

Mechanical – Electromagnetic Property of Stainless Sheet Laminated BSCCO – 2223 Wires

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Abstract

In order to elucidate the effect of tensile stress / strain on the critical current of DI-BSCCO-2223 wires, the critical current measurement and the tensile test were carried out at 77 K. Neutron diffraction measurements were performed at 77 K to get direct information about the local strain exerted on the BSCCO superconducting filaments. It was reported that the critical current of BSCCO wires decreases linearly in a small range of tensile stress / strain and that the critical current returns reversibly on reducing the stress / strain. The gradual decrease of critical current was observed within the reversible region. When the tensile stress / strain increased beyond a characteristic value, the critical current decreased rapidly due to the brittle fracture of BSCCO filaments.

It is proposed that the reversible stress / strain limit of critical current (R_{rec} and A_{rec}) can be defined experimentally as the 99% I_c recovery stress ($R_{99\% \text{rec}}$) and strain ($A_{99\% \text{rec}}$). The reversible strain limit is proposed to consist mainly of three factors of pre-strain, thermal strain and tensile fracture strain of SC filaments themselves. The calculated relation between the reversible stress (R_{rec}) and strain (A_{rec}) could well explain quantitatively the observed relation between 99% I_c recovery stress ($R_{99\% \text{rec}}$) and strain ($A_{99\% \text{rec}}$).