

## **Development of in-situ measurement method of internal strain and critical current of composite superconductors and their quantitative evaluation**

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### **【Outline of survey】**

In property- and reliability- designing for engineering application of superconducting composite wires and tapes, it is required to reveal the stress response of the constituting components in composites and to clarify quantitatively the correlation of the stress-state to superconducting- and fracture- properties. In order to estimate them comprehensively in a wide variety of stress- and temperature environments for a wide variety of the composite superconductors, development of a new laboratory-scale experimental method is needed in addition to the employment of big X-ray facility at photon factory. The aims of the present work are to develop a laboratory-scale in-situ strain measurement system thorough a development of a high accuracy new optical system for hard X-ray, to measure the necessary data for property- and reliability- estimation by the developed system, and to describe them in a quantitative manner based on the mesomechanical modeling.

### **【Expected results】**

By combining a mesomechanical modeling of superconducting composites and novel experimental methods to obtain strain of superconducting filaments in the composites under stress, we plan to propose a quantitative method to understand and evaluate reliability of superconducting tapes and wires under external applied loads. The novel experimental methods of X-ray strain analysis are expected to contribute to wider range of fields not only in the strain analysis but also powder diffractions and scattering, where a focusing beam is useful.

### **【References by the principal researcher】**

- H. Okuda, S. Ochiai et al: In Situ Strain Measurements of Bi2223 Superconducting Filaments in Ag-sheathed Bi2223 Tapes, Physica C, Vol.411, (2004)114-119.
- S. Ochiai, H. Okuda et al: A Monte Carlo - Shear Lag Simulation of Tensile Fracture Behavior of Bi2223 Filament, Superconductor Science and Technology, Vol.18 (2005) S356-S363.

**【Term of project】 FY2006 - 2009**

**【Budget allocation】 41,900,000 yen**

**【Homepage address】 <http://www.matdesign.iic.kyoto-u.ac.jp/English/E-index.htm>**