

**16th IEEE International  
Conference on Dielectric Liquids  
ICDL 2008**

**Poitiers, FRANCE  
June 30<sup>th</sup> – July 3<sup>rd</sup>, 2008**

Organizing group:  
LEA – EHD Group

Laboratoire d'Etudes **A**érodynamiques



# Table of Contents

## PROGRAMME OF THE CONFERENCE

Overview .....	1
Full programme.....	3

## HANZ TROPPER MEMORIAL LECTURE

Partial discharge measurements in dielectric liquids Massimo POMPILI, University of Roma "Sapienza" Roma – Italy.....	8
--	---

## SESSION 1: ELECTROHYDRODYNAMICS

### KEYNOTE LECTURE:

CI-01 Advances in ElectroHydroDynamic conduction pumping Jamal. SEYED-YAGOOBI, Illinois Institute of Technology, USA.....	18
--	----

### ORAL PRESENTATIONS

S1-01 Development of an ElectroHydroDynamic conduction micropump using PCB/LCP MEMS technology M. Ashjaee, S. R. Mahmoudi.....	26
S1-02 Drop-on-demand extraction from a water meniscus by a high field pulse P. Atten, A. Ouigini, J. Raisin, J.L. Reboud.....	28
S1-03 The effect of an electric field on behaviour of thermally induced bubble in liquid nitrogen P. Wang, D. J. Swaffield, P. L. Lewin, G. Chen.....	30
S1-04 A numerical analysis of Quincke rotation F. Peters, A. Khayari, L. Lobry, E. Lemaire.....	32
S1-05 PIC-FE and FCT-FE numerical simulation of two-dimensional electroconvection: Comparison of the results P. Vázquez, G. E. Georghiou, A. Castellanos.....	34
S1-06 Features of ElectroHydroDynamic flows in needle-plane-electrode system Yu. K. Stishkov, V. A. Chirkov.....	38
S1-07 Dielectric response of electrorheological fluids : application to the electrical characterization of particles suspended in liquid medium Q. Guegan, J.-N. Foulc.....	40
S1-08 Mixing of two-layer laminar flow in a microfluidic system using opto- electrostatic micro vortex H. Kurita, K. Torii, H. Yasuda, K. Takashima, K. Adamiak, A. Mizuno.....	42
S1-09 Numerical modeling of a ElectroHydroDynamic plume between a blade and a flat plate A. Perez, P. Traoré, D. Koulova, H. Romat.....	44

## POSTER PRESENTATIONS

S1p-01	A model for bubble motion in non-uniform electric fields P. L. Lewin, P. Wang, D. J. Swaffield, G. Chen.....	46
S1p-02	Electrophoretic deposition of nanostructured films from colloidal suspensions of conjugated polymers M. Onoda, Y. Abe, K. Tada.....	48
S1p-03	Application of space-charge electrostatic precipitator for Collection of oil mist from pyrolysis gases A. Bologna, A. Hornung, H. Seifert, K. Woletz, H.-R. Paur.....	50
S1p-04	Heat transfer enhancement of a poiseuille flow by means of electric conduction phenomena M. Yazdani, J. Seyed-Yagoobi.....	52
S1p-05	ElectroHydroDynamical characteristics of a dielectric liquid flow induced by charge injection M. Daaboul, C. Louste, H. Romat.....	54
S1p-06	Field induced disruption of a planar water-oil interface influenced by a close metallic sphere P. Atten, J. Raisin, J.-L. Reboud.....	56
S1p-07	Electrically induced coalescence of two facing anchored water drops in oil J. Raisin, P. Atten, F. Aitken, J.-L. Reboud.....	58
S1p-08	Measuring the electrophoretic mobility in semi-diluted suspensions by dynamic light scattering M. Medrano, L. Lobry, F. Peters, A. T. Perez .....	60
S1p-09	Effects of engine base oil type and ZDDP on the electrical double layer in the rotating shaft–oil–lip seal system with and without an external DC electric field J. B. Gajewski, M. J. Głogowski.....	62
S1p-10	Effect of the difference in ion mobilities on traveling-wave electro-osmosis A. Gonzalez, A. Ramos, P. Garcia-Sanchez, A.Castellanos.....	64
S1p-11	Transient evolution of finite amplitude electroconvection: scaling analysis P. A. Vázquez, G. E. Georghiou, A. Castellanos.....	66
S1p-12	EHD flow in symmetric wire-wire electrode system P. V. Glushchenko, Y. K. Stishkov.....	68
S1p-13	Limitations of EHD control flows and jets using corona discharges in gas V. S. Nagorniy, I. V. Nagorniy.....	70
S1p-14	Initial strength of electric field of corona discharge with small interelectrode gaps in EHD converters V. S. Nagorniy.....	72
S1p-15	Modeling of dielectric liquids with low conductivity V. Bloschitsyn, A. Shaposhnikov, Y. K. Stishkov.....	74

S1p-16	Experimental study of a plane turbulent wall jet induced by a dielectric barrier injection in dielectric liquid C. Louste, M. Daaboul, H. Romat.....	76
S1p-17	Influence of the dielectric force on a thermoelectric convection phenomena in case of weak injection D. Koulova, A. Perez, Ph. Traoré, H. Romat.....	78
S1p-18	Flow of electrolytes induced by AC voltages in a point-plane electrode microsystem P. Garcia-Sanchez, A. Ramos, A. Castellanos, H. Yang, H. Jiang.....	80

## SESSION 2: ELECTRICAL DISCHARGES AND APPLICATIONS

### KEYNOTE LECTURE

CI-2	“Streamers” in liquids: relation with practical high voltage Insulation and testing of liquids Olivier LESAINT CNRS, INPG, Joseph Fourier University, France.....	84
------	--	----

### ORAL PRESENTATIONS

S2-01	The negative leader in transformer oil under impulse voltage Yu. V. Torshin.....	92
S2-02	Creeping discharges in transformer oil under lightning impulse voltages over 100 kV peak value H. Yamamoto, S. Uozaki, R. Hanaoka, S. Takata, Y. Kanamaru, Y. Nakagami .....	94
S2-03	Influence of hydrostatic pressure on morphology and final length of creeping discharges over solid/liquid interfaces under impulse voltages A. Beroual, L. Kebbab.....	96
S2-04	The breakdown characteristics of the liquefied SF <sub>6</sub> E.-H. Choi, S.-D. Kim, C.-H. Lim, S.-T. Choi, K.-S. Lee.....	98
S2-05	Optical breakdown probability in silicone oil by short pulsed Q-switched lasers Y. Yasojima.....	100
S2-06	Optical studies of prebreakdown cathode processes in deionized water S. M. Korobeynikov, A. V. Melekhov, V. G. Posukh, A. G. Ponomarenko, E. L. Boyarintsev, V. M. Antonov.....	102
S2-07	Streamer propagation and breakdown in rape-seed oil at high voltage C. Tran Duy, O. Lesaint, A. Denat, N. Bonifaci, Y. Bertrand.....	104
S2-08	Degradation of organic molecules by streamer and spark discharges in water : a measurement of the energetic efficiency T. H. Dang, A. Denat, O. Lesaint.....	106

S2-09	Effect of biological cell size and shape on killing efficiency of pulsed electric field A. EL-Hag, S. H. Jayaram .....	108
S2-10	Spectral analysis of light emitted from streamers in some chlorinated alkane and alkene liquids S. Ingebrigtsen, N. Bonifaci, A. Denat, O. Lesaint.....	110
S2-11	Time resolved imaging of pulsed streamer discharge in water S. Kanazawa, Y. Abe, Y. Kihara, M. Kocik, J. Mizeraczyk.....	112
S2-12	Characterization of breakdown and sustaining of a discharge in a gas bubble in water P. Ceccato, A. Rousseau.....	114
S2-13	Degradation of 4-chlorophenol by pulsed arc electrohydraulic discharge in water – estimation of the energy consumption L.-V. Hoàng, B. Legube.....	116

## POSTER PRESENTATIONS

S2p-01	Pulsed corona discharge in water for <i>Coli</i> bacteria inactivation M. Dors, E. Metel, J. Mizeraczyk, E. Marotta.....	120
S2p-02	Reduction of microbial growth in milk by pulsed electric fields A. El-Hag, A. Otunola, S. Jayaram, W. A. Anderson.....	122
S2p-03	A new approach to the study of surface discharge on the oil-pressboard interface P. M. Mitchinson, P. L. Lewin, G. Chen, P. N. Jarman.....	124
S2p-04	A facility for testing the dielectric strength of liquid nitrogen S. Fink, M. Noe.....	126
S2p-05	Pre-breakdown phenomena in synthetic esters and silicone oils for power transformers T. Aka-Ngnui, A. Beroual, C. Perrier .....	128
S2p-06	Fundamental electrohydraulic discharge characteristics and plasma parameters of dielectric liquid dodecane with Ar gas injections for gold nano-particle fabrications J. Hieda, J.S. Chang, N. Saito, O. Takai.....	130
S2p-07	Point cathode streamer propagation in cyclohexane: effects of electron scavengers S. Ingebrigtsen, L. E. Lundgaard, P.-O. Åstrand.....	132
S2p-08	The phase transition & Breakdown characteristics of SF6 in temperature decline H. Park, E.-H. Choi, Y.-H. Do, J.-B. Kim, K.-S. Lee.....	134
S2p-09	Streamer inception in cyclohexane above and below freezing point Ø. L. Hestad, L. E. Lundgaard.....	136

S2p-10	Spectroscopic investigation of corona discharge in liquid Helium Z.-L. Li, N. Bonifaci, A. Denat, V. M. Atrazhev, V. A. Shakhmatov, K. Van Haeften.....	138
S2p-11	Studies on the applicability of the Pockels technique to measure surface discharge in liquid Dielectrics T. N. Tran, P. L. Lewin, D. J. Swaffield, J. S. Wilkinson.....	140
S2p-12	Review of investigations of streamers in dense gases and liquids by computer simulations V. M. Atrazhev.....	142
S2p-13	Partial discharge inception voltage measurements in dielectric liquids M. Pompili, C. Mazzetti, R. Bartnikas.....	144
S2p-14	New test method for dielectric breakdown voltage of insulating oils W. Lick, G. J. Pukel, H. M. Muhr, M. Baur.....	146

### SESSION 3: FUNDAMENTAL STUDIES

#### ORAL PRESENTATIONS

S3-01	Transient photoconductivity caused by dissociation of excited states in solutions. Effect of temperature L. V. Lukin.....	150
S3-02	Formation of cluster ions $A^-(H_2O)_n$ in nonpolar liquid A. A. Balakin.....	152
S3-03	Properties of liquids, liquid crystals, ionic liquids and ionic liquid crystals in thin cells studied using shear horizontal wave propagation K. Yoshino, R. Ozaki, H. Moritake.....	154
S3-04	Infrared luminescence of $Xe_2$ excimers produced by electron impact in dense gas A. F. Borghesani, G. Carugno.....	156
S3-05	Dielectric liquids behaviour by time domain reflectometry (TDR) M. Abdelguerfi, A. Soualmi, S. Kermi.....	158
S3-06	The effect of water on permittivity properties of nanodielectrics exposed to the atmosphere) C.T. Dervos, J. A. Mergos, P. Skafidas, M. D. Athanassopoulou, P. Vassiliou.....	160

#### POSTER PRESENTATIONS

S3p-01	The pre-breakdown current-voltage EHD characteristics calculations for liquid insulators M. S. Apfelbaum.....	164
S3p-02	Fermentation process monitoring of Japanese sake by dielectric measurement M. Kouzai, A. Nishikata, S. Miyaoka, K. Fukunaga.....	166

S3p-03	The peculiarities of electrical properties of engine oils B. N. Dikarev, G. G. Karasev, R. G. Romanets .....	168
S3p-04	Structure of negative ions in dielectric liquids A. G. Khrapak, W. F. Schmidt.....	170
S3p-05	Effects of ultrasonic wave propagating in liquid crystals on substrate H. Moritake, R. Ozaki, K. Yoshino.....	172
S3p-06	Calculation of ionization potentials and electron affinities for molecules relevant for streamer initiation and propagation H. S. Smalø, P.-O. Astrand, S. Ingebrigtsen.....	174
S3p-07	First attempts at heating ethylene glycol in a prototype labyrinth-type heater J. B. Gajewski, T. J. Maćzka.....	176
S3p-08	Molecular interaction studies of some dielectric binary liquid mixtures K. Rajagopal, S. Chentilnath.....	178
S3p-09	Charge propagation in a low-conducting liquid under modulated electric field B. L. Smorodin, A. V. Taraut.....	180
S3p-10	Study of AC conductivity and dielectric permeability of a mixture of cyclohexane and honey T. Matuszewski.....	182
S3p-11	Dielectric properties of fullerene-doped hydrocarbons D. Zmarzły, P. Aksamit, T. Boczar.....	184
S3p-12	Dielectric study and molecular interaction of halogenated compound in non-polar solvent at different temperatures A. Ghanadzadeh, A. Ranjkesh, H. Ghanadzadeh, M. M. Moghadam.....	186

## SESSION 4: POWER TRANSFORMERS

### KEYNOTE LECTURE

CI-4	Charge Behavior and Field Measurement Techniques in Different Kinds of Insulating Oil for Power Transformers H. OKUBO and K. KATO, Nagoya University, JAPAN.....	190
------	--	-----

### ORAL PRESENTATIONS

S4-01	Analyses of electro-chemical characteristics of palm fatty acid esters as insulating oil T. Kanoh, H. Iwabuchi, Y. Hoshida, K. Tamura, J. Yamada, T. Hikosaka, A. Yamazaki, Y. Hatta, H. Koide.....	198
S4-02	Streaming electrification characteristics of silicone oil with oil temperature increase T. Ishikawa, K. Yasuda, S. Okabe S. Kaneko, S. Yanabu.....	200

S4-03	The mechanism of gassing in power transformers I. Fofana, J. Sabau, D. Bussi�eres, E. B. Robertson.....	202
S4-04	New insulating liquids for high voltage apparatus E. Gockenbach, H. Borsi.....	204
S4-05	High frequency dielectric response of paper/oil insulation L. E. Lundgaard, D. Linhjell, �. L. Hestad, J.-T. Borlaug.....	206
S4-06	Monitoring of total and mercaptan sulphur under combined thermal electrical ageing of paper-oil insulation system J. S. Rajan, K. Dwarakanath, S. Rilatha, C. J. Naidu, A. K. Tripathy.....	208
S4-07	Studies on the ageing behavior of various synthetic and natural insulation oils I. L. Hosier, A. S. Vaughan, S. G. Swingler.....	210
S4-08	Analysis of flow electrification parameters of power transformer oils R. Vaucelle, T. Paillat, O. Moreau, Y. Bertrand, J. M. Cabaleiro, G. Touchard.....	212

#### POSTER PRESENTATIONS

S4p-01	Flow electrification by nano particules impurities T. V. Prevenslik.....	216
S4p-02	Static electrification properties of hexane and cyclohexane mixtures M. Zdanowski.....	218
S4p-03	The influence of the cole-cole model coefficients on the parameters of the recovery voltage phenomena of paper-oil insulation S. Wolny, M. Zdanowski.....	220
S4p-04	Partial discharge inception strength in a full-scale HTS cable based on LN <sub>2</sub> /polypropylene laminated paper insulation N. Hayakawa, R. Yamaguchi, H. Kojima, F. Endo, H. Okubo.....	222
S4p-05	Charge behavior in palm fatty acid ester oil (PFAE)/pressboard insulation system under flow condition for power transformers H. Okubo, S. Yamamoto, T. Nara, K. Kato, F. Endo, A. Yamazaki, Y. Hatta, T. Hikosaka, H. Koide.....	224
S4p-06	On the states of water and its quantification in oil impregnated power equipments I. Fofana, V. Arakelian.....	226
S4p-07	Electrical properties propagation of exposed combined insulation V. Mentlik, P. Trnka, J. Pihera, P. Prosr.....	228
S4p-08	Ageing of petroleum and synthetic based insulation oils from the view of the structural analyses V. Mentlik, P. Prosr, R. Polansky.....	230



S4p-09	Evaluation of transformer oil by frequency domain techniques P. K. Poovamma, T. R. Afzal Ahmed, C. Viswanatha, K. Mallikarjunappa, A. Sudhindra.....	232
S4p-10	Application of modern diagnostic techniques to assess the condition of oil and pressboard A. Bouaïcha, I. Fofana, M. Farzaneh.....	234
S4p-11	On electrical stresses at wedge-shaped oil gaps in power transformers with application to surface discharge and breakdown H.-Z. Ding, Z. D. Wang, P. Jarman.....	236
S4p-12	Partial discharge pattern analysis in cylindrical insulators model of transformer W. Plueksawan, P. Apiratikul.....	238
S4p-13	Assessment of the effect of the pressboard nature on the electrostatic hazard inside the large power transformers P. Mas, Th. Paillat, R. Vaucelle, G. Touchard.....	240
S4p-14	Diffusion processes in oil-filled electrical equipment S. M. Korobeynikov, L. A. Darian.....	242
S4p-15	Estimation of water content in power transformers in service by polarization and depolarization current measurements T. Gradnik, M. Babuder, M. Koncan-Gradnik.....	244
S4p-16	A new information optimization processing technique for monitoring the condition in oil-filled transformer based on grey theory on line D. Mei.....	246
S4p-17	An artificial neural network (ANN) approach for transformer fault diagnosis in oil-filled transformer on line D. Mei.....	248
S4p-18	Evaluation of several techniques and additives to de-moisturise vegetable oils and bench mark the moisture content level of vegetable oil-based dielectric fluids M. Amanullah, S. M. Islam, S. Chami, G. Ienco.....	250
S4p-19	Influence of ageing on conduction and breakdown in rape-seed and mineral oils C. Tran Duy, A. Denat, O. Lesaint, N. Bonifaci, Y. Bertrand, W. Daoud, M. Hassanzadeh.....	252
S4p-20	Influence of thermal ageing on transformer oil properties S. Abdi, A. Boubakeur, A. Haddad.....	254
S4p-21	Acoustic emission measurements of acoustically induced cavitation bubbles in insulating oils T. Boczar, M. Szmechta, D. Zmarzły.....	256

S4p-22	Measurements of distribution of streaming electrification current inside pipe D. Zmarzły, T. Boczar.....	258
S4p-23	Is there a possibility to change the mineral-based insulating oil to natural ester in transformers in the service? M. Szebeni.....	260
S4p-24	Effect of temperature, water content and aging on the dielectric response of oil-impregnated paper A. Setayeshmehr, I. Fofana, A. Akbari, H. Borsi, E. Gockenbach.....	262
S4p-25	Ester fluids as alternative to mineral based transformer Oils H. Borsi, E. Gockenbach, B. Dolata.....	264
S4p-26	Flow electrification process : the physicochemical corroding model revisited T. Paillat, J.M. Cabaleiro, H. Romat, G. Touchard.....	266