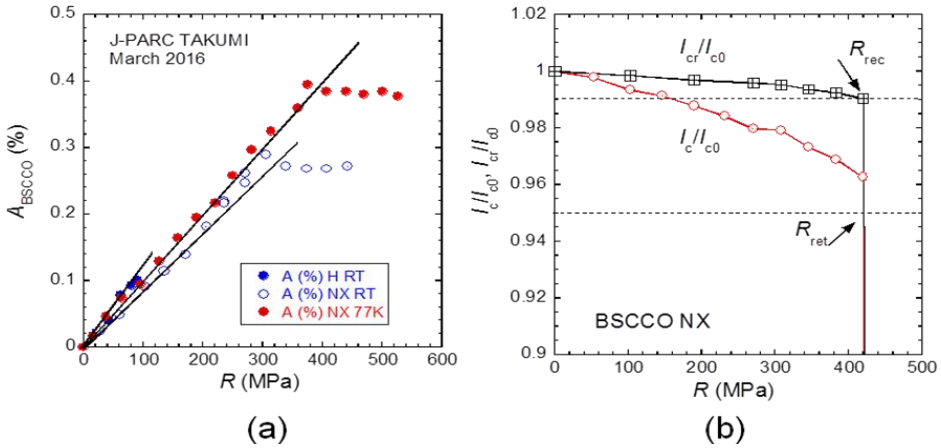


Fig. 3 Applied tensile stress dependence of the local strain exerted on $(Bi, Pb)_2Sr_2Ca_2Cu_3O_{10}$, filaments (a) and the normalized critical current (b) for the type H and type NX BSCCO wires

Fig. 3 (b) indicates two types of normalized critical currents, I_c/I_{c0} and I_{cr}/I_{c0} as a function of tensile stress. Both I_c/I_{c0} and I_{cr}/I_{c0} decrease abruptly at about 420 MPa. Thus the abrupt decrease of critical current has been directly proved to be attributing to the fracture of superconducting filaments when adding the diffraction data shown in Fig. 3(a).

The present result will be presented at International Cryogenic Materials Conference held Kanazawa in November, 2016.

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〇論文等による成果発表の予定 (Your publication plan)