4Pa76

Nb_3Sn線材のIc特性に及ぼす中性子照射効果

Neutron Irradiation Effect on I_C Properties of Nb_3Sn Wire

西村新[1], 菱沼良光[1], 吉田誠[2], 飯尾雅実[2], 中本建志[3],
小黒英俊[4], 山崎正徳[5], 外山健[5], 淡路智[6]

Arata Nishimura[1], Yoshimitsu Hishinuma[1], Makoto Yoshida[2], Masami Iio[2], Tateshi Nakamoto[3],
Hidetoshi Oguro[4], Masanori Yamazaki[5], Takeshi Toyama[5], Satoshi Awaji[5]

[1]核融合研、[2]J-PARC、[3]高エネ研、[4]東海大、[5]東北大

[1]NIFS, [2]J-PARC, [3]KEK, [4]Tokai Univ., [5]Tohoku Univ.

Introduction

A Nb_3Sn wire was manufactured by a bronze process and the samples were neutron-irradiated at BR2 to 4.9 x 10^{22} n/m^2 (>0.1 MeV). Then, the I_C of the irradiated sample was measured in the range of 8 T to 15.5 T with a 15.5 T magnet and a variable temperature insert (VTI) at Oarai center of Tohoku University. The results were discussed comparing the data opened in the papers.

Test Results

The V-I curve measured in LHe with a 28 T magnet at HFLSM at Tohoku University and the V-I curve measured with VTI are shown in Fig. 1. The results with VTI were obtained under the ramp rate of 150 A/s and the sampling rate of 10 Hz. Due to the joule heating at the sample holder, the sample temperature raised, and the I_C became lower.

The I_C results are plotted against magnetic field as shown in Fig. 2. The I_C measured in LHe are higher than those measured with VTI. The neutron irradiation increased the I_C in the range of tasted magnetic field, and the ratio of the irradiated I_C to the non-irradiated I_C, (I_C/I_{C0}), becomes almost constant of 1.75.

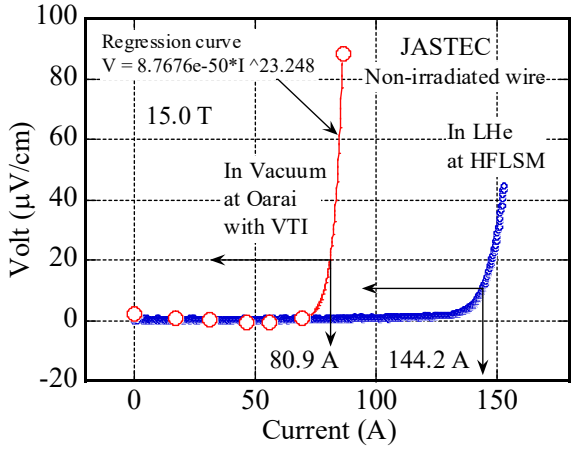

Fig. 1 Comparison of V-I curves measured in vacuum with VTI at Oarai center and in LHe at HFLSM.

The I_C/I_{C0} of 1.75 was compared with the data opened in the papers as shown in Fig. 3. The horizontal axis is the neutron fluence of over 0.1 MeV. The present result is plotted on the data obtained at 6 T after the irradiation at KUR. The sample was manufactured with the bronze process.

Study Plan

The samples manufactured with an internal Sn process were already irradiated. The effect of the neutron fluence and the manufacturing process will be investigated in near future.

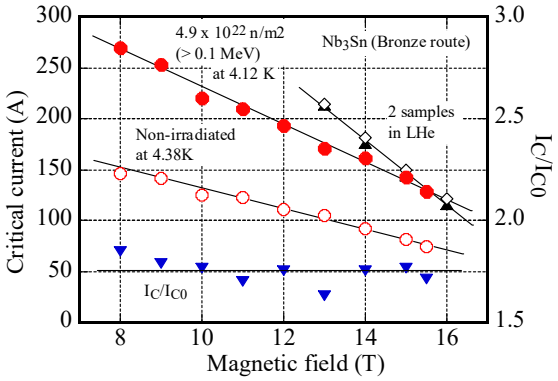

Fig. 2 Change in critical current and I_C/I_{C0} against magnetic field.

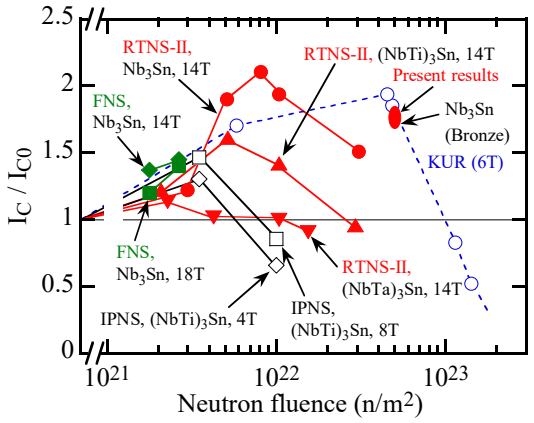

Fig. 3 Change in I_C/I_{C0} against neutron fluence.