

§4. Database Development for He II-cooled Superconducting Magnet System Design

Haruyama, T., Kimura, N., Nakai, H. (KEK)
 Shintomi, T. (Nihon Univ.)
 Shiotsu, M., Shirai, Y., Hata, K. (Kyoto Univ.)
 Sato, A., Yuyama, M., Maeda, M. (NIMS)
 Mito, T., Yanagi, N., Maekawa, R., Iwamoto, A.,
 Hamaguchi, S.

i) Introduction

Recently, R&D and constructions of large superconducting magnet systems cooled with superfluid helium (He II) have been conducted. However, the database for the design of He II system has not been arranged systematically and is insufficient to be utilized. Therefore, it is important to integrate the required information to design large superconducting systems with the He II cooling.

We have arranged the database for He II, which researchers can use and apply for system design, from a large number of papers and from our complimentary experiments of He II. These works were performed with a Grant-in-Aid for scientific research of the MEXT for three years from year 2000 to 2003. Its continuous maintenance have been followed by the collaborative program of NIFS from 2003.

This group consists of four institutions of various fields: high-energy physics, applications of high magnetic field, power application, fusion science, and so on. Therefore, data from various field can have been integrated for the database.

ii) Arrangement of the database

In FY 2004, we integrated the database by searching and collecting data from literatures published after year 2000. New data of the number of 155 have been collected from accessible papers. Those data have been checked in the effectiveness and reliability, and the graphs, figures and required information have been selected for the database. The collected data are categorized as shown in Table I.

The utility of the database was also upgraded. User can search and access requiring data by key words. Moreover, the content of literature is completed for easy understanding of users requiring the data.

iii) Experimental studies for the He II database

We have performed the following supplementary experiments:

1. experimental and analytical studies on heat transfer in He II to apply to large super-conducting magnet systems,
2. pressure dependence of heat transfer function of He II,
3. heat transfer and boiling-off properties in He II.

By studies 1 and 2, we could make it clear that some phenomena are peculiar to large superconducting magnet systems cooled by He II. The pressure dependence of the heat transfer function could be revised to the more precise data by our experiments. Moreover, we could confirm reliability of some data in the database.

iv) Published papers

The following abstract was published.

1. T. Haruyama, et al., "Database development for He II-cooled superconducting magnet system design (2) – research results and DB publication-", Abstracts of CSJ Conference, Vol.70(2004), p. 35.

Table I Technical items for document

Head items	Items	Sub items
Heat transfer	He II pressurized	plate channel
	He II saturated	plate channel
System	Cryostat	
	Heat exchanger	JT HeIIp-HeIIs
	Pumping	vacuum pump cold compressor
	Materials	
Cooling technology	Measurement	temperature
		pressure
flow rate		
level		
miscellaneous		
Special technique	seal	
	miscellaneous	
Operated cases	Refrigeration Magnet Magnet stability Conductor	