UC3M

RESEARCH GROUPS

DIAMAT

GROUP OF DIAGNOSIS OF
ELECTRICAL MACHINES
AND INSULATING
MATERIALS

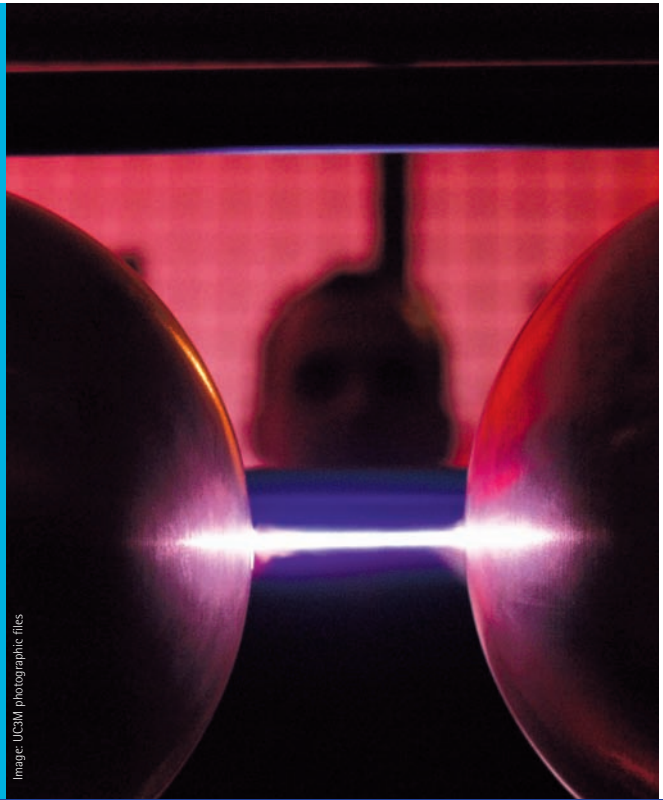

Image: UC3M photographic files

Universidad
Carlos III de Madrid
www.uc3m.es

Development of systems for real-time monitoring and diagnosis of insulating status in distribution transformers

The **Group of Diagnosis of Electrical Machines and Insulating Materials (DIAMAT)**, led by Dr. Javier Sanz Feito, is formed by a team of twelve experts in the development of novel techniques for the monitoring and diagnosis of electrical machines, including power transformers, the analysis of the behavior of insulating materials in electrical devices and machines and the performance of high-voltage tests and measurements and analysis of dielectric response (in the frequency domain).

As a result of the previous work done in the field of new insulating materials and their testing techniques, the group has also launched a new research line in the field of hybrid electrochemical energy storage systems, which include modeling, simulation and testing of batteries, ultracapacitors and fuel cells, and their optimization in both stationary and vehicular applications.

•LINES OF RESEARCH•

· Aging of insulating materials.

· Detection and analysis of partial discharges in MV and LV cables and electrical equipment

· Monitoring and diagnosis of failures in electric transformers.

· Electrochemical energy storage systems: fuel cells, ultracapacitors, batteries.

View of the High Voltage Laboratory

•OUTSTANDING COLLABORATIONS AND R&D PROJECTS•

The main clients of the group include UNIÓN FENOSA DISTRIBUCIÓN, S.A., DIAGNOSTIQA S.A., SANTOS Maquinaria Eléctrica S.L. or CEIS S.L., with which it maintains close and steady relationships.

Applied voltage tests on an outdoor MV insulator

The members of the group also maintain steady scientific cooperation relationships with the Universidad Pontificia de Comillas (ICAI), University of Bologna, University of Pisa, University Paul Sabatier of Toulouse, University of Lille, Windsor University, and École Polytechnique Federale de Lausanne.

Some of the most relevant R&D&I projects are:

· ENERGOS: Technologies for the automatic and intelligent management of future distribution networks. CENIT Project 2009.
Funding entity: Centre for the Development of Industrial Technology (CDTI). Date: 2009-2012.

· Optimization of the drying processes of power transformers on site.
Funding entity: Ministry of Science and Innovation. Date: 2010-2012.

· Analysis of the drying processes of power transformers on site.

Equipment for measuring and diagnostic analysis of partial discharge

Funding entity: Ministry of Science and Innovation. Date: 2009.

· RoadMapping of Renewable Energies.
Funding entity: Ministry of Science and Technology. Date: 2004-2006

· Design and Construction of a Prototype of an Airport Sector Hybrid Electric Vehicle Powered by a Hydrogen Fuel Cell.
Funding entity: Ministry of Industry, Tourism and Trade. Date: 2005-2007.

· Advanced electrical and opto-magnetic instrumentation development for the measuring of partial discharges in transformers.
Funding Entity: Ministry of Science and Education. Date: 2006-2009.

· Measurement Multichannel equipment in partial discharges based upon high frequency inductive sensors.
Funding Entity: Ministry of Science and Innovation. Date: 2010-2012.

•INNOVATIVE TECHNOLOGICAL SOLUTIONS •

· FUTURE system, for monitoring and diagnosing problems in distribution transformer.

Equipment for characterising the dieletric response of insulating materials in the control of frequency. Band width/range 0,1 uHz at 30 MHz

· Inductive sensor for the measurement of partial discharges in electrical machines. Patent WO2009130356.

•SCIENTIFIC-TECHNICAL SERVICES•

· Design and development of new techniques for the maintenance of power transformers.

· Study of the aging processes of insulating materials and development of techniques for monitoring their status.

· Characterization of insulating materials and evaluation of the insulation status by means of dielectric tests.

• TECHNOLOGICAL EQUIPMENT •

· High-voltage Testing and Research Laboratory (LINEALT). It is currently in phase prior to accreditation, and it has its own Quality System implemented according to the Standard UNE-EN-ISO 17025 and belongs to the Network of Laboratories of the Community of Madrid.

· Machine Monitoring and Diagnosis Laboratory.

· On-line simulation and testing platform for electrochemical energy storage systems.

AC Hipot

The group has instruments for performing dielectric spectroscopy tests with measurement ranges between 0.1 μHz and 30 MHz and maintains a shielding level which allows taking partial discharge measurements with a background noise of less than 2 pC.

The following tests and determinations can be carried out with this equipment:

· Dielectric tests of breakdown voltage, capacitance, tg δelta, and partial discharges, according to UNE and IEC Standards.

· IDA 200 System for frequency response analysis and diagnosis of insulations in transformers.

· HiPot tests in alternating and direct current, Surge Test up to 15 kV.

· TREK 20/20 high-voltage amplifier, 20kV, 20mA, 0-10 kHz.

· Measurements of moisture in oil.

· Measurement and characterization of spatial charge injected, by electroacoustic pulse (EAP).

Karl-Fischer equipment for moisture-content titration in paper insulation for power Equipment for capacitance and tg measurements.

Science Park Universidad Carlos III de Madrid
Technology Transfer Office
Tel +34 916244023/4011 · Fax +34916244097
E-mail comercializacion@pcf.uc3m.es
Web www.uc3m.es

DIAMAT

Contact Information

HEAD RESEARCHER
Javier Sanz Feito

E-MAIL
javier.sanz@uc3m.es

WEB
http://www.uc3m.es/portal/page/portal/research/research_groups/diamat

Universidad
Carlos III de Madrid
www.uc3m.es

IMAGE OF COVER: *Explosor de esferas*
Miguel Ángel Sepúlveda