ACTIVITIES OF THE TECHNICAL COMMITTEE ON DEI IN IEEJ

Digest Reports of Investigation Committees in DEI

Investigating Committee on Structure and Functions of Molecular Ultrathin Films, Organic Thin Films and Interfaces

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The committee was established in July 1997, with the term of three years. The investigation has focused attention mainly on the subjects below:

1. fabrication techniques and evaluations of the structure of molecular ultrathin films and organic thin films,
2. new functions of molecular thin films and their interfaces,
3. evaluations and control of optical and electrical properties at interfaces of thin films, and
4. interface structures between different materials and evaluations of the interaction.

There were twelve committee meetings up to Sep. 1999 and six meetings of them were held for visiting distinguished laboratories in Japan, that is, NIMC, IMS, Yamagata Univ., Shizuoka Univ., ETL and Nagoya Univ. Lectures were given by the researchers at the labs about evaluation of organic thin films using energy-filtering transmission electron microscopy or photoelectron spectroscopy, properties of polymer dielectrics, molecular and nanophotonics, scanning probe microscopes, electronic structure of metal /molecular thin film interface and so on. Furthermore, detailed discussions among the members of the committee were carried out for their researches. There have been further lectures by the member and non-member researchers.

The results of the investigation will be summarized at the end of the term in 2000 as a technical report mainly for evaluation techniques of structure and functions of molecular thin films, organic thin films and interfaces.

Investigation Committee on Various Problems with High Reliability for Insulation of Electronic Equipment.

T.Tsukui (Tokai University)
Y.Yamano (Chiba University)
K.Shutoh (Science University of Tokyo)
M.Nonogaki (Mitubishi Electric Co. Ltd.)

Electronic equipment is becoming small in size, light in weight, and high in performance. The printed wiring boards for the equipment are designed in fine and high density with multi layer, which result in small distance and high electric field strength between the foil conductors on the board. The insulating failures may occur on the board under such conditions. Therefore, an insulating reliability comes up to an important problem for the design of electronic equipment and systems. However, the study on the insulating reliability for the printed wiring board has not been systematically carried out.

One of the reasons for this may be a low operating voltage in the electronic circuit. Furthermore, it

is impossible to evaluate the reliability of the board by long term testing, because the electronic products such as personal computer or portable telephone must be designed within short-range term by request of a market.

In the previous investigation committee with the insulation reliability of the printed wiring board, the round robin tests of the ionic migration were carried out by more than 10 members to establish the evaluation method for the reliability by the environmental aging test. However, the tests under various environmental conditions have not been carried out yet.

From these viewpoints, a new investigation committee has started in April 1999 with 27 members. The main subjects of the committee are as follows.

(1) Survey on test methods for insulating failures due to the ionic migration.
(2) Survey on the insulating reliability with multi-constructed printed board.
(3) Survey on insulating strength between the conductors against surge of high voltage.

We have held 2 committee meetings and one study meeting since the start of this committee. Now, we are surveying on practical problems with the insulating reliability occurring in the product of electronics equipments or products. At the end of the committee, we will publish the technical report.

Investigation Committee on Insulation Life of Dielectric Materials and Electrical Apparatus

T.Ito (Musashi Institute of Technology)
M.Miyamoto (Fuji Electric Corporate Research and Development, Ltd)
K.Uchida (Chubu Electric Power Co., Inc.)
Y.Ehara (Musashi Institute of Technology)
K.Segawa (Toshiba Corporation)

The committee was established in April, 1999 with the term of three years. The committee consisted of 30 members from universities, research institutes, electric power companies, power apparatus manufactures and user companies of electric power. The diagnosis of insulating performance in power apparatus is an important research area to estimate the life limitation of electric apparatus. There are unknown deterioration mechanism still to be investigated on the insulating material and electric apparatus. The following activities have been achieved by this committee;

(1) Investigation on relation between the deterioration mechanism of insulation material such as partial discharge, treeing and other signals for the deterioration.
(2) Investigation on the diagnosis for power apparatus and power cable prior to breakdown.
(3) Investigation on the prediction of life limitation with rotating machine, Cable, transformer, capacitor and power system.

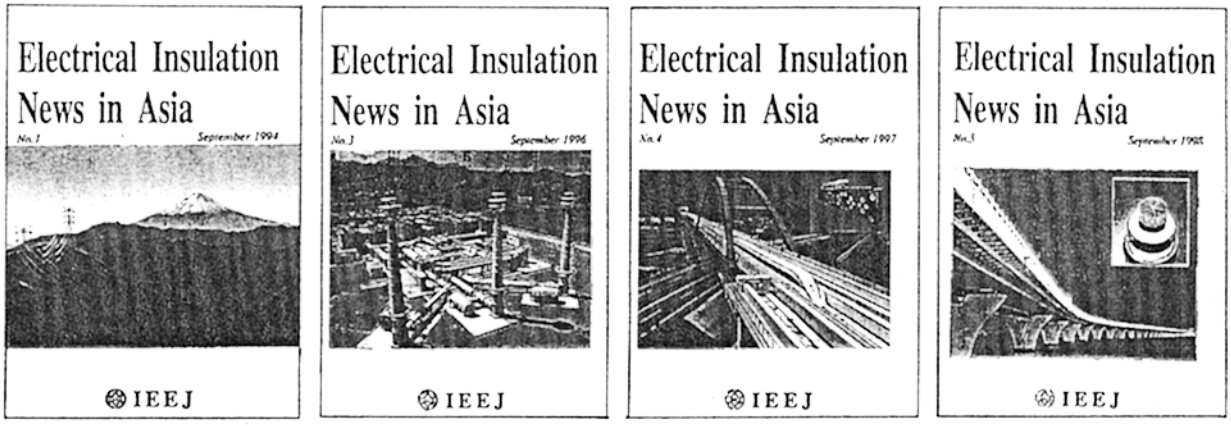
The committee has held 3 meetings. In 1999, the committee promote the Asian Conference on Electrical Insulation Diagnosis, and sent 17 papers from Japan. The committee will be promote the study meeting with life limitation and diagnosis of Dielectric Insulation Materials and Electrical Apparatus at Feb. 8, 2000 and Feb 2001.

Cooperative Research Committee on Electrical Insulation News in Asia

Chairperson	H. Yamashita (Keio University)
Secretary	T. Niwa (Fujikura Ltd.)
Secretary	Y. Inoue (Toshiba Corporation)
Assistant secretary	H. Miyata (Fujikura Ltd.)

Preceding committee ("Cooperative Research Committee (CRC) on Asian Interlink on Dielectrics and Electrical Insulation", chairperson: late Prof. Ieda) worked from Jan. 1991 to Dec. 1992. The committee

reviewed the present status of scientific and technical cooperation in the field of dielectrics and electrical insulation among Japan and Asian countries and sought the appropriate ways to promote it. As an important activity discussed in the committee, the "CRC of Electrical Insulation News in Asia" was established in Apr. 1994 and edited and published "Electrical Insulation News in Asia (EINA)" No. 1 - 5 (in every September from 1994 to 1998), and will publish EINA No.6 in November, 1999. The EINAs have gained favorable responses by questionnaires inserted in distributed EINAs.



No.1 (1994) No.3 (1996) No.4 (1997) No.5 (1998)

Front covers of some back numbers of EINA

Investigation Committee on Mechanism of Treeing Degradation and Influence of Polymer Morphology

N.Shimizu (Nagoya University)
H.Tanaka (The Furukawa Electric Co., Ltd.)
M.Kanegami (CRIEPI)

Electrical energy is one of the most important infrastructures. XLPE cable, widely used in under-ground electric power transmission and distribution, plays very important role in stable electrical energy supply.

Lifetime of XLPE power cable is practically decided by treeing degradation, namely electrical and water treeing. The investigation of treeing phenomena is of importance concerning with reliability of electric power system. Much effort has been paid to investigate treeing phenomena, and fundamental process of initiation and propagation has been gradually clarified.

However a lot of the detailed points are still unclear. Especially the influence of polymer morphology such as spherulite, amorphous, free volume etc is left unclarified, although it is essential factor to treeing phenomena.

From this viewpoint, the committee was established in April 1998 with the term of three years. The main subjects of investigation and survey of this committee are

1. Initiation and propagation mechanisms of electrical tree and the influence of polymer morphology on them.
2. Initiation and propagation mechanisms of water tree and the influence of polymer morphology on them.
3. Initiation and propagation mechanisms of electrical tree originating from water tree and the influence of polymer morphology on them.

Since the start, we have held 9 regular meetings and 9 secretary meetings. The results of investigation and survey will be published in Technical Report of IEEJ.