

No.	Title	Affiliation	Name	Abstract
18aA-1	Thermally Stimulated Current of PA/BaTiO <sub>3</sub> Composite Film	Osaka Institute of Tech. Nitto Denko Co.LTD	Fukuzo YOSHIDA Tsukasa OHTA Masahiko YOSHIURA	Recently, composite films of polymer and inorganic-filler are required as a key material for further compactness of electronic devices such as capacitor. We have studied, through thermally stimulated current (TSC) measurement, to explain the effects of trap levels on electrical conduction and charging properties of PA/BaTiO <sub>3</sub> composite films. Trap parameters that enable us to determine a TSC curve measured by thermal sampling can be accurately determined through asymptotic estimation method (AEM). From TSC curves separated by AEM, it was found that the four traps (0.440 eV, 0.541eV, 0.635 eV and 0.741 eV) were mainly formed in the composite film.
18aA-2	Charging of Adhesive Tapes on Peeling (3) – Several improvements on measuring charges and the effect of humidity on amount of charges –	Graduate School of Engineering, Nagoya Institute of Technology	○Yasuro HORI, Takeshi YAMAKAWA, Takuya HIRAO	Charging behavior of adhesive tapes on peeling was investigated for various adherends. On measuring the charges of tapes, several improvements were achieved. 1)The charges on adhesive tapes generated by peeling has been found to induce the charges on the tweezers which is used at peeling tapes off, and this induced charges reduce the measured value of charges. By using an completely insulated tweezers to avoid the induced charges, the amount of charges on tapes has been accurately measured and the absolute value of charges on tapes has been confirmed to be equal to those on the adherends. 2)The condenser charge storage method was developed as a modification of current integration method for measuring the amount of charges. With this condenser charge storage method, it has been possible to investigate charging on the conductive adhesive tapes such as an Al conductive tape. 3)To control the humidity in the measuring box, the effect of humidity on the amount of charges generated on adhesive tapes can be observed.
18aA-3	Effect of environmental factor on the decay of triboelectric charge		Tsuneki Ichikawa	The decay rate of electric charge on triboelectrically insulating materials depends on several environmental factors such as humidity, temperature and so on. Although humidity is known as a major controlling factor for the decay., the mechanism of the decay has not been fully understood. The present study is aimed at clarifying the mechanism of the humidity-induced decay by measuring the dissipated charge from several types of triboelectrically materials. The experimental results suggest that water molecules attracted on triboelectric charges mobilize the charges to induce the migration of the charges to less electro-repulsive environments.
18aA-4	Moisture Absorption and Charge Generation in Polymeric Dielectrics	*Sekii PE Consulting Office **National Institute of Information and Communications Technology	*Yasuo Sekii and **Takashi Maeno	It is well-known that, under DC voltage stress, negative hetero-charges are generated near the positive electrode in XLPE (Cross-linked polyethylene) and EPR (Ethylene Propylene Rubber). The generation of negative hetero-charges is caused by such inclusions as acetophenone, moisture and antioxidants in dielectrics. To investigate the influence of moisture absorption on the generation of hetero-charges, the moisture absorption characteristics of LDPE, XLPE and EPR were analyzed, together with measuring charge profiles in those materials. The dissipation of generated hetero-charges is also touched upon.
18aA-5	Characteristics of Negative Spread Corona Discharge in Needle-to-Plate Electrode System (II)	Oita university	Toshiaki Kudo, Syuichi Akamine, Toshikazu Ohkubo	The electric discharge of a negative polarity has been made unsuitable for a gas processing. An electric discharge of a positive polarity is because an ionization region is large, so the treatment efficiency is good. However, in our research, the electri

18aA-6	Influence of Surface Tension on Corona Characteristic from a Fine water Droplet.	Graduated School of Science and Engineering, Yamagata University	○Yuya Ohnishi, Yoshio Higashiyama	Corona discharge from a water droplet inevitably involves deformation of the droplet and emission of fine jets. Corona discharge phenomenon was investigated from a water drop located at a tip of grounded rod electrode facing to a ring electrode with positive dc potential. Ion exchanged water and surface-active agent aqueous solution were used as a water sample. The magnitude of viscosity and surface tension of water vary with water temperature or existence of surface-active agent. Corona onset voltage for an ion exchanged water drop hardly affected by temperature of water drop, surface tension with water temperature ranging. On the other hand, corona onset voltage was decreased drastically with a concentration of surface-active agent due to decrease of surface tension. Negative corona discharge from a water drop has a unique waveform. This would result from periodical variation of the shape of a water cone. As a result, negative corona discharge with trains of Trichel-like pulses occurred after ejection of cone jets. The peak and interval time between corona pulse within pulse trains were affected strongly by applied voltage
18aA-7	Investigation of Discharging Electrode Geometry of Negative Spread Corona Discharge Plasma Reactor for Practical Use	Oita University	Yusuke Sotoya, Shuichi Akamine, Toshikazu Ohkubo	If it continues discharging when a needle electrode is used for a discharge electrode, a needle will be gall and the stable electric discharge will not be obtained. Then, we experimented by using the different materials and form from a needle electrode. If a better electrode is created, it will be helpful to the experiment of harmful gas processing.
18aA-8	Low Voltage Discharge at a Micro Gap in Air	School of Engineering, The University of Tokyo	Yuto ONO, Tetsuji ODA	Electrostatic discharge (ESD) at low voltage causes bad things, such as destructions and error of devices. But low voltage ESD shows different properties from those of high voltage ESD, so properties and mechanism of electrostatic discharge at low voltage are not known well. In this research, I examine some properties of low voltage ESD with the electric circuit with a switch that simulates low voltage discharge at a micro gap.
18pD-1	Improvement of the Characteristics of a Corona Discharging Type Ionizer ( I )	*Sendai National College of Technology, **Shishido Electrostatic, Ltd.	○M. Hattori*, M. Goto*, D. Endo*, J. Sugaya*, T. Saito**, K. Izumi**	For a semiconductor producing or handling process, an ionizer or a charge eliminating device is a necessity. A corona discharging type ionizer is common for such processes. In this paper, we are investigating the performance of a piezoelectric transformer type ionizer which has a negative feedback gate circuit. This type has the merits of small size and is light, however, the use of a high frequency power supply produces some ozone gas. In order to search for an appropriate working condition of this ionizer, various experiments with different parameters of the feedback gate frequency and duty ratio have been done. Moreover, a DC power supply type ionizer was tested and compared with the characteristics of the piezoelectric type one. As a result, it is clear that the piezoelectric type has comparable performance in charge removal time and generating density of ozone compared with the DC type ionizer.
18pD-2	Space Charge Balance Sensing System for Static Control System	University of Industrial Technology	○Syamsul Arifin, Toshio Tanabe, Kazuo Okano	Final voltage of products VPF (Ion balance) is one of the most important factors for static neutralizing system. Two kinds of sensing system for ion balance control system were investigated for measuring the VPF. The first is Static Sensing System (SSS) and the other is Dynamic Sensing System (DSS). MOSFETs were used as voltmeter in SSS and ammeter in DSS. The detection limit VPFMIN of both systems was below 100 mV. The response time $\tau$ of the DSS was 5 times higher than the SSS.

18pD-3	Discharge electrode emitter deterioration characteristic of the corona discharge type ionizer	KASUGA DENKI, INC.	Tomoko Nakayama, ONobuo Nomura, Yoshitsugu Okamura, Kazuaki Nakajima And Fumiaki Hashimoto	The electrostatic disaster caused by the electrostatic discharge is getting more and more serious problems in many industries. It is well known method in general to eliminate the charged charge with the corona discharged type ionizers. However, there is a problem that the corona discharge type ionizers create the dust from its electrode emitter pins and it becomes a factor of contamination problems in the environment. Recently, this contamination problem becomes also a big factor to reduce the yield rate by contaminating the products with the dust from emitter pins of ionizers in the certain industries. This report provides the deterioration characteristic of the diamond made emitter pins used in electrostatic eliminator as the diamond made emitter pins can solve the contamination problems.
18pD-4	Development of ion conveying type ionization system generating large charged-particles by ionic nucleation of water vapor part2	* Technical R&D Center, Techno Ryowa Ltd., * * Dept. of Ecological Engineering, Toyohashi University of Technology	OMasanori SUZUKI * , Takashi MATSUDA * , Hideaki MATSUHASHI * and Akira MIZUNO * *	In order to control static electricity in narrow space such as space in ULSI and LCD manufacturing equipments, we have conducted the development of low energy X-ray ionization system conveying ions through tubes, In the previous paper, we reported the results of evaluation in terms of the influence of several factors on charge eliminating performance of the ionization system generating fine charged-mist (large charged particles) by the condensation through adiabatic expansion. In this paper, we will report the results of investigation on the influence of temperature of the humidified air, ratio of the flow rate with the purge air and type of the nozzle on charge eliminating performance, for optimizing charge eliminating performance of the new ionization system generating large charged-particles by condensing water vapor with the vortex-tube.
18pD-5	Characteristics of ionic wind by Negative Spread Corona Discharge in Needle-to-mesh Electrode System.	Oita University	Hiroshi Muto, Syuichi Akamine, Toshikazu Ohkubo	Many reports of research are performed about the corona discharge characteristic of negative polarity in needle-to-plate electrode system. However, we observed the spreading corona discharge of negative polarity which attains to even the opposite poles. We decided to call this discharge a "negative spread corona discharge". It aims at acquiring the properties of the ionic wind generated by a negative spread corona discharge in this research. Therefore, the direct current voltage of a negative polarity is impressed to a discharge electrode, and a spark discharge is generated. And the cardinal trait about the properties of the ionic wind generated between a needle electrode and a mesh electrode is acquired.
18pD-6	A Study of Separation of Transferred Positive and Negative Ions from AC Corona Discharge	Dept. Electrical Eng. * , Yamagata University, KOGANEI Corp. * *	OYoshinari FUKADA * , * * , Takashi YASUKAWA * * , Kyoko YATSUZUKA *	An AC corona discharge ionizer is one of the most useful equipment to eliminate static charge on electronic devices. This paper represents the measurements of the positive and negative ions transferred by an AC corona discharge ionizer by faraday cage in which a rod electrode is inserted to form a deflecting electric field. We succeeded in the separation of the positive and negative ions by applying the voltage on the rod electrode. With increase of the voltage of the rod electrode, the ion currents of the same polarity of the rod increased, while the ion currents of the opposite polarity decreased. Positive ions has the larger ion current and ion generation time than negative ions does. Negative ions are easier to be affected by the electric field than positive ions are. In addition, the influence of the electric field examined analytically to show good agreement of the experimental results and analysis.
18pD-7	Static electricity neutralizing system of the human body in a Vehicle	NISSAN MOTOR CO., LTD * , MURATA MFG CO., LTD * *	Takayuki Fuwa * , OYasuhiko Shimanaka * * , Shinji Kato * *	People often feel discomfort when entering or exiting a vehicle because of a static electric shock. In the electronics industry, ionizers have been developed to prevent electrostatic discharges and contamination sticking around or on circuit components. Ionizers incorporate corona discharge principles to neutralize the static electric field. Using this idea, we developed an in-vehicle system to neutralize the human body charge. To accomplish this, the mechanism by which the human body attains a charge when exiting a vehicle was first defined. That definition was then used to determine the design characteristics of the system.

18aC-1	Preparation of Transparent Conductive Film for All-Solid EC device by Pulsed Laser Deposition Method	Oita University	Yuki Torii, Syuichi Akamine, Toshikazu Ohkubo	Development of All-solid electrochromic (EC) device is our target. All-solid electrochromic (EC) device is made already in our laboratory, however, it is very important to find preparing condition of Pulsed Laser Deposition (PLD) method in order to get be
18aC-2	Drift-suppression of Pesticide Droplets by Using Electrostatic Pesticide Spraying and Grounded Conducting Net	Graduate school of Tottori University	Ryo NISHIMURA, Yoshifumi HASHIMOTO, Katsumi NISHIMORI, Naganori ISHIHARA	It is well known that electrostatic pesticide spraying (EPS) is effective to improve the adhesion performance of pesticide to agricultural crops. On May 29, 2006 the Ministry of Health, Labour and Welfare introduced the positive list system for agricultural chemicals remaining in foods. The system prohibits the distribution of foods that contain agricultural chemicals, such as pesticides, above a certain level if maximum residue limits have not been established. Because of this, pesticides should be sprayed only on the target plants. Also, the drifting pesticide particles should be shielded not to reach the other plants. In this paper, we show that charged droplets can be shielded by using grounded conducting net. EPS is also effective to prevent drift hazard of pesticides.
18aC-3	Experiments on Electrostatic Pesticide Spraying to Japanese Pear ( <i>Pyrus pyrifolia</i> ) Trees in Orchard	Graduate school of Tottori University	Yoshifumi HASHIMOTO	In this paper, we report on the results of basic experiments on electrostatic pesticide spraying (EPS) at an orchard of Tottori University. We assembled a prototype sprayer for EPS using a two-stroke-engine-driven sprayer. By using this sprayer, the effectiveness of EPS is examined by spraying solution of edible red dye in water to test trees. The test trees used for this experiment are seven-year-old Japanese pear ( <i>Zuisyu</i> ) trees which are cultivated in a greenhouse. It is shown that the amount of adhered water droplets (pesticide) is increased by 17% by applying -38 kVDC to a nozzle of the sprayer. Also, we carried out this EPS experiment blowing air from behind the nozzle aiming to improve the adhesion performance.
18aC-4	Uniformity of Coating Thickness in the Atomized Electrostatic Powder Coating and its Testing Method	*Zao Electrostatic System Laboratory,* *Owell Co., *** I. P. D., Inc.,	Mitsuru MATSUI*1, Hirofumi KOYAMA*2 and Tsutomu ITO*3	In the atomized powder coating (APC) system the agglomerated particles contained in paint powders are pulverized with an atomizing unit. The pulverizing effects various merits to the system, such as increasing the charge density of powder particles sprayed from the gun, realizing the powder mass flow rate sensor, improvement of the transfer efficiency and, etc. In this paper an improvement of the uniformity of coating thickness is described and its testing procedure is discussed. High speed spraying of highly charged powders not only penetrates the powders to the recessed area but also prevents to yield the over-deposition of powders on the fringe area of the object. Therefore the uniformity of the coating thickness is improved considerably. In the experiment using a flat test object, size of 400 × 600 mm, the average value of the coating thickness measured at the 25 points on the surface of the object and the standard deviation (std) of them were obtained as 88.0 μm and 5.8, respectively. Compared with the measured values by the conventional system, the coating thickness has increased 27 percent and the std has improved by 4.7.
18aC-5	Effect of WO <sub>3</sub> Film Preparation Condition by Pulsed Laser Deposition Method on Electrochromic Coloring Characteristics	University of Oita	Hideki Masudome, Yuki Torii, Syuichi Akamine, Toshikazu Ohkubo	We are developing all-solid thin display devices using WO <sub>3</sub> electrochromic thin film by Pulsed Laser Deposition (PLD) method. To optimize preparation condition of WO <sub>3</sub> thin film, such as oxygen pressure and spacing between target and substrate, electrochrom

18aC-6	Preparation of LSGMCO Films by PLD Technique and its Application for Fuel Cells	* Department of Electrical and Electronic Engineering, Oita University ** Kumamoto University	Seiji Kanazawa*, Syouji Matsunaga*, Shuichi Akamine*, Toshikazu OHKUBO* Fumiaki Mitsugi**	The LSGMCO thin films were prepared on the several kinds of substrates by KrF excimer pulsed laser deposition technique. The structural and electrical properties of the LSGMCO films were investigated for various deposition conditions. Next, a new-type planar fuel cell (single-chamber SOFC with methane-air mixture) where the electrodes were deposited on the surface of LSGMCO film was prepared and evaluated its performance. The V-I characteristics of the cell was measured and the feasibility of thin film SOFC using a simple electrode configuration onto the electrolyte film was confirmed.
18aC-7	Ion irradiation electronic paper printing system	Kobayashi Create Co.,Ltd	Noriaki Nimi	We are developing a novel electronic paper printer that uses the small ion irradiation head. The method of ion electrical discharge is controlled by the heating of electrodes applied high voltage on it, and a voltage necessary for the control is 5v. Further this newly developed ion irradiation head causes electrostatic latent image on films.
18aC-8	EHD effect in a symmetrical cylindrical-cylindrical electrode system with insulating film coating	Faculty of Engineering, Yamagata University	Shunsuke Shimoyama	We have investigated on the EHD effect in a cylindrical-cylindrical electrode system. Though it is said that the EHD effect did not happen in the electrode system which formed symmetric electric field distribution, we got a remarkable EHD effect in a such symmetric electrode system. It seems that an imbalance space charge distributions vicinity of electrodes are taking place to drive the fluid. In this study the insulating film coating is involved in order to make an imbalance space charge distributions around the electrodes, allowing the charge exchange reaction rate decreased. The EHD effect with the insulating film coating is larger than that without the film, and the current with the film is also larger than that without the film against our expectation. We proposed the explanation with the imbalance space charge distribution based on the difference of the charge exchange rates at the electrodes. We also proposed a model for the mechanism of formation of the imbalance space charge distribution in considering of the electrical potential of the tube wall. Those models give a good explanation of our experimental results.
18pC-1	Fabrication of Electrode Ribbons of a Stacked-type Electrostatic Actuator	Tokyo Institute of Technology	OKenichi FUJIKAWA, Ryosuke WATANUKI, Koshuke YAMAMOTO, Keiji SANEYOSHI	We are studying a stacked-type electrostatic actuator aiming to make an artificial muscle. The force of the actuator is in inverse proportion to the square of the gap length between electrodes, so we have to miniaturize the actuator to generate large force. However, it is difficult to make the small sized electrode ribbon which is a main component of the actuator. In this paper, we report a new method for fabricating small sized electrode ribbon using photolithography and etching process which is used in microfabrication. This method is suitable for miniaturization of the actuator and mass production.
18pC-2	Basic study of sterilization technique at low discharge voltage by using Microplasma( II )	Innovation and Joint Research Center, Shizuoka University	OMasahiro YAMADA, Marius BLAJAN and Kazuo SHIMIZU	Sterilization of micro-organism, such as Escherichia coli, is experimentally investigated by using microplasma. Microplasma is suitable for practical application for sterilization, since its discharge voltage is low and its apparatus could be small and inexpensive. In this study, Gram-negative Escherichia coli HB101 and Gram-positive Bacillus subtilis JCB20036 are used as the target to be sterilized. From the series of experiments, decrease in the amount of germs is effectively obtained after microplasma treatment. In addition, the effect of sterilization increases as the discharge voltage increases. When nitrogen is used as carrier gas, the effect of sterilization was obtained although ozone is not generated during the discharge. The sterilization rate of E. coli is better than that of B. subtilis when both air and nitrogen are used as carrier gas.

18pC-3	Inactivation of E.coli using Ar/Ar+H2O Plasma Torch	Department of Ecological Engineering, Toyohashi University of Technology	ONaoto FUJII, Tomoko NAKAJIMA, Hachiro YASUDA, Kazunori TAKASHIMA and Akira MIZUNO	A plasma torch with inert gas is chemically-activated low temperature plasma. Recently, it has received a lot of attention for application to plasma processing or medical field. However, the plasma can't produce much oxidative species compared with Dielectric Barrier Discharge. It suggests that solve this issue if we can use an OH radical with the strongest oxidation power in active oxygen and plasma torch. In this study, the effect for E.coli inactivation investigates using Ar/Ar+H2O plasma torch was studied. Argon gas was moisturized by bubbling in ion-exchanged water. Dissociated water molecules in discharge space of the plasma torch generate OH radical. In addition, we measured the light emission of the plasma to understand characteristics of the discharge. The spectrum of OH radical both in the Ar and Ar+H2O plasma torch was observed. It was suggested that Ar+H2O plasma torch was effective in inactivation of E.coli on Petri dishes.
18pC-4	Fundamental Investigation on Sterilization of Bacteria by Pulsed Electric Field with Dielectrophoresis in Micro-gap Reactor	Tokyo Metropolitan Univ.	Atsuto Tsukutani, Satoshi Uchida, Fumiyoshi Tochikubo	Pulsed electric field sterilization is an appropriate treatment for fresh foods and medicines. However, this method has disadvantages that the energy efficiency is not high enough and high voltage is required for the sterilization. In the present work, we developed a micro-gap reactor with dielectrophoretic system to improve the energy efficiency. In addition, basic properties of the reactor were investigated. The voltage required for the sterilization was reduced. We confirmed effects of bacterial concentration by dielectrophoresis and pulsed electric field sterilization in the reactor. Consequently, further effective pulsed electric field sterilization can be expected with combination of dielectrophoretic concentration.
18pC-5	Numerical Investigation of Bacterial Capture Region in a Dielectrophoretic Microfilter	Tokyo Metropolitan Univ.	Shintaro IMAFUKU, Satoshi UCHIDA and Fumiyoshi TOCHIKUBO	Dielectrophoretic devices are powerful equipment in bioscience and bioengineering, since the electrostatic force is dominant for behavior of bioparticles in micro space. Numerical simulation of dielectrophoresis in micro region is essential for further improvement of the devices. In the present work, we modeled the capture region of bacteria in dielectrophoretic microfilter and analyzed the behavior of single Escherichia coli numerically. If a flow rate is risen from 6.0 ml/h to 60 ml/h, the capture region reduced to 50% at a maximum. If voltage is risen from 5 V to 10 V, the capture region became 50% at a maximum. Therefore change of flow rate and voltage extremely the change in the capture region. The capture region is narrow on the right of electrode and large on outer edge of electrode. This result suggests that control of the operating parameter and adjustment of electrode configuration are effective for optimization design of microfilter.
18pC-6	Extraction of $\lambda$ DNA by Electro-blotting	Department of Ecological Engineering, Toyohashi University of Technology	Mai HASHIMOTO, Hachiro YASUDA, Hirofumi KURITA, Kazunori TAKASHIMA and Akira MIZUNO	Fundamental study on high speed detection of bio-particles (BPs) in air was carried out. Fine particles in air were sampled on a collection plate effectively using electrostatic precipitation. Collected particles were exposed to barrier discharge to destroy the cell and to obtain cell lysates. In situ electrophoresis in agarose gel and membrane filtering were examined to separate the DNA from the other substances in the lysates. Transferred DNA was stained with fluorescent dye for microscopic observation. In this experimental condition, majority of the DNA can be transferred through the thin agarose gel layer by using electro-blotting. From the experimental results, detection of bio-particles will be possible in the short time.

18pC-7	Investigation of Dielectrophoretic Effect for microorganism in chemical solvents	Tokyo Metropolitan Univ	○ Kunihiro SHIBATA, Satoshi UCHIDA and Fumiyoshi TOCHIKUBO	The development of new measurement system of drug-resistant strain of bacteria is essential for online manufacturing processes in food and chemical industries. In the present work, we proposed a dielectrophoretic method with fluorescence analysis to evaluate the distribution and concentration of bacteria in emulsion and investigated dielectrophoretic effect for bacteria with micro electrode array. The optimal frequency at maximum trapping speed and volume was 100 kHz in the case of a medium conductivity of 0.655 mS/m. Positive dielectrophoresis was attenuated remarkably with a decrease in Clausius-Mossotti factor below 10 kHz or above 3 MHz. In addition, the spatio-temporal distributions of trapping bacteria and suspension colloids in the emulsion were observed. These results suggest that the present method should be useful for quantitative estimation for bacteria in general chemical solvent.
18aB-1	Electrostatic regeneration of fluorocarbons for recycle or improvement of efficiency	*Asada Corporation ** National Institutes of Advanced Industrial Science and Technology ***Toyohashi University of Technology	○Makoto OHNO*, Taizo ONO** , Akira MIZUNO***	An experimental apparatus has been built for recycling fluorocarbons using electrostatic separation of contaminated oil mists. Oil mists are charged by tribo-charging, and separated using parallel electrode with dc electric field. The tribo-charging of the oil mists by the metal needle valve is about 50 times larger than that by Teflon tube. The results indicate that the apparatus can regenerate contaminated fluorocarbons nearly to their initial quality with the applied voltage of 600 V. With this regeneration, destruction of contaminated CFCs can be avoided in many cases, and efficiency of air conditioning system can be improved, resulting in reduction of CO2 emission.
18aB-2	Electrohydrodynamically-Assisted Electrostatic Precipitator for Collection of Low Resistive Diesel Particulates	* Department of Electrical and Electronics Engineering, Musashi Institute of Technology ** Road Systems Engineering Department, Fuji Electric Systems Co. Ltd.1 Fuji-machi, Hino City,	T. Yamamoto*, T. Abe*, T. Mimura*, Y. Ito*, N. Otsuka*, Y. Ehara*, and A. Zukeran**	
18aB-3	Observation of Plasma Generation on the Surface of Catalyst Using Microscope-Image Intensifier-CCD Camera	National Institute of Advanced Industrial Science and Technology (AIST)	○ Kunihiro SHIBATA, Satoshi UCHIDA and Fumiyoshi TOCHIKUBO	In this work, optical microscope-image intensifier-CCD camera system was used to observe the discharge plasma on the surface of catalyst. Various metals (Ag, Zr, Cu etc) were loaded on TiO2 and various zeolites with different loading amount. It was found that the shape of discharge plasma was greatly influenced by the presence of loaded metals on the surface of catalyst. For all catalysts tested in this work, the area of plasma expanded over wide range than the bare catalyst. The difference in the shape of discharge plasma was also found to be correlated to the performance of plasma-catalyst reactor for the decomposition of VOC.
18aB-4	Inactivation of E.coli using Ar /Ar+H2O Plasma Torch	Department of Ecological Engineering, Toyohashi University of Technology	Adrian MIHALCIOIU, Selma Mededovic THAGARD, Kazunori TAKASHIMA and Akira MIZUNO	Compact, energy efficient systems for ammonia generation at low temperature are needed for the next generation of SCR systems used for diesel exhaust treatment in mobile applications. A novel non-thermal plasma electrode transforming solid urea into ammonia can be used in instant on like SCR systems effective at engine startup low temperatures. A neon transformer is used to power the DBD reactor. Decomposition of dry and wet urea under dry and humid airflow is evaluated. Temperature on the electrode surface is correlated with ammonia production

18aB-5	Decomposition of Adsorbed Xylene on Adsorbent Using Nonthermal Plasma and Gas Circulation	*Osaka Prefecture University, **Musashi Institute of Technology	○ Tomoyuki KUROKI*, Kiyoyuki HIRAI*, Masaaki OKUBO* and Toshiaki YAMAMOTO**	The xylene decomposition system which consists of adsorption process by adsorbents and adsorbed xylene decomposition process using nonthermal plasma with gas circulation is investigated. The ac 60 Hz and 20 kHz high voltage power supplies are employed for nonthermal plasma generation. After xylene mixture which consists of o-, m- and p-xylene is adsorbed by adsorbent for 130 min, nonthermal plasma is generated in order to decompose adsorbed xylene with gas circulation. As a result, the conversion ratios of adsorbed xylene to CO and CO <sub>2</sub> ( $\eta$ CO <sub>x</sub> ) of 69 and 48% are obtained by ac 60 Hz plasma for 90 min and ac 20 kHz plasma for 75 min. Ac 20 kHz plasma is unstable and generates NO <sub>x</sub> as byproduct. From FTIR analysis of exhaust gas after treatment, it is clarified that N <sub>2</sub> O is generated by ac 60 Hz plasma
18aB-6	Characteristics of Ozone Generation and Toluene Decomposition for Negative Spread Corona Discharge	Oita university	Tomofumi Arita, Syuichi Akamine, Toshikazu Ohkubo	Various types of non-thermal atmospheric discharge plasma have been studied its applicability to air pollution control. DC positive streamer coronas are used for treatment of NO <sub>x</sub> and VOCs, while negative coronas are mainly used for particle charging but not for air pollution control usually. In this paper, effects of DC negative coronas on ozone generation and toluene decomposition are studied by using sharp discharging electrodes in needle-to-mesh electrode system. Especially, our main interests is on the effects of "negative spread corona discharge" on VOC abatement, which is widely spread negative corona extending from discharging electrode to plate electrode, named in our laboratory, The corona discharge characteristics, ozone generation and toluene decomposition characteristics of DC negative spread corona discharge are studied experimentally using plasma reactor combined with deodorizing catalyst.
18aB-7	Behavior of Toluene Adsorbed into Internal Micro-Space of Zeolite with Ozone – Studies of Chemical Species on Solid Surface by Infrared Spectroscopy	National Institute of Advanced Industrial Science and Technology (AIST)	Atsushi OGATA, Hiroshi IZUMI, Hyun-Ha KIM, Masami SUGASAWA, and Hisahiro EINAGA	The enhancement effect for toluene decomposition is greatly different by types of zeolites in the zeolite-hybrid plasma reactor. It has been already known that ozone played an important role in this effect. However, zeolites as an adsorbent do not have the ability of ozone decomposition into the formation of active oxygen species for toluene decomposition. In this work, we investigated the behavior of toluene molecule adsorbed on HY zeolite in the presence of ozone by an FT-IR method. It was found that toluene adsorbed on the zeolite decomposed into acids by ozone directly, whereas toluene in gas phase do not react at all with ozone at low temperature. Toluene adsorbed on zeolites is interacting with the solid surface and changing electron density in its skeleton, resulting in the decomposition of toluene by gas phase ozone easily.
18pB-1	Basic Study on Treatment of Indoor Air Pollutants by Microplasma (II)	Innovation and Joint Research Center, Shizuoka University	○Masaki KANAMORI , Marius BLAJAN , Kazuo SHIMIZU	Removal of formaldehyde by using microplasma is investigated. Microplasma is occurred with a pair of electrodes, covered with dielectric barrier, at a relatively low discharge voltage of around 1kV, and has an advantage of reducing the power and downsizing the entire plasma system. In this paper, electric characteristics and ozone generation are obtained. Related to this, the temperature effect by the microplasma electrode is investigated by a thermograph camera. In order to investigate the advantage of the microplasma electrode, removal of very low concentration formaldehyde with different air flow rates are carried out. For more observation, formaldehyde treatments with existence/inexistence of humidity are investigated by the HPLC, to obtain the effect of OH radicals in the plasma chemical reaction. With this microplasma electrode, formaldehyde could be purified with low discharge voltage and power, while ozone and NO <sub>x</sub> generation are near zero. In addition, byproduct analysis is confirmed by using the FT-IR. When there is no humidity in the flowing air, CO <sub>2</sub> , CO, and N <sub>2</sub> O are the major byproducts of the microplasma treatment. On the other hand, when there is humidity in the flowing air, the byproducts change to CO, N <sub>2</sub> O, and HCOOH

18pB-2	Improvement of Catalyst-Hybrid Plasma Reactors for VOC decomposition –For Best Combination with Ozone Decomposition Catalyst –	National Institute of Advanced Industrial Science and Technology (AIST)	Atsushi OGATA, Keiichi SAITO, Hyun-Ha KIM, Masami SUGASAWA, Hirofumi ARITANI, and Hisahiro EINAGA	The enhancement effect for toluene decomposition is greatly different by types of zeolites in the zeolite-hybrid plasma reactor. It has been already known that ozone played an important role in this effect. However, zeolites as an adsorbent do not have the ability of ozone decomposition into the formation of active oxygen species for toluene decomposition. In this work, we investigated the behavior of toluene molecule adsorbed on HY zeolite in the presence of ozone by an FT-IR method. It was found that toluene adsorbed on the zeolite decomposed into acids by ozone directly, whereas toluene in gas phase do not react at all with ozone at low temperature. Toluene adsorbed on zeolites is interacting with the solid surface and changing electron density in its skeleton, resulting in the decomposition of toluene by gas phase ozone easily.
18pB-3	Economical VOC removal using adsorption/thermal desorption and surface discharge	Musashi Institute of Technology	Yujiro Oishi, Yoshiyasu Ehara, Toshiaki Yamamoto	Volatile organic compounds (VOCs) in exhaust gas from various industries generated from painting and printing processes have focused attention for serious environmental problems. Therefore, VOCs must be removed before discharged into atmosphere. However, it is ineffective and not economical to treat a low concentration VOCs by the conventional technologies. For these reasons, gas treatment system combined with the gas concentration technique using thermal desorption was investigated. Toluene, which is one of the most frequently used VOCs, was used and the optimization of thermal desorption combined with surface discharge was investigated. 400ppm of toluene was concentrated more than 9,000ppm (more than 20 times) with the flow rate of 1/20, resulting in the compact plasma reactor.
19aA-1	Observation of Electrostatic Agglomeration in Liquid	Department of Electrical and Electronic Engineering, Oita University	Yoshinori KONDO, Shuichi AKAMINE, Seiji KANAZAWA	The process of the electrostatic agglomeration in liquid can be used in the separation of mixing liquid, fine particle production, and etc. In this study, the oppositely charged water droplets were created in oil phase using the DC atomization in the dripping mode and the behavior of the droplets with opposite charges was observed. The trajectory of charged water droplet under the influence of electrical forces was also visualized. As a result, it is found that the agglomeration between the initial droplets takes place at first stage and then another droplet plunges into the coagulated droplet, becoming larger droplets. Therefore, the volume of the droplet gradually increases and finally settles down onto the bottom of the reactor after the several times of the agglomeration.
19aA-2	Emission spectrum of honeycomb discharge	**Fakulta matematiky, fyziky a informatiky, Univerzita Komenskeho,	○Satoshi SATO*, Karol HENSEL**, Hiroki YAMAUCHI*, Kazunori TAKASHIMA* and Akira MIZUNO*	Selectivity and energy efficiency of plasma chemical processes can be improved significantly if plasma is combined with a catalyst. Generation of stable discharge plasma inside narrow capillaries of honeycomb catalyst for automobile exhaust after treatment, however, has been quite difficult. The paper presents a method to generate discharge inside honeycomb. The method uses a packed-bed discharge connected in series with honeycomb capillaries. With a DC voltage across the capillaries, streamers are extended from the packed-bed discharge into the capillaries. With this method, ionization can be made inside fine channels of honeycomb catalyst made of insulating materials. This discharge is designated as “honeycomb discharge”. Electrical and optical characteristics of the honeycomb discharge generated inside a bundle of quartz capillaries were measured. Effects of the applied voltage and power, diameter of the capillaries, and composition of the gas mixture passed through the capillaries on the emission spectra of the honeycomb discharge are presented.

19aA-3	Measurement of Emission Spectrum of N2 in Microplasma Discharge	Innovation and Joint Research Center, Shizuoka University	○Tatsuya ISHII, Marius BLAJAN, Kazuo SHIMIZU	Characteristics of microplasma i.e. effect of electric field, electron energy, generation of radicals are not well investigated compared to the other non thermal plasma, since it's study has been just begin. It is important to investigate such characteristics to obtain an efficient electrical discharge or improving the chemical reaction in the microplasma. In this paper, characteristics of atmospheric pressure microplasma, are investigated by optical emission spectroscopy (OES) method. Also electric characteristics such as discharge voltage, discharge current and discharge power are measured. An experimental Marx Generator with MOSFET switches is used to generate output voltages of up to -1.8kV, with a frequency of 1 kHz. The discharge power increases with the increase of the discharge voltage and with the increase of its frequency. Emission spectrum of microplasma discharge in N2 are observed by a spectrometer with ICCD camera. Emission from N2 second positive band was confirmed, and the emission spectrum was extinguished within 150 nanoseconds. By increasing the discharge voltage, increase of the emission intensity of N2
19aA-4	Channel Length and Luminous Area of Electrostatic Discharge Occurring between a Charged Particle Cloud and a Grounded Electrode.	Graduate School of Science and Engineering, Yamagata University	Masaaki ENDO, Kenji TOKI, Yoshio HIGASHIYAMA	To understand characteristics of electrostatic discharges occurring between a charged particle cloud and a grounded spherical electrode, the charged particle cloud was formed by powder particles. Negatively charged particles by pulsed corona discharge were ejected upward with angle of 45 degree. A divided spherical electrode with 105 mm diameter consisting of upper and lower electrode was set at the outside of the charged particle cloud. Discharge channel between the electrode and the charged cloud was taken by CCD video camera via an image intensifier, and discharge current was measured by a digital oscilloscope. The discharge channels contain a number of luminous branches. When the applied voltage to the corona charger was increased from 16 to 25 kV, the average length of discharge channel increased from 280 to 390 mm, respectively. The total luminous area consisting of discharge channels was increased with the applied voltage. The charge quantity neutralized by a single discharge event strongly related to the discharge luminous area.
19aA-5	Electrostatic Measurement of Atmospheric Air	Department of Ecological Engineering, Toyohashi University of Technology	Akira Mizuno	Using an electrode set on roof of a building, electrostatic measurement of atmospheric air has been made. The electrode is connected to an electro-meter through 10 m coaxial cable. Area of the electrode is 100 cm <sup>2</sup> , and supported by an insulator. This electrode serves as a capacitor, and the electrometer measures the voltage generated between the electrode and the ground. Time constant of the voltage measurement was about 3 h. The system measures sudden change of outside electric field. At the meantime, the system measures the voltage change due to the ionic flow from outside to the electrode. The measured data for about 1 month are shown in this paper.
19pA-1	Effect of flocking bands on insulation characteristics of polluted silicone rubber	Yamagata University	Toshiyuki Sugimoto	Effect of flocking bands on insulation characteristics of sea water polluted silicone rubber has been investigated experimentally. Silicone rubber (SiR) is hydrophobic material recently used for insulators of power delivery. Because its hydrophobic surface merely forms water conducting path, the water polluted SiR surface has withstand voltage higher than ceramic surface. However, partial or corona discharges often triggered from water droplets deformed by an electric field, it is important to suppress the water triggered discharge. This paper presents the effect of flocking band on SiR surface to suppress the water triggered discharge. Alternating hydrophilic band/hydrophobic band are made using an electrostatic flocking treatment. It was found that the flocking band effectively absorb water from the SiR bands, resulting in withstand voltage twice as much as virgin SiR.

19pA-2	Fundamental Processes of Corona Discharge –Surface analysis of traces stained with discharge on brass plate in negative corona–	Internatioal Graduate School of Arts and Sciences, Yokohama City Univerisity	Kanako Sekimoto and Mitsuo Takayama	The surface profile and chemical components of the trace stained with negative corona discharge on the brass plate have been analyzed with surface profiler and laser desorption/ionization mass spectrometry, respectively. The trace pattern was made up of several concentric circles and the pattern seemed to reflect the distribution of inhomogeneous electric field strength between point-to-plane electrodes. The surface profile of the trace showed a concave pattern like a crater. Abundant NO <sub>x</sub> <sup>-</sup> and their complexes with Cu were observed in the center region of the crater, while abundant carbon cluster ions C <sub>n</sub> <sup>-</sup> (n=2-10) and NO <sub>x</sub> <sup>-</sup> related ions were observed in the rim region of the crater. The results obtained indicated that NO <sub>x</sub> <sup>-</sup> ions were mainly produced on the field line arising from the needle tip apex with high electric field strength, while the periphery of the needle tip with lower field strength resulted in the carbon cluster ions.
19pA-3	Electric Tree Initiation in LDPE Nanocomposite of Al <sub>2</sub> O <sub>3</sub> Nano-particles and Metal Phthalocyanine	Faculty of Education, Chiba University	Yoshiaki Yamano and Masaaki Iizuka	Tree initiation voltages (TIVs) for LDPE nano-composites were studied under ac voltage application. The studied LDPE composites contained Al <sub>2</sub> O <sub>3</sub> nano-particles and metal phthalocyanine (M <sub>Pc</sub> ) with the concentration ranges of 1 – 5wt% and 0.5 – 3wt%, respec
19pA-4	Raman Measurement of the Main Molecular Density in Spark Ignited Hydrogen–Air Mixture	The University of Tokyo	Akihiro MAEKAWA, Ryo ONO and Tetsuji ODA	Hydrogen is ignited easily by electrical static discharge. The clarification of the ignition mechanism is important to prevent the ignition beforehand. Molecular behavior is thought to be very important in ignition process.The main molecules' behavior in spark ignited Hydrogen–Air mixture can be observed by using Raman spectroscopy. In this research, Raman measurement in spark ignited Hydrogen–Air mixture was performed for the first time in the world.
19pA-5	Electrostatic Charging of Human Body during Walking	Department of Ecological Engineering, Toyohashi University of Technology	Tamae Mizuno, Kazunori Takashima and Akira Mizuno	The voltage of human during walking due to electrostatic charging has been measured. A metal mesh electrode was set on ceiling of a room. When human is walking under the electrode, a voltage is induced to the electrode due to movement of charged human body. Change of charge of human body also induces voltage. The induced charge is dependent of material of shoes, as expected, and in average, the value is a few hundreds volt. The induced voltage may cause enhancement of attachment of suspended particles in air. It should be added that the monitoring method is simple, and can be used to monitor safety against electrostatic hazard and so on.
19aC-1	Generation and transportation mechanism of chemically active species for a post discharge flow in atmospheric air	*Tohoku Univ., **Tohoku Univ. (Presently, Isuzu Motors), ***Adtec Plasma Technology	Takehiko Sato, **Osamu Furuya, ***Takuya Urayama	A low-temperature argon plasma flow in atmospheric air has been investigated to clarify generation and transportation of chemically active species which result in inactivation of bacteria. The flow which has the ultra-weak emission as 10 <sup>-5</sup> – 10 <sup>-9</sup> times as emission from the quartz tube can be visualized using an optical analysis system realized by developing a reflection reduction box. The ArI, N <sub>2</sub> second positive system and OH were mainly observed by the spectrum analysis. The flow which is toward upstream around the nozzle is observed by profiles of temperature and velocity obtained using computational method. This implies that chemically active species which has inactivation effect are not mainly transported to bacteria by the flow since most of generated reactive species might be transported upstream by the flow.

19aC-2	Protein decomposition by pulsed discharge plasma in water	Dept. Chemical and Environmental Eng., Gunma University	Takayuki OHSHIMA, Taiki HIRINO, Yoshiyuki SHIBATA, Yuko HASEGAWA, and Masayuki SATO	A wastewater from home is one of the pollutants in our circumstance. These wastewaters consist of various organic compounds such as lipid, protein, and detergent, and these compounds should be decomposed in wastewater treatment. We have studied the generation of pulsed discharge plasma in water and some AOPs for wastewater treatment. In this study, we demonstrated the decomposition of soluble proteins by pulsed discharge plasma in water. Microbubbles generated by SPG (Shirasu Porous Glass) filter was introduced into the plasma reactor to facilitate the discharge plasma generation. When albumin (0.1 mg/mL) was used as the model protein, 90 % was achieved within the treatment time of 60 min with the applied voltage of 14 kV. We also tried to decompose milk protein with the same system. Although the significant decomposition of the proteins in non-diluted milk was not confirmed, apparent decomposition of milk proteins was observed by SDS-PAGE analysis after 250 times of dilution of sample milk. The applied voltage, which affected the frequency of plasma generation, was also influenced the decomposition ratio of milk proteins, and higher voltage resulted in the higher decomposition ratio. These results confirmed that the soluble protein could be decomposed by pulsed discharge plasma in water.
19aC-3	Basic study of Liquid purification of water at low voltage discharge ( II )	Innovation and Joint Research Center, Shizuoka University	OShuichi MURAMATSU, Tomonori SONODA, Marius BLAJAN, and Kazuo SHIMIZU	Effective use of water resource is required by a global increase in population and industrial development. Water treatment is experimentally investigated by using low voltage discharge below 10kV. Low voltage discharge in the water is suitable for practical application of water treatment, since its apparatus could be small, inexpensive, and has low power consumption. In order to apply voltage to the reactor, pulse circuit with spark gap is used. Decolorization of indigo carmine solution is carried out to investigate the feasibility of low voltage discharge in the water. Air and nitrogen is used as carrier gases to produce bubbles in the water. As a result, indigo carmine solution is decolorized, although the discharge voltage is less than 10kV. When air is used, treatment efficiency of indigo carmine is higher than that of using nitrogen.
19aC-4	The effect of spraying of water droplets and location of water droplets on the water treatment by pulsed discharge in air	Yamagata University	OTsutomu Kobayashi Taiki Handa Yasusi Minamitani Yousuke Tashima Taisuke Nose	We studied the effect of spraying of water droplets and location of water droplets into discharge area on water treatment by pulsed discharge in air. A solution of organic dye, indigo carmine, was used for sample. Time spending for decolorization of water droplets including indigo carmine was shorter than that into water flowing along the inner wall of a reactor. This result shows spraying as water droplets into the discharge in air has efficacy for faster treatment of water. The time spending for decolorization of water droplets including indigo carmine was fastest at the location near the cylindrical electrode of the reactor.
19pB-1	The Effect of Discharge Conditions on the OH-LIF Measurement in Atmospheric Pressure DC Streamer Coronas	Department of Electrical and Electronic Engineering, Oita University	Michihiko HIRAO	The LIF measurement of the hydroxyl (OH) radicals was performed in a nozzle-to-plate electrode system during the steady-state positive DC streamer coronas. First, the two-dimensional OH distribution in the DC corona discharge in N <sub>2</sub> /CO <sub>2</sub> mixture was observed. The ground-state OH radicals were generated and stayed mainly in the region of the streamer propagation. Next, the effects of the humidity and NO concentration in the reactor on the spatial distribution of OH radicals were investigated. It was found that OH-LIF signals increase with increasing the humidity under the stable discharge operation. While OH-LIF intensities decreases with increasing the amount of NO due to the OH radical consumption for the chemical reactions.

19pB-2	Basic Characteristics of Dielectric Barrier Discharge Using Anodic Porous Alumina as Barriers	Department of Electrical and Electronic Engineering, Nippon Bunri University	OToshiyuki Kawasaki, Takanori Kuriaki, Nobuyuki Takahama, Kazuhide Noguchi, Yu Jieming, Geng Siyuan and Lee Sunku	The dielectric barrier discharge (DBD) skillfully combined with (porous) ceramics and/or catalysts has been investigated as the technologies for gas control such as harmful gas treatment and high-efficiency ozone generation. In this study, the anodic porous alumina, which have many pores with nanometer-order diameter and high aspect ratio, has been focused as the barrier of a DBD reactor. The anodic porous alumina will significantly improve the DBD reactor. However, the influences of the anodic porous alumina on the discharge generation and gas phase reactions have not been systematically studied. In this paper, the plane-to-plane type multilayer DBD generation using the anodic porous alumina barriers was tested in atmospheric pressure air for future development. The basic NO <sub>x</sub> removal and generation characteristics in air were also studied, and compared with that of a typical DBD in order to clarify the influence of the anodic porous alumina on them.
19pB-3	Measurement of Metastable N <sub>2</sub> (A) in Atmospheric Pressure Pulsed Corona Discharge Using LIF	The University of Tokyo	Yoshiyuki Teramoto, Ryo Ono, and Tetsuji Oda	Relative density and spatial distribution of metastables are measured in pulsed positive corona discharge using LIF under atmospheric pressure. The vibrationally ground state is excited to , then the fluorescence from to is detected. The discharge occurs within a 12 mm point to plane gap in nitrogen. Spatial distribution of density shows that is mainly produced in the primary streamer channel, not in the secondary one. Decay rate of density after discharge near the point anode is faster than that in the rest of the discharge volume away from the point anode.
19pC-1	Metal Plating for Fluorocarbon Polymer Films Using Atmospheric-Pressure Nonthermal Plasma Graft Polymerization	* Osaka Prefecture University, ** Technology Research Institute of Osaka Prefecture	OMasaaki OKUBO *, Mitsuru TAHARA **, Tomoyuki KUROKI * and Toshitomo HIBINO *	A low-environmental load surface modification technique for plating the fluorocarbon polymers films is developed using an atmospheric-pressure argon and acrylic acid vapor nonthermal plasma graft polymerization. The results of the T-type peeling test show that the peeling strength of copper plating on the treated PTFE (polytetrafluoroethylene) film is approximately 46 times greater than that on the untreated film. With scanning electron microscope analysis of the surface of the copper plating on the treated PTFE, it is confirmed that the hydrophilic surface of the treated film contributes to uniform copper plating.
19pC-2	Development of Miniature Pulsed Power Generator for Microplasma Applications	Bioelectrics Research Center, Kumamoto University	Takahisa UENO, Takashi SAKUGAWA, Sunao KATSUKI and Hidenori AKIYAMA	Recently, the microplasma, which is small volume plasma, has been widely studied in the research fields of small manufacturing, chemical analysis, short wavelength light source and plasma function device. In this work, the miniaturized Marx generators have been developed as the microplasma generator. As the results, the breakdown phenomena of the bipolar junction transistor (BJT) have been used as the closing switch of the miniaturized Marx generator and the dual Marx generator, which has fast rise- and fall- time and variable pulse duration of the output voltage, has developed as the active control generator of the microplasma.
19pC-3	Film Thickness Measurement by Spectrometer of WO <sub>3</sub> thin film for Electrochromic Device	Oita University	Yuki Torii, Syuichi Akamine, Toshikazu Ohkubo	All-solid electrochromic (EC) devices which consist of transparent conductive film, electrochromic thin film, solid electrolyte thin film are prepared by Pulsed Laser Deposition (PLD) method in our laboratory. To make larger size of all-solid electrochromic device is a key point in the study. In this paper, to make larger size WO <sub>3</sub> thin film for EC device, the effects oxygen concentration and spacing between target and substrate on the film thickness are studied experimentally. The WO <sub>3</sub> film thickness and the transmittance are measured by Peak-valley method using spectrometer. As a result, wide uniform WO <sub>3</sub> electrochromic thin film can be obtained by optimizing oxygen pressure and spacing between target and substrate. The purity of raw oxygen gas to supply has also significant effects on WO <sub>3</sub> thin film preparation.

19aB-1	Regeneration of Adsorbent and NOx Reduction Using Nonthermal Plasma – Optimization of electrode figure–	* Department of Mechanical Engineering, Osaka Prefecture University, ** JST Innovation Plaza Osaka, Japan Science	Noboru NAKAJO * , Keiichiro YOSHIDA * * , B.S. Rajanikanth * * * , Masaaki OKUBO *	Comparison of performance among three types of nonthermal plasma reactors was carried out in order to realize diesel emission control system using nitrogen nonthermal plasma desorption. It was shown that helical wire = cylinder reactor have higher regeneration efficiency than the straight wire–cylinder reactor and pipe–cylinder reactor. It was clarified that the helical wire–cylinder reactor was the most effective reactor for regeneration of NO zeorite adsorbent of molecular sieve 13X.
19aB-2	NOx Reduction for Boiler Emission Using Pilot–Scale Plasma–Chemical Hybrid System	* Osaka Prefecture University, ** Takao Iron Works Co., Ltd., *** Musashi Institute of Technology, *** * Japan Science and Technology Agency, Innovation Plaza Osaka	OHidekatsu FUJISHIMA * , Tomoyuki KUROKI * , Keiichi OTSUKA * * , Atsumi TATSUMI * ,Toshiaki YAMAMOTO * * * , Keiichiro YOSHIDA * * * * and Masaaki OKUBO *	NOx removal from a smoke tube boiler flue gas was investigated using a commercial ozonizer for indirect NO oxidation and a Na2SO3 chemical scrubber. The flue gas flow rate was in the range of 410 ~ 1,480 Nm3/h, the gas temperature of 185 ~ 325 oC, and NOx concentration of around 40 ppm in city gas firing. Operational and performance data were obtained. The NOx removal efficiency was clearly dependent on the ORP, and increased inversely as the oxidation reduction potential (ORP) in the liquid decreased. To keep the specified NOx removal performance, it is essential to maintain the ORP properly by controlling additional Na2SO3 and NaOH solution injection, and to keep the ORP of less than 0 mV and the ORP change rate of less than 0 mV/min.
19aB-3	Study of NOx Removal Processes by Microplasma Generation	Innovation and Joint Research Center, Shizuoka University	Marius BLAJAN, Masaki KANAMORI, and Kazuo SHIMIZU	Microplasma discharge at relatively low voltages and very small discharge gaps is analyzed. The electrical characteristics of the microplasma electrodes and the small size of the supply circuit show that this technology can be applied for NOx removal processes especially for mobile exhaust gas sources. The effect of the discharge gas temperature and O2 amount in the gas composition are investigated. The electrode arrangement using a parallel connection allows the treatment of different gas composition at different flow rates. The experimental results show that with the increase of the discharge gas temperature the NOx removal efficiency increases for the gas composition without O2. At higher gas temperatures the energy efficiency of the NOx removal process is lower. By increasing the amount of O2 in the discharge gas the efficiency of the NOx removal process will decrease. Due to the destruction of O3 at higher temperatures with the increase of gas temperature the NO removal efficiency in the presence of O2 is decreasing and also fewer quantities of NO were oxidized to NO2. Higher NOx removal efficiencies were obtained at lower concentrations of NO and lower gas flow rates.
19aB-4	Change in number density of PM by the exposure to ozone	Department of Ecological Engineering, Toyohashi University of Technology	Hiroshi UMEMOTO, Kazunori TAKASHIMA and Akira MIZUNO	Particle matter (PM) can be removed from the diesel exhaust gas stream efficiently, by a diesel particulate filter (DPF). Removed particles from the gas stream can be oxidized at 600 degree C. However, heat stress occasionally breaks DPF, and low temperature oxidation below 200 degree C is preferable. In our previous research, ozone could oxidize simulated carbon particle at 200 degree C. However, oxidization of the small size PM that was not able to be removed effectively enough by DPF had not been evaluated. The purpose of this study is to evaluate oxidization of such particles by measuring the number density of PM affected when ozone is added to exhaust gas. Under no load condition of the diesel generator, the number density of PM in the exhaust was affected by the ozone addition. The number of PM smaller than 30nm decreased, and PM ranging from 30nm to 200nm in diameter increased. The result suggests that hydrocarbons, fine PMs and ozone play synergetic roles in generation of PMs with 30 – 200nm diameter.

19pD-1	The Oscillation Component on the Discharge Current of ESD from Charged Metal that Influences to its Radiation Noise	Department of Electrical Engineering, Tokyo University of Science	Kentaro Kawasaki, Takahiro Yoshida, Noriaki Masui	<p>In our previous study, it says that oscillation component after the first peak of the discharge current of ESD from charged metal causes radiation noise. In this study, we investigate characteristics and conditions of the oscillation component on the discharge current. The applied voltage to the metal electrode is varied from <math>\pm 2\text{kV}</math> to <math>\pm 10\text{kV}</math>. In addition, we also investigate the factor that influences this oscillation component.</p> <p>From experimental result, we found the followings:</p> <ol style="list-style-type: none"> <li>1) The oscillation component of the discharge current is relatively to the peak value of the 1-peak discharge current.</li> <li>2) There is no observation of the oscillation component on the 2-peaks discharge current.</li> <li>3) As the breakdown gap length is shorter, the amplitude of the oscillation component and maximum amplitude of the radiation noise is bigger.</li> </ol>
19pD-2	Control of Electrostatic charge by use of Explosion – Protected Static Eliminator in Powder Handling Process	Kasuga Denki INC, Japan national Institute of occupational safety and health	Teruo SUZUKI, Mizuki Yamaguma, Kwang-Seok CHOI	<p>Recently, the automated process and the improved productivity have been advanced in the powder handling processes. For example, large amounts of electrostatic charge generated by friction and/or collision within the pneumatic powder transportation pipe walls and devices accumulate on powders. As a result, electrostatic hazards and nuisances have become a large problem in the powder handling processes. From such a background, explosion – protected static eliminator and electrostatic field detecting system have developed, which can be used in the powder handling processes as a countermeasure against electrostatic. We examined the influence of the voltage waveform applying to the eliminator on the charge elimination performance for charged particles. When an AC voltage was applied to the eliminator, the elimination was insufficient, while a DC voltage charged the specimen to the opposite polarity. Therefore we tried that feedback control type static eliminator was evaluated with a real scale experimental facility for pneumatic powder transportation. As the experiment results, it was confirmed that the feedback control type electrostatic eliminator is effective for control the electrostatic charge of powder. Experimental details and results are presented in this paper.</p>
19pD-3	Effect of the shape of grounded electrode on the electrostatic discharge from charged human body (Part II)	Department of Electrical Engineering, Tokyo University of Science	Hiroshi YOSHIHARA , Takahiro YOSHIDA , Noriaki MASUI	<p>In this paper, the relationship between waveform of discharge current of ESD from the charged human body and the body potential is discussed. The shape of grounded metal in actual situation of ESD has many types. In this study, we research the effects of</p>
19pD-4	Effect of the Shape of the Outlet of Ventilation Duct for Controlling Ignition Hazard of Hydrogen due to the Static Electricity	Research Institute of Science for Safety and Sustainability	Tomohiko Imamura, Toshio Mogi, Yuji Wada and Yuji Ogata	<p>In order to prevent the ignition of hydrogen due to the static electricity at the outlet of ventilation duct, we investigated the effect of the shape of outlet of ventilation duct. Four kinds of outlets were designed; 1/4 inch pipe, 1/2 inch pipe, 1 inch pipe and tapered porous outlet. The total opening area of the tapered porous outlet is same as that of the 1/4 inch pipe. Iron(III) oxide was used as the model dust in the ventilation duct. We measured the voltage generated at the ventilation duct that the outlet was installed and that of the mixture which consisted of the spouted hydrogen, ambient air and iron oxide particles. It was confirmed that if the ventilation duct and outlet are grounded, there are little concern that the static electricity which has the enough energy to ignite hydrogen is generated at the ventilation duct and outlet. But it was also clarified that the voltage of the mixture cannot be reduced by only grounding the ventilati! on duct and outlet. However, it was confirmed that the voltage and energy of the mixture can be reduced by using the tapered porous outlet.</p>

19pD-5	Calculation of the energy of a spark discharge from an insulated conductor in an electric field	National Institute of Occupational Safety and Health	A. Ohsawa	This paper presents calculation methods of the potential of an insulated conductor in an electric field to evaluate the electrostatic ignition risk by a discharge may occur from it, in which they use Gauss's law or Thomson's theorem. In addition, the electrostatic energy of a gap between a grounded conductor and it corresponding to that of a spark discharge as well as the surface charge distribution and capacitance of it can be obtained from the result of its surface electric field distribution.
19pD-6	Investigation Results on the Causes of the Fire of the Transformer in the Power Station due to the Niigata Chuetsu Oki Earthquake	National Research Institute of Fire and Disaster	Hiroyuki TAMURA	The Niigata Chuetsu Oki Earthquake (M6.8) occurred on July 16, 2007. In Kashiwazaki-Kariwa Nuclear Power Station, a fire occurred at the House Transformer 3B of Unit No.3. We report the outline of a fire of the House Transformer and the causes of the fire. The main contents are as follows. At the House Transformer 3B, because the secondary connecting bus of the transformer was subsided against the foundation of the transformer, the secondary connecting bus ruptured. Then the bushing of the secondary side of the transformer ruptured, and the insulated oil leaked out the inside of the duct of the secondary connecting bus. And the duct contacted to the connecting terminals, arc discharge occurred between the duct of the connecting bus and the connecting terminals in the duct. The insulated oil leaked ignited by the heat of arc discharge.