

No.	Title	Affiliation	Name	Abstract
12aA-1	Diesel Exhaust Treatment by Honeycomb Discharge Generated with a Single High Voltage Power Supply	Department of Environmental and Life Sciences, Toyohashi University of Technology	Tomoya SUZUKI, Hideaki HAYASHI, Hirofumi KURITA, Kazunori TAKASHIMA, Akira MIZUNO	Atmospheric pressure discharge plasma has been studied and applied to environmental purification in recent years. We have been trying to purify diesel exhaust gas and we have verified that the combination of discharge plasma and honeycomb catalyst is quite effective for the exhaust treatment. However, complicated setup of high voltage power supplies and electrodes is required to generate stable discharge plasma inside the narrow capillaries of the honeycomb catalyst. Therefore, discharge formation inside a ceramic honeycomb using a single high voltage power supply was carried out in this study. As a result, primary discharge was generated by using surface discharge electrodes installed at both ends of the glass capillaries and the discharge successfully expanded into the capillaries from both sides. In this study, NO oxidation using this type of discharge was also investigated. As a result, the oxidation efficiency was improved by the combination of the honeycomb discharge compared to that of surface discharge alone. Therefore, it was suggested that the discharge was formed inside the honeycomb
12aA-2	Control of Electrical Tree in Nano-Composite LDPE Added with Azobenzoic Compound	Faculty of Education, Chiba University	○Yoshiaki Yamano and Masaaki Iizuka	Polymer nano-composite was prepared by mixed addition of azobenzoic compound and Al ₂ O ₃ nano-particle into LDPE to improve the electrical treeing resistance under ac voltage application. Three kinds of azobenzoic compound were tested: azobenzene (Az), nitro-azobenzene (Ni_Az) and amino-azobenzene (Am_Az). The average diameter of the particles was in a range 22.2 – 47.7 nm. The maximum concentrations of the azobenzoic compound and the particle in LDPE were 2.5 wt% and 5 wt%, respectively. The test materials of the mixed addition were processed in our laboratory by the solution casting method. The experimental results showed that tree initiation voltages for the mixed addition (2wt% of Az and 3wt% of the particle) were 2 times higher than those for LDPE with single addition of Al ₂ O ₃ particle. The mixed addition was also effective to control tree development. The development for the material of mixed addition for above concentrations was estimated to be more than 100 times slower than that for LDPE. In the case of the material of mixed addition, it was found that azobenzoic compounds prevent the cohesion of Al ₂ O ₃ nano-particles in the LDPE,
12aA-3	Measurement of Atmospheric Ionic Current and Possible relation with Earthquake	Department of Environmental and Life Sciences, Toyohashi University of Technology	Yosuke KINOSHITA, Kazunori TAKASHIMA, Akira MIZUNO	Atmospheric ionic current has been continuously measured in this study. Daily time evolution of the potential normally showed a very small value after sunset until sunrise. It then gradually increased with time reaching a peak around noon followed by a gradual decrease to a very small value in the evening. It follows above time course of the potential in most cases, however, clearly and significantly different signal was observed in some cases. The earth is a capacitor made of the crust and the ionosphere. If the pressure of the plate changes suddenly, it might cause the change of ground potential due to the piezo-electric effect and/or to movement of underground water that constitutes a battery. Sudden change of the surface potential of the ground should induce counter charge in the ionosphere. This sudden change of the charge distribution in the ionosphere could cause the change of atmospheric ionic current. The abnormal behavior of the measured atmospheric ionic current prior to major earthquakes might be an indication. Therefore, further study on the relation between atmospheric ionic current and earthquake is necessary.

12aA-4	Development of Electrostatic Measuring Technique using Charged Material Oscillation	National Institute of Advanced Industrial Science and Technology	○Kazuya KIKUNAGA, Toshihiro KAMOHARA, Kazufumi SAKAI and Kazuhiro NONAKA	We have proposed and demonstrated a unique technique for electrostatic measurement with detecting electromagnetic field (EM) generated by charged material oscillation (CMO). Charged polyamide films were vibrated by acoustic wave, and EM intensity was detected through a monopole antenna and an oscilloscope. Changes of EM intensity generated by acoustic vibration of the charged film were observed. This indicates that the change of EM field would be generated by charge oscillation, which is displaced spatially. Also, surface potential of the sample was proportionate relationship to generated EM intensity with the acoustically-oscillated sample. In addition, the EM phase was difference greatly depending on the nature of electrical polarity. They mean that the CMO method is a promising measurement technique to detect electrostatic easily and non-destructively.
12aD-1	Electrostatic Hazard of Powders in Fluidized Bed Reactor Freeboard Region	Japan National Institute of Occupational Safety and Health	Kwang-Seok CHOI	This paper reports on electrostatic hazards related to a fluidized bed reactor freeboard region. The electric field was monitored over the fluidizing time. A batch-type fluidized bed system was used in the experiments. The sample powder were polyvinyl chloride (PVC), methylmethacrylatebutadienestyren (MBS), polyamide11 (PA11), and cellulose (CL). The superficial air velocity with zero relative humidity was 0.53 m/s. Several interesting results and detailed discussion are presented in this paper.
12aD-2	There is a electrification characteristic that the static electricity disaster prevention flexibility container has.	Shibata Industrial CO.,LTD* Technology Institution of Industrial Safety (TIIS)**	○Nobuyuki Tsuda* et al.	Flexible intermediate bulk containers (FIBC) are widely used for the storage and transportation of powdered. Static electricity occurs in the operation such as the filling, the emptying of FIBC and the electrification happens. The ignitability electro static discharge by the electrification can become serious problems such as the explosive accident under the combustible atmosphere. Countermeasure against static electricity FIBC which restrains an ignitability electro static discharge as the measure exists. Each type exists in countermeasure against static electricity FIBC but there seems to be few ones which are explaining the mechanism, being clear. It had a purpose of clarifying the difference of each type in experimenting on each type of countermeasure against static electricity FIBC in the electrification and making the data
12aD-3	Effect of Humidity on Electric Potential of a Human Body Generated by a Walk	Technology Research Institute of Osaka Prefecture	○Manabu HIRAI, Hirokazu KIMURA	Relative humidity dependence of electric potentials of a person walking on a ceramic tile was examined for four kinds of footwear. For any footwear, while relative humidity decreased, not only the electric potential but also its resistance increased gradually. But the relationship between relative humidity and resistance for the ceramic tile could not be derived. The order of footwear on the value of electric potential was different from that of resistance of footwear at the same humidity. As a result, the electric potential of the walking human body was not determined only by the resistance of footwear.
12pD-1	Instrument for Transverse Wave of Field and Doublets Charge Quantity	Tokyo University of Agriculture and Technology	Norio Murasaki	Frictional electrification generate transverse wave and longitudinal wave of field with charge electrification and doublets electrification. Instrument for transverse wave of field and doublets charge quantity measurement are not presented now. This paper is the present of them.
12pD-2	Measurement of electromagnetic field intensity due to low voltage ESD using spherical electrode.	* Hachinohe Institute of Technology, ** Tohoku Gakuin University, *** Nagoya Institute of Technology	○Ken KAWAMATA *, Shigeki MINEGISHI * * and Osamu FUJIWARA * * *	The relationship between discharge voltage and radiated electromagnetic field intensity due to low voltage ESD was examined in experimental study. In this time, we present an experimental system to measure the radiated electromagnetic filed intensity in wideband region using spherical electrodes and a horn antenna. As a result, the radiated electromagnetic field intensity is proportion to the charged voltage from 300V to 620V, and the amplitude of electromagnetic field intensity was according to the ratio of surface area of the spherical electrode.

12pD-3	Effect of Apply Frequency on Performance of Flange-Type Electrostatic Ionizer	* Kasuga Denki INC 、 * * Japan National Institute of Occupational Safety and Health	○Teruo SUZUKI * 、 Tomofumi MOGAMI、 Kwang Seok CHOI * * and Mizuki YAMAGUMA * *	In order to improve the performance of the flange-type electrostatic eliminator, the effect of the frequency of the AC voltage applied to the eliminator on the static charge elimination performance was studied using a full-size pneumatic powder transporting facility. The frequency of eliminator (AC 7kV in RMS) was used in the range of 2 to 200Hz. As the experiment results, it was confirmed that the frequency of eliminator was a important factor in performance; namely, the charge to mass ratio, q [C/g] of powder decreased clearly with an increase in frequency of AC-type ionizer under 0.1 MPa and 0.15 MPa. Some discussions are presented in this paper.
12pD-4	Development of Small Type Explosion Protection Electrostatic Ionizer	Japan National Institute of Occupational Safety and Health	Kwang-Seok CHOI, et al.	As one of countermeasures against accidents due to incendiary electrostatic discharges, electrostatic ionizers are required for industries. The new small type explosion protection electrostatic ionizer has been developed, which is driven with an AC high voltage (± 10 kV _{p-p} , 28 kHz). It consists of two needle electrodes situated within a grounded shield, a punch plate inserted into the nozzle opening of the ionizer, two pressure sensors, a high-voltage power source, and a slender air apply line. In this current study, we evaluated the elimination performance of the new ionizer through the real size pneumatic powder transportation facility and 300 kg of polypropylene powder. The new ionizer was attached to the end of the loading pipe inside the silo. As the results, the new ionizer was effective for reducing electrostatic charges from the sample powder. The effective elimination was achieved by using four arranged new ionizers. It could suppress incendiary discharges, which occurred along the pellet-heap
12pD-5	Optimum Operating Frequency of AC Discharge Air Ionizer	The University of Industrial Technology	○Nana IWAMOTO, Kazuo OKANO	The AC corona discharge air ionizer is one of the most important equipment for controlling electrostatic charges in the manufacture of electronic devices. The performance such as the neutralizing current and the voltage swing of the products depend on the operating condition of the air ionizer. In this report, we deal with the effect of the operating frequency on the performance of the air ionizer to find out the optimum operating frequency. The performance was measured by using the charged plate monitor. Both the neutralizing current and the voltage swing increased with decreasing the frequency. The methodology was discussed to find out the optimum operating frequency.
12pD-6	A method to minimise oscillated offset voltage with an AC or pulsed-DC ioniser	National Institute of Occupational Safety and Health	A. Ohsawa	This paper proposes a method to minimise the offset voltage of an object to be neutralised when an AC or pulsed-DC ioniser is used. It has been found in a computer simulation that the offset voltage is created by imbalanced current between the motions of positive and negative ions in vicinity of the ioniser that caused by the local electric field generated by alternate space charge of positive and negative ions there; in addition, it causes the oscillation of the offset voltage. The idea of the modification is to eliminate the cause by the alternate space charge and a simulation demonstrates that it can reduce the oscillated offset voltage.
12pD-7	A Study of Ion Flow in Jet from a Nozzle on an Ionizer	KOGANEI Corp. * , Dept. Electrical Eng., Yamagata University * *	○Yoshinari Fukada * 、 * * 、Kazuo Kotsuji * * 、Ichiro Kano * * 、 Kyoko Yatsuzuka * *	There are a lot of types of ionizers using a DC or AC Corona discharge and the ions are often carried by air jet toward the vicinity of the object. We have investigated about a DC or AC Corona discharge type ionizer with a Faraday Cage. In this report, we have measured the dependency of spread of the ions, blown by the air from the nozzle on an ionizer. The farther from the nozzle the probe is put, the smaller the air velocity is and ion current also. The numerical value of nondimensional air velocity and ion current is the same, regardless the air flow rate. The ions spread wider than air jet does. The air flow in impingement flow area, $z/D=5$,

12aC-1	Electric charge image observation using SEM —Relation between surface potential and SEM image brightness—	Department of Optical and Imaging Science & Technology, School of Engineering, Tokai University	Naotaro Kumagai and Shin Omotani	Direct observation of latent image before developing by toner is ideal for detailed analysis in electro photographic imaging process. SEM is an effective tool for visualizing electric surface image. We have observed electric surface images, on PET film, formed by a corona discharger with various scanning speed of the discharger. We have measured the relation between surface potential and SEM image brightness. We also have observed the interesting process how the inhomogeneous latent image, which is caused by an indirect charging through a metal mesh electrode, is finally become homogeneous after an excessive charging.
12aC-2	Hydrophilic Treatment of PTFE Surface Using Surface Discharge Plasma	Osaka Institute of Technology	Keiichiro YOSHIDA, Junichiro SUGIO	The surface of PTFE sheets are exposed to plasma that is generated with surface discharge in Ar under atmospheric pressure. The objective of the study is to investigate the non-uniformity of such the treatment. The surface characteristics of the treated samples are evaluated using contact angle of water and diiodomethane, and surface free energies. Results show that the treatment makes surfaces hydrophilic basically according to plasma density, however the effect of the diffusion of excited species from the zone where plasma is generated is observed.
12aC-3	Basic study on surface treatment of GaN substrate by atmospheric microplasma	Shizuoka University, Innovation and Joint Research Center	Yuta NOMA, et al.	Surface treatment of GaN substrate by atmospheric microplasma was experimentally investigated. Microplasma was generated with a pair of the electrodes which covered with the dielectric layer and faced each other, at relatively low discharge voltage of around 1 kV. Streamers which generated from the electrodes generate various radicals and ions could affect a target surface. An analysis by X-ray Photoelectron Spectroscopy (XPS) was measured before and after microplasma surface treatment of GaN.
12aC-4	Influence of gases to Dye-Sensitized Solar Cell with Dielectric Barrier Discharge in Atmospheric Pressure	* School of Engineering, The University of Tokyo * Graduate School of Science, The University of Tokyo	○Keisuke HANAWA * * , Shungo ZEN * * , Yoshiyuki TERAMOTO * * , Ryo ONO * * , Tetsuji ODA *	Dye-sensitized solar cell (DSC) is a promising next generation solar cell. In this paper we propose the process of TiO ₂ electrode on the DSC using an alternating dielectric barrier discharge (DBD) in atmospheric-pressure humidified nitrogen to enhance the efficiency of the DSC. This is low temperature processing and has an advantage that it can be used for a plastic film DSC as well as a glass plate DSC. When the treatment time is 5 minutes with the discharge voltage of 36kVp-p, the frequency of 200Hz and the degree of humidity of 95%, the short-circuit photocurrent density and the energy conversion efficiency of the DSC are increased by about 6% and 10%, respectively, compared with the untreated one. The OH radical generated by the discharge seems to be an important factor to increase the amount of dye absorbing on TiO ₂ film. It results in the improvement of the conversion efficiency of the plasma treated DSC.
12aC-5	New Method to Fabricate Large-scale Composite Film Containing Carbon Nanotubes aligned by parallel electrode array	Faculty of Information Science and Electrical Engineering, Kyushu University	Michihiko Nakano, et al.	Recently, nano-composites have been paid attention since there is a possibility they will supersede metal or ceramic materials. Carbon nanotube (CNT), especially, is an excellent candidate as a nano-filler due to its physical, electrical and thermal properties. When high electric field is applied on CNTs in a nano-composite, CNTs are aligned along the electric field, resulting in increasing its properties in the aligned direction. Although application of electric field for the alignment is effective, the conventionally used one pair of parallel plate electrode is not applicable to large-sized nano-composite fabrication due to limited output voltage of high voltage source. We proposed an array of parallel wire electrodes to address this issue. Composite material was spread over a thin dielectric layer placed on the wire electrodes. High electric field region can be extended over wider area just by increasing the number of the electrode pair. Discrete electric field distribution bordered by the wire electrodes was avoided by linearly oscillated motion of composite film. A CNT/epoxy resin composite film with the size of

12pB-1	Aerosol generation and collection of hydrocarbon in diesel exhaust gas by using ozon	School of Chemistry, University of Manchester	OM. Prantsidou and J. C. Whitehead	The treatment of spent oils and organic solvents from the nuclear industry which may be considered as low level radioactive waste (LLW) represents an unsolved challenge in the clean-up of nuclear waste. One of the common spent-oils found in nuclear waste is odorless kerosene. In this work, non-thermal atmospheric plasma has been generated in an AC gliding arc discharge reactor, to treat odorless kerosene in the vapour phase, as understanding the gas chemistry would be the key for future liquid treatment. The effect of different carrier gas composition on the odourless kerosene destruction has been investigated using FTIR spectroscopy and OES for quantitative and qualitative analysis.
12pB-2	Toluene Decomposition Using Two-layered Ozone-assisted Catalysts Consisting of Zeolite (ZSM-5, HY) and Ag/ZSM-5	National Institute of Advanced Industrial Science and Technology (AIST)	OMasami SUGASAWA, Hyun-Ha KIM, Katsunori KOSUGE, Atsushi OGATA, andNobuaki NEGISHI	The ozone (O ₃)-assisted catalytic oxidation of toluene was investigated on ZSM-5, Ag /ZSM-5, HY and Ag/HY in order to optimize two-layered O ₃ -assisted catalysis system. Consequently, the zeolite (ZSM-5, HY) catalysts were used for the upper layer because of adequate C ₆ H ₅ CH ₃ conversion. On the other hand, Ag /ZSM-5 catalyst having strong oxidizing power of C ₆ H ₅ CH ₃ to CO ₂ was set in the lower layer. The 0.5 g ZSM-5 + 0.5 g Ag/ZSM-5 combination showed 91 % of C ₆ H ₅ CH ₃ conversion and 94 % CO ₂ selectivity without HCOOH formation by supplying 2700 ppm O ₃ at 100° C. However, 0.5 g HY + 0.5 g Ag/ZSM-5 combination showed 95 % of C ₆ H ₅ CH ₃ conversion and 91 % CO ₂ selectivity with 6 ppm of HCOOH formation under the same conditions. The former showed the excellent performance further than the latter.
12pB-3	Influence of Ozone and Catalyst on Trichloroethylene Decomposition by the Atmospheric Non-thermal Plasma	School of Engineering, The University of Tokyo	Yuta Tomimura, et al.	Trichloroethylene (TCE) decomposition in the dielectric barrier discharge reactor combined with the catalyst was investigated concerning with that amount. In this experiment, the catalyst was settled at the down flow of the reactor. The tested amounts of the catalyst in this experiment are 1g and 2g. respectively for the gas flow rate of 1 l/min. As the filled catalyst in the chamber increases, the TCE decomposition efficiency increases even at 3g catalyst suggesting the further improvement of the efficiency.
12pB-4	Development of Silver Based Catalyst for Toluene Decomposition Assisted by Ozone	National Institute of Advanced Industrial Science and Technology (AIST)	OAtsushi OGATA*, Tetsuya NANBA*, Hyun-Ha KIM*, Masami SUGASAWA*,Katsunori KOSUGE* and Hisahiro EINAGA**	Performance of ozone assisted catalysis on decomposition of toluene at 100oC was investigated using Ag supported various metal oxides, such as Al ₂ O ₃ , TiO ₂ , SiO ₂ , ZrO ₂ and MgO. It was found that Ag/ZrO ₂ showed highest performance among them. Toluene conversion decreased in the order Ag/ZrO ₂ > Ag/MgO > Ag/Al ₂ O ₃ > Ag/SiO ₂ > Ag/TiO ₂ . In particular, Ag/ZrO ₂ and Ag/MgO could decompose ozone easily. The propensity of catalysts for active oxygen species formation from ozone decomposition is one of important factor for the ozone assisted catalysis. Most of Ag species on ZrO ₂ and MgO was supported as metallic state, while Ag species on the others were supported not only as metallic Ag state but also as Ag ⁺ state. These results suggested that metallic Ag species were useful for the ozone assisted catalysis. Furthermore, we pointed out that the basicity of catalyst supports was a significant factor for getting the
12pB-5	PM oxidation by using microwave with various infill powder	Department of Environmental and Life Sciences, Toyohashi University of Technology, DENSO CORPORATION	Shunsuke MORIMITSU, Hideaki HAYASHI, Soichiro KAWAKAMI, Kazunori TAKASHIMA, Akira MIZUNO, Yoshihiko MATSUI	Air pollution have become a serious problem as a result of remarkable economic development. The exhaust from diesel vehicles is one of the serious air pollutants. Especially, particulate matter (PM) in the diesel exhaust, contains causative agents of the respiratory illness, and it is feared to influence harmfully to human health. Recently, diesel exhaust gas treatment method using diesel particulate filter (DPF) has been developed. Although it has high collection efficiency, the collected PM blocks the filter and it causes high pressure loss. Therefore the technology for PM oxidation at low energy consumption is required. In this study, PM oxidation by using microwave with various powder infill was investigated for efficient oxidation. As a result, after the oxidation of carbon powder mixed with infill powder, CO concentration was lower and CO ₂ concentration was higher compared with those without the infill powder. The weight of carbon powder mixed with various catalyst powders was also decreased. Consequently, the oxidation could be assisted by the powder mixed with carbon powder. Using microwave irradiation using microwave and infill powder are effective for the regeneration of in DPF.

12pB-6	An ESP using bipolar-discharge with DC corona for road tunnels	Panasonic Ecology Systems Co., Ltd*, Toyohashi University of Technology**	Atsushi Katatani*, Akira Mizuno**	Two-stage-type ESPs (electrostatic precipitators) are composed of ionizers and collectors. DC high voltage is applied to the discharge poles in the front stage ionizers. Particles passing through the space of positive or negative corona are charged. The rear stage collectors capture the particles. Although spike-typed dischargers are adopted widely, the spikes in this test are arranged not only in the voltage-applied plates but also in the earth-plates in the ionizer. As the test result, particles are collected by the discharge from both the voltage-applied plates and the earth-plates. The discharge in earth-plates generates ions with opposite polarity to that of voltage-applied plates. This bipolar collection method with the simultaneous positive-and-negative discharge shows a possibility that particles are efficiently captured not only on earth-plates but also on voltage-applied plates in the collector. This study implies that the bipolar-
12pB-7	Development of EHD-Enganced Plasma Electostatic Precipitator	Department of Electrical and Electronics Engineering, Tokyo City University	Satoru MAEDA, et al.	The novel device is able to not only collect the low resistive particles generated from diesel engine but also incinerate captured particulates within the same reactor. The new electrohydrodynamically (EHD)-enhanced plasma ESP (EHD plasma ESP) is to utilizes the ionic wind to transport the charged particles effectively into the low electrostatic field region where electrostatic repulsion force acting on particles by induction charge becomes very small, resulting in reentrainment suppression. At the same time, collected particulates are incinerated by ozone and oxidation product of NO2 in the flue gas by the surface discharge plasma, so that no particle handling device is required. The particle-size dependent collection efficiency and particle incineration were evaluated by the Scanning Mobility Particle Sizer (SMPS) and particle counter (PC). This device is particularly important applications for automobile and marine diesel
12aD-4	Measurements of Transient Noise on Information Cable Exposed by Induced ESD	*1 Impulse Physics Laboratory, Inc. *2 Tokyo Electronics Trading Co., Ltd.	Masamitsu Honda, et al.	In case less than about 0.1mm small gap exists between a floating metal and neighbor metal, voltage difference is generated between the gap by static charge induction depending upon surrounding field variation and discharge ("Induced ESD") may occurs at the gap if conditions meet. We report and analyze the measurement results of induced noise waveform received by variety of information cables closely exposed by this induced ESD.
12aD-5	Contact Resistance Depends on Transferred Energy in Contact Discharge	Department of Electrical Engineering, The University of Tokyo	Yutaka Soda, Tetsuji Oda	Contact discharge from an electrified object into a floating device was investigated as the energy-loss caused thermal damage. With the discharges between various capacitors, thermal-energy was obtained by integration of the current-waveform. Theoretical energy-loss was estimated by the difference between the potential energies prior to and following the discharges. The energy-loss was 0.05nJ for 2pF-capacitors at 10V and increased 2.5nJ when both capacitors were 100pF. 3D-plot of the energy-loss indicated a gradual increase as both capacitance-values increased. Comparison of the potential energy-loss and the current energy indicated that the contact resistance decreased from 100ohm to few-ohm as the energy-loss increased.
12aD-6	Comparison of ESD Characteristics from Various Discharge Sources	Department of Electrical Engineering, Tokyo University of Science	○Junki KOMURA, Takahiro YOSHIDA and Noriaki MASUI	In recent years, electrostatic discharge (ESD) causes serious damages to semiconductor devices and electronic equipments. Therefore, the elucidation of the mechanism of the ESD has been required. In actual situation, ESD occurs by many kind of discharge sources. In this study, we research the ESD characteristics of 5 types of discharge sources. The charged potential is varied from ±1kV to ±3kV. The grounded electrodes are hemisphere. The radius of curvature of electrode is 5mm or 15mm. From experimental results, we found followings; (1) Max frequency of discharge current from ESD gun was different between the air discharge and the contact discharge. (2) Discharge rate and charge amount of ESD from charged human body was smaller. (3) The value of all parameter of ESD from fingertip of charged human body was smallest.

12aD-7	Development of a practical ESD detector system	* Kagoshima Prefectural Institute of Industrial Technology, ** NIPPON KEIKI KAGOSHIMA Co.,	OHiroshi ONOMAE *, Masaaki KATO **	We developed a practical ESD detection system. It is constructed four receiving antennas and fast-sampling digital oscilloscope, and can detect ESD source position accurately by hyperbolic method. By using alignment tool, the setup time to make preparations became very short.
12aD-8	Calculation Method of RLC Constant for Equivalent Circuit of Various Electrostatic Discharge	Department of Electrical Engineering, Tokyo University of Science	OHajime HIROSE, Takahiro YOSHIDA and Noriaki MASUI	It is desirable to simulate the ESD tolerance and immunity in advance because this pre-test method will achieve shortening of the development period and reduction of development cost. In the development of this ESD tolerance simulator, the ESD equivalent circuit which reflects real ESD characteristics is necessary to realize the simulator. Therefore, in this study, we developed calculation method of RLC constant for equivalent circuit of various ESD such as ESD gun (IEC61000-4-2), ESD from fingertip of charged human body, ESD from metallic tool handled by charged human body and ESD from charged metal. This method could calculate the constant from actual ESD current parameter, i.e. peak current and peak appearance time, as transient phenomena of RLC series circuit. In addition, we designed the some equivalent circuit which reproduced the current waveform of various ESD by the proposed method. As a result of comparison between the simulated current waveform using a circuit simulator "Agilent Technologies GENESYS" and targeted actual current waveform, we confirmed that the proposed method could calculate the RLC constant of equivalent circuit with high accuracy from the viewpoint of the shape of the waveform, the peak current value and the peak appearance time.
12pA-1	Influence of Pulse Rise Time on Streamer Velocity and Spectroscopic of Plasma Emission Using All Solid Type Nanosecond Pulsed Power Generator		Ippei YAGI, Koichi TAKAKI, Sho OKADA, Takao MATSUMOTO, Douyan WANG, Takao NAMIHIRA, Ryo ONO and Tetsuji ODA	Streamer corona discharge was generated by applying nanosecond pulsed voltage with many different pulse rise times. Pulsed voltage having pulse rise time of 5-41 ns was applied to a coaxial chamber in atmospheric pressure air. Streamer propagation in the discharge was observed using a streak camera. The propagation velocity increased with a shortening rise time of the pulsed voltage. Transient light emissions of N2 Second Positive System (SPS, N2(C3·u)·N2(B3·g)) and N2 First Negative System (FNS, N2+(B2·u+)·N2+(X2·g+)) from streamer discharges were observed for estimating electric field of the discharge. The light emission of SPS had a peak at several nanoseconds after the FNS peak.
12pA-2	Particle formation by the recombination of positive and negative ions generated by discharges		Kenkichi NAGATO	Stable ion clusters formed by discharges in the air have been proposed to provide a stable source of new aerosols through ion-ion recombination with stabilization of the recombination cluster. However, few laboratory experiments have confirmed that positive and negative ions generated in the air can form ultrafine particles via ion-ion recombination. We developed an ion recombination chamber which consisted of a drift tube and corona discharge type ionizers. Positive and negative ions were generated by corona discharge at each end of the drift tube and were forced to drift toward opposite direction by the electric field in the drift tube. Formation of particles through ion-ion recombination was accessed by measuring the particle concentration under the conditions with unipolar discharge and bipolar discharge, and with drift voltage 0 and 500V. We have confirmed that ion-ion recombination can form particles and that ammonia greatly enhanced the particle formation. Positive and negative ion compositions were also measured using a drift tube ion mobility/mass spectrometer.
12pA-3	Theoretical analysis of streamer discharge by discharge simulation	The University of Tokyo	OAtsushi Komuro, Ryo Ono, Tetsuji Oda	A practical streamer discharge model is developed to analyze the characteristic of pulsed streamer discharge in a positive point-to-plane electrodes filled with air at room temperature and atmospheric pressure. The calculated primary and secondary streamer development shows good agreement with an experimentally obtained streak photograph. The calculation shows that the calculated streamer head development and streamer radius are closely dependent on the

12pA-4	Raman spectroscopy of molecule densities in Hydrogen-Air mixture premixed gas ignited by spark discharge	*Graduate School of Frontier Sciences, The University of Tokyo **School of Engineering, The University of Tokyo	○Ayumi KUMAMOTO*, Ryo ONO* and Tetsuji ODA**	For investigating the electrostatic ignition process of hydrogen-oxygen mixture, the densities and dynamics of H ₂ , O ₂ and H ₂ O molecules are measured in a spark-ignited hydrogen-oxygen mixture using Raman spectroscopy. A KrF excimer laser (248 nm) is used for the Raman spectroscopy. Hydrogen-oxygen mixtures with 30%, 66% and 80% H ₂ are ignited with a capacitive spark discharge.
12pA-5	Spatial and temporal distribution of microplasma light emission	Innovation and Joint Reserch Center, Shizuoka Univ.	Marius Blajan, et al.	Emission spectroscopy analysis was used to study the microplasma phenomena. The microplasma discharge in Ar, O ₂ /Ar and N ₂ /Ar mixture was analyzed in the discharge gap area and spatial and temporal distribution of active species was measured. The results are necessary for optimizing the microplasma processes such as surface treatment and biomedical applications.
12pA-6	Measurement of OH radicals in atmospheric-pressure helium plasma jet using laser-induced fluorescence	*Advanced Energy, The University of Tokyo **Department of Electrical Engineering, The University of Tokyo	○Seiya YONEMORI*, Yusuke NAKAGAWA**, Ryo ONO*, and Tetsuji ODA**	Two-dimensional distributions of OH density and air-helium mixture ratio in atmospheric-pressure helium plasma jet were measured using laser-induced fluorescence (LIF). The air-helium mixture ratio was measured using the quenching rate of OH excited state in the LIF measurement. The plasma jet was generated by an ac high voltage (7 kHz, 10 kV peak-to-peak). The diffusion of ambient air into the helium jet was quantitatively measured by the LIF. It was shown that the OH radicals are distributed only in the plasma jet with its peak density of 0.1 ppm.
13aC-1	Basic Study of Low Discharge Voltage Remote Sterilization Process by Using Atmospheric Microplasma	Innovation and joint Research Center, Shizuoka Univ.	Shigeki Tatematsu, et al.	Sterilization of bacteria by atmospheric microplasma was experimentally investigated. Microplasma was generated by electrodes which were covered with a dielectric layer and faced together with a spacer (thickness 100 mm) in between, at relatively low discharge voltage of around 1 kV. This experiment was performed Ar and air as a process gases. Various radicals and ions could affect bacteria. Microplasma generated by both air and Ar are effective for sterilization with various radicals and ions. The photos taken by SEM indicate that microplasma sterilization acts like an etching process.
13aC-2	A Numerical Simulation of Dielectrophoretic Condensation - Analysis of Aggregation Characteristic of Bacteria-	Tokyo Metropolitan University	○Yuichi YOSHIDA, Yuta TESHIMA, Satoshi UCHIDA, Fumiyoshi TOCHIKUBO	The electrical condensation of microparticles using dielectrophoretic device is an attractive technique for detection of bacteria although the optimization of device structure is essential for further improvement. In the present work, an analytical model was developed on the basis of cellular automata and the concentration properties of bacteria were investigated at various operating parameters. The detailed behavior could be simulated for transportation and aggregation of bacteria. In addition, the influence of gap length of the device to the number of trapped bacteria was shown quantitatively. These results suggest that the present model is available for the optimum design of dielectrophoretic devices.
13aC-3	Mechanisms of Neovascularization using Micro-Spot Plasma	*Department of Biomedical Engineering, **Department of Electrical and Electronic Engineering, ***Nano Carbon Bio Device Research Center, Tokyo City niversity	○Chihiro TSUTSUI***, Takamichi HIRATA*, ***, Yukiko YOKOI*, Toshifumi KOMACHI*, Takumi KISHIMOTO*, Shigeru MURATA*, Akira MORI*, Masahiro Akiya*, ***, Toshiaki YAMAMOTO**, Akira TAGUCHI*, ***	Atmospheric pressure plasma has been investigated in the area of hazardous material decomposition, and surface modification. Recently, plasma application was expanded to sterilization, disinfection, and development of complex new areas which require a diverse perspective, involving biomedical science. From the above-mentioned background, we carried out the experiments for tissue and cell activation using micro-spot atmospheric pressures plasma (micro-spot plasma) source. Using an in vivo and in vitro model, we investigated the effect of the direct ion/radical irradiation to endothelial cells and burn wounds of rat. Endothelial cell proliferation and death following plasma were measured. FGF2 and VEGF expression from endothelial cells and its effect on cell proliferation were semi-quantified. Finally, the mechanisms of new blood cell development using micro-spot plasma on were explored. This proliferative effect is likely related to FGF2 and VEGF release due to plasma-induced reactive ion/radical interaction.

13aC-4	A Novel Gene Transformation Technique using Water-in-oil Droplet in an Electrostatic Field	Department of Environmental and Life Sciences, Toyohashi University of Technology	ASADA ATSUSHI, Kurita Hirohumi Kazunori TAKASHIMA, Akira MIZUNO	Droplet-based micro total analysis systems (M ² TAS) have been investigated by many researchers and used in bioengineering. In these systems, individual water-in-oil (W/O) droplets perform as micro-reactors. To manipulate W/O droplets, an electrostatic field is one of the most useful tools. For example, by applying a direct current electric field between electrodes soaked in oil, W/O droplets in the electrodes spacings reciprocate due to dielectrophoretic force and Coulomb force. In this study, gene transformation to Escherichia coli (E. coli) cells by using the droplet reciprocation was carried out. A droplet containing E. coli and plasmid DNA was located between the electrodes and DC voltage was applied. As a result, the transformants were obtained. Therefore the gene transformation by the electrostatic droplet manipulation was confirmed. In this method, sample volume can be smaller than that of conventional method. Therefore, our novel gene transfection method is expected to be a new tool in miniaturized bioengineering.
13aC-5	Inactivation of cell viability by plasma-treated culture medium	*Tohoku Univ., **Shinshu Univ.	○Takehiko Sato*, Mayo Yokoyama*, Kohei Johkura**	In this study, we aim at clarifying an effect of H ₂ O ₂ generated by exposure to a plasma flow in a culture medium on inactivation of cell viability. The plasma flow was generated by a dielectric barrier discharge between a needle and the surface of culture medium with the applied voltage of 7.5 kV _{0p} , 5 k Hz and the power consumption of 7.1 W. The concentration of H ₂ O ₂ generated in the culture medium by exposure to the plasma was proportional to the plasma treatment time. When the cells were exposed to the plasma-treated culture medium, the cell survival ratio decreased with increase of the plasma treatment time. A same trend was observed correspondingly by exposure to H ₂ O ₂ -added culture medium. Morphological damage processes in both cases of plasma-treated and H ₂ O ₂ -added culture media showed a same trend. These results implied that H ₂ O ₂ could be one of important factor for inactivation effect on the cells among stable chemical species in the plasma-treated culture medium.
13aC-6	Investigation of Microbial Inactivation Profile by Submerged Style Pulse Discharge System in Bubble Water	*○Department of Chemical and Environmental Engineering, Graduated School of Engineering, Gunma University	○Takanori TANINO*, Miki Yanagisawa*, Takayuki Ohshima*	Inactivation profiles of microorganisms by submerged style pulse discharge system in bubble water were investigated. The survival ratio of 2 L Escherichia coli suspension with the cell density of 10 ⁷ viable cells per milliliter was decreased to 1.1 × 10 ⁻⁴ by the pulsed discharge system in bubble water within relatively short time 120 seconds. The discharge plasma frequency increased with air flow rate and gas species used for bubble formation affected on the inactivation efficiency of E. coli suspension. Investigation with L-histidin as the radical scavenger demonstrated that radicals generated by the discharge plasma was only one of the important factor of inactivation mechanism. And inactivation efficiency was strongly affected by the initial cell density. The spore of Bacillus subtilis was also inactivated by pulsed discharge system in bubble water. Although, inactivation of B. subtilis spore required longer treatment time than that of E. coli, the survival ratio of 2 L suspension with the cell density of 10 ⁷ viable cells per milliliter was decreased to 2.2 × 10 ⁻³ within 60 minutes treatment. And B. subtilis spore inactivation density.
13aC-7	Single-molecule Measurement of Strand Breaks on Large DNA Induced by Atmospheric Pressure Plasma Jet	Department of Environmental and Life Sciences, Graduate School of Engineering, Toyohashi University of Technology	Hirofumi KUIRTA, Tomoko NAKAJIMA, Hachiro YASUDA, Kazunori TAKASHIMA and Akira MIZUNO	We report a single-molecule-based analysis of strand breakages on large DNA molecules induced by an atmospheric pressure plasma jet (APPJ). We exposed DNA solution to an argon plasma jet; single-molecule observation that involved molecular combing was then used to measure the length of individual DNA molecules. The measured DNA length showed that plasma exposure caused a marked change in length of DNA molecules. The rate of plasma-induced strand breakage on large random-coiled DNA molecules was determined using a simple mathematical model. For strand breaks on large DNA molecules the rate was estimated.

13pC-1	Inactivation process of lysozyme induced by non-thermal atmospheric pressure plasma	Department of Environmental and Life Sciences, Toyohashi University of Technology *	○Yuuki TANI *, Hachiro YASUDA *, Hirofumi KURITA *, Kazunori TAKASHIMA *, Akira MIZUNO *	Recently, inactivation of protein is one of the serious problems in medical sterilization. Therefore destruction and inactivation of protein by discharge plasma has attract attention. However, the mechanism of inactivation of protein by the atmospheric pressure electric discharge plasma is still unclear. In this study, to analyze the damage of protein by discharge plasma, lysozyme, one of the proteins, whose structure and property have been already elucidated, was used. The biological analysis of lysozyme inactivated by dielectric-barrier discharge (DBD) and helium plasma torch was carried out in this study. Inactivation, degradation, and increase of the molecular weight were observed from the DBD-treated lysozyme. Moreover, lysozyme exposed to the helium plasma torch was also inactivated. However, the degradation of lysozyme was not confirmed in case of the helium plasma torch. Lysozyme was considered to be inactivated not only by decomposition but also by chemical modification.
13pC-2	A new fabrication method of protein array with high voltage pulse application	Department of Chemical and Environmental Engineering, Graduate School of Engineering, Gunma University.	○Hidefumi Miyata, Kazuhiro Yumoto, Kanako Ito, Miwa Tamegai, Hiroki Kawaura, Miki Sasahara, Nobuyuki Oshima, Taiho Suzuki, Masahiko Oshige and Shinji Katsura	A protein array is a piece of substrate on which many kinds of proteins have been immobilized at separate locations in an ordered manner. This provides a multiplex approach to identify protein-protein interactions between massive kinds of proteins. For easier preparation of protein arrays, we developed a new method of "in situ" immobilization of protein on modified gold substrate by application of high voltage pulses. In this method, E. coli bacteria bearing the His-tagged GFP (Green Fluorescence Protein) was immobilized on the gold substrate. The substrate was soaked in lysozyme solution, and the outer membrane of E. coli bacteria was hydrolyzed. Then, the remaining inner cell membrane was broken down by application of high voltage pulses, resulted release of cytosol protein and immobilization of the recombinant protein on the surface of the substrate. This method may permit proteome analysis with a lower cost
13pC-3	Inactivation mechanism of bacteriophage M13 treated with atmospheric pressure cold plasma	Department of Environmental and Life Sciences, Toyohashi University of Technology	Hachiro Yasuda, Takuya Miura, Hirofumi KURITA, Kazunori TAKASHIMA, Akira MIZUNO	It is essentially important to understand the interactions between atmospheric pressure cold plasma and living organisms for promoting the bio-medical application of the plasma. Bacteriophages are suitable for the study of such a interaction because of their simple composition and structure. We have analyzed the biological damages of DNA in M13 phage exposed to the plasma. The plasma caused damage to the phage DNA not only single strand break but also some chemical modification. The damage was repaired in vitro by DNA repair enzymes, and ascorbic acid prevented the DNA degradation. DNA transfection assay revealed that single strand DNA is extremely susceptible to the plasma. Coat proteins proved to be more robust than the DNA by recombinant phage DNA experiments. We reached the conclusion that DNA damage is responsible for the plasma-inactivation of M13 phage.
13pC-4	Cell Activation and Inactivation using Atmospheric Pressure Nonthermal Plasma	* Department of Electrical and Electronic Engineering, * * Department of Biomedical Engineering, * * * Nano Carbon Bio Device Research Center, Tokyo City University	○Shigeru INOMATA *, Takamichi HIRATA * *, Chihiro TSUTSUI * * *, Yoshiyasu EHARA *, Toshiaki YAMAMOTO *	Two different types of plasma reactor were used to investigate the effectiveness of Nonthermal plasma irradiation on NIH3T3 cell activation and inactivation. One was the nanosecond pulsed corona and the other was the surface discharge plasma reactor. The effects of oxygen concentration as background media, soft/hard plasma, and plasma treatment time were investigated. The results showed that soft plasma irradiation was effective for cell multiplication as activation. On the other hand, the effects of plasma irradiation time with low oxygen concentration as background gas and types of plasma reactor were not clear for cell activation or inactivation.
13pC-5				

13pC-6	Collection and Sterilization of E.coli by using pulse voltage	Department of Environmental and Life Sciences, Toyohashi University of Technology	Yosuke Kinoshita , et al.	Water pollution and depleted water resource have been serious matters due to increase of population and economic growth in developing countries. One of the water treatment technologies is filtration using filtration membrane, which can remove quite small particles. However, clogging of filter and pressure drop are concerns in this method due to small pore diameter of the filters, and so performance speed is slow and frequent replacement of filter is needed. Therefore, we tried to develop a new technology on water treatment by applying electrostatic field in this study. Collection of small particles in water such as bacteria (E.coli) by applying dielectrophoretic force was carried out. Pellets of BaTiO ₃ , a ferroelectric ceramic, were packed as a layer inside the glass tube and polarized by applying pulse voltage. Since electric field density should be higher between polarized pellets, dielectrophoretic force can be induced to trap E.coli. Moreover, E.coli could be sterilized at the same time by pulse high voltage. The number of E.coli was reduced by 90% by our method. This could be due to cell membrane destruction of E.coli by high electric field between
13aB-1	The density measurement of OH radicals in coaxial cylinder DBD reactor under atmospheric pressure humid air	Graduate school of Engineering, The University of Tokyo	Yusuke Nakagawa, Ryo Ono and Tetsuji Oda	Behavior of radicals in non-thermal plasma is worth clarifying in order to interpret the chemical reaction processes in the toxic gas decomposition by plasma. In order to reveal the oxidation processes in the decomposition, we made the coaxial cylinder DBD reactor emulating the practical gas treatment reactor and measured the time evolution of absolute density of OH radicals in it. The absolute density near the HV anode at just after discharge is estimated to be about 25-50 ppm. Besides, the dependence of OH production on humidity of background gas was investigated in steady state when AC HV was applied. It resulted in a saturation of OH amount against increasing humidity.
13aB-2	Influence of relative humidity on honeycomb discharge inside a glass capillary	Department of Environmental and Life Sciences, Toyohashi University of Technology	○Yuki Nomura *, Hideaki Hayashi *, Kazunori Takashima *, Akira Mizuno *	Recently, discharge plasma has been applied in various fields. Especially, atmospheric pressure discharge plasma has been studied for environmental remediation, Nitrogen Oxides (NOX) removal from the exhaust emission, the removal of volatile organic compounds, and so on. Previous studies demonstrated that discharge generated in a honeycomb catalyst can improve the NOX removal. However, optimization of the discharge condition against humidity has not been considered yet, although diesel exhaust is highly humid. In this research, the discharge condition for generation of stable honeycomb discharge was investigated by adjusting the humidity. As a result, the packed-bed primary discharge was enhanced and the honeycomb discharge easily occurred when humidity was high. In addition, the dielectric barrier discharge (DBD) was used as a primary discharge instead of the packed-bed discharge since generally it is hardly affected by humidity, and the honeycomb discharge under the various humidity conditions were investigated. The primary discharge was suppressed significantly when the humidity was high. Never the less, the honeycomb discharge
13aB-3	Effect of Space Gap Insertion by Honeycomb Type Discharge Reactor	○ * Development Group, Home Comfort Division, Yamatake Corporation * * Department of Electrical and Electronic Engineering, Tokyo	○Yasuhiro OYA * Masayuki IWATA * Yoshikazu ITO * * Yoshiyasu EHARA * *	Volatile organic compounds (VOCs) has a problem to the health and environment. A toluene, which is one of the most commonly used VOCs, was used and the decomposition characteristics by discharge plasma were investigated. In this study, the toluene decomposition using honeycomb type discharge reactor has been experimentally investigated. The reactor that we had used made the zeolite honeycomb a sandwich with two electrodes. We examined the effect of the space gap during zeolite honeycomb. Therefore, discharge pulses were analyzed, the effects of the space gap during zeolite honeycomb on the toluene decomposition were investigated.

13aB-4	Influence of Structure of the Anodic Porous Alumina Barrier on NO _x Treatment in a DBD Reactor	Department of Mechanical and Electrical Engineering, Nippon Bunri University	○Toshiyuki Kawasaki, Satoshi Yamada, Shohei Wakamatsu, Kouji Koishi and Junichi Shirabe	Porous ceramics in a DBD reactor are useful not only for catalyst support but also for particulate collection and gas adsorption. They also play an important role in the DBD characteristics and plasma chemical reactions. In this study, anodic porous alumina with many straight nanopores has been focused as the barrier of a DBD reactor. Its unique and controllable nanostructure is interesting in applying to the barrier, and also enables one to study the relationship between the DBD and nanostructures systematically. In this paper, the influence of the barrier structure on the NO _x removal were studied using the anodic porous alumina barriers. The relationship was observed between the NO removal rate and discharge power which mainly depends on the change of relative dielectric constant ϵ_r with the structure of the barrier. The unique change of the discharge power in film thickness between 16 and 33 mm was obtained only using the pore-widening barrier. That had direct effects upon the NO removal rate. The NO ₂ adsorption on the barrier was increased with increasing its thickness (\approx pore depth). However, it seemed that little NO ₂ was adsorbed on it in the case of the porous barrier with thickness below 16 mm.
13aB-5	Aerosol generation and collection of hydrocarbon in diesel exhaust gas by using ozon	Department of Environmental and Life Sciences, Toyohashi University of Technology	Nobuhiro Tanji, Hideaki Hayashi, Hirofumi Kurita, Kazunori Takashima, Akira Mizuno	Hydrocarbon in automobile exhaust produces photochemical oxidant, which causes air pollution. Hydrocarbon is exhausted until the catalyst gets warm. It is necessary to develop the novel technology that reduces hydrocarbon emission at the low temperature. Experiments on hydrocarbon reduction by using ozone injection were carried out in this study. The total number concentration of Particle Matter (PM) and the gas components were measured. As a result, of ozone injection the total number concentration of PM was increased, but the newly-generated PM by injecting ozone into the exhaust was effectively removed by the Electrostatic Precipitator (ESP). The concentration of the gas components such as olefinic hydrocarbons and aromatic hydrocarbons was decreased after the ozone injection. Therefore, this method can be used to reduce both PM and hydrocarbon emission. Next, the PM collected by ESP was analysed. As a result, it was suggested that the products generated by the ozone injection might be not solid particles but liquid particles. As a result of EDX analysis, oxygen atoms were found only when ozone was injected. And ozone-injected sample showed stronger carbon signal compared with PM in the exhaust without ozone injection.
13aB-6	Observation of the plasma in bubbles using bubble control	Graduate School of Science and Engineering, Tokyo Institute of Technology	○Hayato OBO, Nozomi TAKEUCHI and Koichi YASUOKA	Plasma generated in bubbles is widely studied due to their energy efficient decomposing abilities, particularly for persistent substances. The plasma = water interactions are crucial for efficient decomposition, thus a new synchronization technique has been developed by combining pressure control of the gas chamber and pulsed plasma generation. The plasma shapes showed apparent distinctions according to time lags between the bubble and plasma.
13pB-1	Decolorization of Indigo Carmine Solution by Superimposition of Streamer Discharges on the Water Surface and Ozone	* Department of Electrical and Electronic Engineering, Oita University, * * Institute of Fluid Flow Machinery, Polish Academy of Sciences	○ Siyuan GENG*, Seiji KANAZAWA*, Shuichi AKAMINE*, Ryuta ICHIKI*, Marek KOCIK**, Jerzy MIZERACZYK**	Pulsed streamer discharges can be generated on the water surface and are applicable to several applications. Formation of hydroxyl (OH) radicals by streamer discharge has been demonstrated. The acidic feature of OH radicals and its ability to diffuse into water can be utilized for water treatment. Hence the formation of OH is an important aspect of water treatment process. In this study, we focus on the superimposition of streamer discharges and ozone in water. Through our experiment, ozone is introduced through the nozzle electrode to interact with the streamer discharges on the water surface. As a result, superimposition of streamer discharges on the water surface and ozone shows to be more time efficient as compared to either individual ozone injection or only discharges on the water surface.

13pB-2	Influence of Pulse Width on Decolorization Efficiency of Organic Dye by Discharge inside Bubble in Water.	Faculty of Engineering, Iwate University *, Shishido Electrostatic, LTD. * *, Faculty of Agriculture, Iwate University * * *	○Shuta KAWANO *, Katsuyuki TAKAHASHI * *, Koichi TAKAKI * and Naoya SATTA * * *	Water purification by discharge inside bubble in water containing organic dye has been investigated. The discharge reactor consists of a glass tube and a tungsten wire inserted into the glass tube, which is immersed in the water. Room air is injected into the glass tube to generate bubbles in the water. The high voltage pulses are generated by a magnetic pulse compression circuit and a pulsed power generator with inductive-energy storage using semiconductor opening switch. The pulse width is adjusted in the range from 61 to 570 ns. The high voltage is applied to the tungsten wire to generate streamer discharges, which propagate into the bubble from the tip of wire. Indigo carmine is employed as a specimen to evaluate decolorization efficiency. Potassium nitrate is used to adjust the solution conductivity. Decolorization rate increases with increasing conductivity of the solution and the applied voltage. The solution of 1830 $\mu\text{S}/\text{cm}$ in conductivity is successfully decolorized. Energy efficiency for decolorization increases with decreasing ohmic loss by decreasing the applied voltage and the pulse width.
13pB-3	Degradation of Methylene Blue by Pulse Surface Discharge	School of Engineering, The University of Tokyo	Takuya BANNO, Ryo ONO and Tetsuji ODA	Water treatment is one of the industrial applications taking advantage of pulsed power. Electrical discharges produced in atmosphere involve a variety of high energy phenomena, which would be effective to the water treatment. The decomposition of a methylene blue solution using the surface discharge on water is proposed in this paper. The effect of pulse peak voltage and water depth is investigated. When water depth is raised, the surface discharge is hardly generated. The observed results showed that decomposition efficiency of methylene blue increased with the increase of pulsed peak voltage, input energy and treatment time. Energy efficiency doesn't depend on pulsed peak voltage, and it is 1.54 ($\text{gkW}^{-1}\text{h}^{-1}$) when decomposition rate is 50 %.
13pB-4	Water treatment characteristics of gaseous cylinder pulsed discharge	Department of chemical and environmental Engineering, Gunma University	○Yukihiro TAMURA , Takanori TANINO , Takayuki OHSHIMA	The characteristics of water treatment using discharge plasma irradiation, which was generated in gaseous cylinder immersed in the treated water, were investigated. Degradation of organic materials, indigo carmine and oxalic acid was carried out in various conductivity solutions. Both materials were successfully degraded by the discharge plasma irradiation, and high degradation ration were shown in the high conductivity solution. The effect of discharge plasma irradiation depth degradation of organic materials was also investigated. Degradation ration observed by the plasma in water was higher than that shown by irradiation of discharge plasma on the water surface.
13pB-5	Decomposition of Perfluoro Compounds in Water Using Discharge Plasmas	Graduate School of Science and Engineering, Tokyo Institute of Technology	Koichi YASUOKA, Hayato OBO and Nozomi TAKEUCHI	Efficient decomposition of perfluorocarbons has been successfully demonstrated using DC plasmas generated in oxygen bubbles. After 180 min treatment, 99% of fluorine atoms were detached from perfluorooctanoic acid (PFOA) and 68% of them were detached from perfluorooctanesulfonic acid (PFOS) after 480 min operation. The decomposition rate and energy efficiency showed apparent differences between PFOA and PFOS solutions.
13aC-8	Electret Properties of Nonwoven Fabrics made of Bicomponent Fibers	Department of Home Economics Osaka Seikei College	Katsutoshi ANDOH, Masanori TAKEUCHI, Kiyoshi AIHARA	Charging mechanism and penetration efficiency of electret nonwoven fabrics made of two types of sheath-core bicomponent fibers were studied in comparison with the electret nonwoven fabric made of polypropylene fiber. One type of the bicomponent fibers was consisted of a core of polyethylene terephthalate and a sheath of polypropylene, and the other type was consisted of a core of polybutylene terephthalate and a sheath of polypropylene. Charging mechanism of all these nonwoven fabrics was surface discharge. Penetration efficiencies of the nonwoven fabrics made of bicomponent fibers changed over time. It is considered this result was caused by electric charge decay through the analysis of thermally stimulated current.

13aC-9	An EHD Effect with some polymer Insulating Coatings.	Dep.Electrical engineering, Yamagata University	Keisuke Endo and Kyoko Yatuzuka	We have been investigated an EHD effect of silicone oil with additives with insulating coated electrodes. When an electrode in coated, the EHD effect has been enhanced. An previous report, it is shown that different substance of coating makes the different EHD effect. In this report, in will be presented that the both electrode are coated by the insulating coating polymers, but both are different substance. The experimental results suggests that the EHD effect is drastically effected by the electrostatic characteristics between the driving liquid and the coating polymers.
13aC-10	Performance Evaluation and Investigation of Photocatalyst Layer Produced by Electrostatic Atomization	College of Industrial Technology, Nihon University	○Shota YAZAWA, Tomoaki TAMURA, Yusuke KUDO, Tetsuya NAKANISHI	A photocatalyst works only because of light. It is very clean and can use semipermanently. Therefore, a photocatalyst is environment-friendly. A photocatalyst has a useful characteristic such as an oxidative decomposition and a super-hydrophilicity. The most effective surface structures of photocatalysts for these useful characteristics are different respectively. Therefore, it is necessary to tailor the surface structure of a photocatalysts properly. We have been studying about fabrication of photocatalyst layer which produced by an electrostatic atomization. And we measured the oxidative decomposition effect and the super-hydrophilic effect of the produced photocatalyst. And the optimum condition was investigated.
13aC-11	Aggregation and arrangement of gold nanoparticles by dielectrophoretic operation	Tokyo Metropolitan University	○Shin Yamazaki, Naoki Shirai, Satoshi Uchida, Humiyoshi Tochikubo	The assembly of colloidal particles into functional structures is available for nanotechnology applications. Although dielectrophoresis (DEP) is an attractive method for the manipulation and alignment of nanoparticles, understanding of specific DEP properties for nanoparticles is essential for the accurate and effective control. In the present work, we measured the absorbance of colloidal gold solution with DEP operation and observed the shape of assembly of particles using SEM. As these results, there were differences of absorbance changing frequency of DEP. The aggregation of colloid was obtained although the qualification for controlling assembly of nanoparticles should be examined.
13aC-12	Evaluation of Self-cleaning Effect of Photocatalys Fabricated by Electrostatic Atomization when the Electrode Distance Changed.	College of Industrial Technology, Nihon University	○Tomoaki TAMURA, Shota YAZAWA, Yusuke KUDO, Tetsuro OTSUKA	In this study, the experimental setup was changed for improving the performance of photocatalys, and a self-cleaning effect of the photocatalyst was measured.
13aC-13	On the Study of a RF Discharge Plasma Ionic Microphone	Department of Electrical and Electronic Engineering , Kanagawa Institute of Technology	Hiroshi AKINO	This study examined the sensitivity of an atmospheric pressure RF discharge ionic microphone. DC corona discharge was not fit for ionic microphone, because of the noise it produces electrically and acoustically. RF discharge that is circuit configuration of harmonic oscillator produces plasma. Change in frequency of harmonic oscillator for RF discharge corresponds to the level of sound wave. For the needle electrode protection, inert gas was effective. The plasma became stable when atmospheric pressure RF discharge flame turned upward and could increase sensitivity of the ionic microphone.
13aC-14	Basic study of atmospheric microplasma effect on pressure loss	Shizuoka University, Innovation and Joint Research Center	Yuta NOMA, et al.	Atmospheric microplasma effect on pressure loss was experimentally investigated. Microplasma was generated with a pair of electrodes which covered with dielectric layer and faced each other, at relatively low discharge voltage of around 1 kV. An AC high voltage energized the electrodes and could generate microplasma and ionic wind between the electrodes which impacts the air flow in the acrylic pipe. A manometer was used to measure the pressure difference at back and front of the electrodes and to observe how the gas flow was changed by passing through electrodes.

13pA-1	Effect of Recrystallizing Act on Triboelectrification of Ice	Geophysics department, Graduate School of Science, Hokkaidou University of	Hisashi Shio	when a couple of ice specimens with identical character on crystal with hot spot was negatively against the other speismen with cold spot for an initial period of rubbing. However, on more rubbing for a long times the only hot spot is changed from single crystalloid face to polycrystalloid face, and then the potential electricity is got to reverse sign on charge.
13pA-2	Piezoelectric properties of poly (lactic acid) multilayer film	Graduate School of Engineering, Kansai University	OTetsuo Yoshida, Takaaki NAKAI, Atsuko KATO, and Yoshiro TAJITSU	We produced poly-D-lactic acid (PDLA)/poly-L-lactic acid (PLLA) multilayer films and then evaluated its physical, mechanical and piezoelectric properties. The piezoelectric constant of PDLA/PLLA multilayer film increases with increasing the number of layers and is over 100 pC/N. Then, using the impedance analyzer, we observed the piezoelectric resonance curve of PDLA/PLLA multilayer film. In the measurement, we found the sharp peak in admittance curve and large changing in phase curve, in comparison with that in a single PLLA film. These results suggest that the realization of large piezoelectricity in PDLA/PLLA multilayer film is affected strongly by its microscopic multilayer structure. In other words, the PDLA/PLLA multilayer films share the advantage of being high piezoelectricity.
13pA-3	Disruption and electrification of a droplet of water on the superhydrophobic surface	Kanagawa Institute of Technology	OHirofumi SHIMOKAWA and Tathuya WATANABE	In the previous report, it was shown that the small droplet was ejected from the water droplet which drops on the Tefron surface with charged negatively. The small droplet had the negative charge. This report examined the ejection of the small droplet from the water droplet which drops on the superhydrophobic surface. There was the ejection of the small droplet in the condition that the superhydrophobic surface had not been charged. The charge of the small droplet increased with the electrification of the surface. These phenomena was related to the hydrophobicity of the surface, and the effect of material and thickness was secondary.
13pA-4	Evaluation of hydrophobic property of insulators using electrostatic spray	Faculty of engineering, Yamagata University	Toshiyuki Sugimoto, Hiroo Adachi, Yoshio Higashiyama	Evaluation method for hydrophobic property of polymer insulators has been developed by supplying charged fine droplets to the insulator surface using electrostatic spray and measuring an electric field formed by the charged droplets. Tapped water of 0.02 ml was ejected continuously from the tip of a cylindrical pipe electrode with 0.52 mm in inner diameter. The pipe electrode connected to dc high voltage supply penetrated through a hole of a plate electrode connected to the ground. These electrodes were placed above a test sample at a height of 20 mm. Electrostatic spray from the tip of the pipe electrode was supplied to the surface of the test sample. Two surface voltmeters were placed next to the electrostatic sprayer to measure the electric field formed by the charged spray deposited on the test surface. The electric field was found to be a function of hydrophobic property of the test surface aged by the corona discharge. The electric field was drastically increased for polymer insulator with low contact angle due to aging by corona discharge.
13pA-5	The Charge of a Raindrop in the Thunderstorm	Kanagawa Institute of Technology	OTakuma ENDO Hirohumi SHIMOKAWA	The paper described electric charge of the raindrop in the thunderstorm. In addition, drift phenomenon which was a problem of the measuring system was also considered. It was found that in the thunderstorm, the result which the charge of the raindrop has large value further the $\pm 1\text{pC}$ was dominant. Especially, the charge having more than $\pm 10\text{pC}$ affects the overall charge that was measured. This result is greatly different from the result in case of usual rain. The drift phenomenon was greatly improved by exchange to the new cable, and change way of the dry air.