

講演番号	title	affiliation	name	abstract
10aA-1	Emission Spectroscopy of Sliding Discharge inside Quartz Capillary Tubes at Atmospheric Pressure	*Department of Ecological Engineering, Toyohashi University of Technology **Faculty of Mathematics, Physics and Informatics, Comenius University	○Satoshi SATO*, Karol HENSEL**, Hiroki YAMAUCHI*, Kazunori TAKASHIMA* and Akira MIZUNO*	Selectivity and energy efficiency of plasma chemical processes can be significantly improved if plasma is combined with a catalyst. The generation of stable discharge plasma inside the narrow capillaries of automobile catalytic honeycomb is, however, quite difficult. The paper present a novel method, which utilizes the combination of packed-bed discharge, connected in series with the honeycomb capillaries. By the application of dc voltage across the capillaries, the packed-bed discharge can be extended inside the capillaries and form so-called sliding discharge. The paper presents electrical and optical characteristics of the sliding discharge generated inside a bundle of quartz capillaries. The effects of discharge voltage and power, gas mixture composition and capillary diameter on the emission spectra of the discharge are presented.
10aA-2	Characteristics of Negative Spread Corona Discharge in Needle-to-Plate Electrode System	Department of Electrical and Electronic Engineering, Oita University	○Hiroshi Muto, Toshiaki Kudo, Syuichi Akamine, Toshikazu Ohkubo	Nonthermal discharge induced plasmas are studied by using various discharges for air pollution control. We have been mainly studied by using DC positive streamer coronas for NOx treatment. However, negative corona are mainly used for particle charging but not for air pollution control because of narrow ionization region compared to positive streamer corona. In this paper, DC negative coronas are studied by using sharp discharging electrodes in needle-to-plate electrode system. We observed widely spread negative corona extending from discharging electrode to plate electrode, named "negative spread corona discharge". The corona discharge characteristics, morphology and ozone generation characteristics of DC negative spread corona discharge are studied compared to negative glow corona and positive streamer corona.
10aA-3	ICCD Camera Imaging of Microdischarges in Porous Ceramics	* Faculty of Mathematics, Physics and Informatics, Comenius University, Bratislava, Slovakia ** Laboratoire de Physique des Gaz et des Plasmas, Université Paris Sud, Orsay, France	○Karol HENSEL * and Pierre TARDIVEAU **	Imaging of microdischarges inside porous ceramics generated by ac high voltage by means of intensified CCD camera at various time scales and sensitivity was performed. The images of discharge light emission were synchronized with the signal of the applied voltage. The light emission of both microdischarges inside the ceramics and a barrier discharge on the surface was recorded. The difference between the microdischarges in 10 and 80 μm pore size ceramics was
10aA-4	Observation of Metastable N ₂ (A) in Atmospheric Pressure	The University of Tokyo	Chihiro Toubaru Ryo Ono Tetsuji Oda	It becomes severer these days to regulate the hazardous air pollutants, such as volatile organic compounds (VOC) and nitrogen oxide (NOx). Non-thermal plasma is a very effective method to decompose the pollutant gas. However, there are a lot of unknown factors for reaction process of non-thermal plasma. In this study, we focused on metastable which is an excitation state of nitrogen molecule. It is thought that has a significant influence on various reactions in non-thermal plasma. To study the dynamics of metastable, we observed in atmospheric pressure corona discharge using laser induced fluorescence (LIF).
10aA-5	Observation of Atmospheric Pressure Streamer Discharge Generated by Pulsed Power Supply Using a Semiconductor Switch	* Department of Electrical and Electronic Engineering, Oita University ** Institute of Fluid Flow Machinery, Polish Academy of Sciences	Seiji Kanazawa*, Shoichi Sato*, Yoshifumi Ohtsu* Marek Kocik**, Jerzy Mizeraczyk**,	The characteristics of pulsed corona streamers in air were investigated in the needle-to-plane electrode configuration with electrode gap of 10 mm. In the pulsed power circuit, MOS-FET switch was used as a semiconductor closing switch. Time resolved streamer images were recorded using an ICCD camera. As the pulsed corona discharge generated in this study was relatively modest in terms of the discharge power, the streamer features such as streamer number, diameter and branching were similar to the DC corona streamers. The averaged velocity of the streamer head propagation is about 0.3mm/ns, which is in agreement with our results for the DC corona
10pS-1		National Institute of Advanced Industrial Science and Technology	Koichi Mizuno	
10pB-1	Analysis of radical generation and transportation for dielectric barrier discharge in tube and its sterilization efficacy	○*Tohoku Univ., **Tohoku Univ. (Presently, Toshiba), ***Wavefront, ****Toyo Advanced Technologies	○*Takehiko Sato, **Osamu Furuya, ***Kei Ikeda, ****Tatsuyuki Nakatani	A dielectric barrier discharge (DBD) in a tube has been developed for catheter sterilization. We investigated sterilization efficacy against Geobacillus stearothermophilus in a polyvinyl chloride tube of 3 mm in diameter and 100 mm in length and radical generation and transportation mechanisms in the tube. For improvement of the performance of sterilization in a tube, we also analyzed the discharge processes such as electron avalanche and streamer propagation, and clarified the time evolution of the chemical species concentration and the spatial distribution of the electron number density and temperature.

10pB-2	Generation of a sliding discharge in honeycomb catalyst – Characteristics of the discharge in a bundle of glass capillaries–	Toyohashi University of Technology	OHiroki YAMAUCHI, Satoshi SATO, Kazunori TAKASHIMA, Akira MIZUNO	In order to improve catalytic activity at low temperatures, combination of plasma and catalyst is effective. A honeycomb discharge can be generated using a packed bed discharge at one side of a honeycomb, and a dc electrode at the other end. Basic characteristic of the honeycomb discharge has been examined using a bundle of glass capillaries in this study. Packed bed plasma reactor was connected to the bundle of fine glass capillaries. The bed was filled with 3 mm diameter pellets of gamma alumina, and ac voltage was applied to generate a packed bed discharge. With an adequate dc electric field along the capillary tubes, discharge was generated inside the capillaries. The onset and spark voltage were measured to obtain a stable operating condition.
10pB-3	Screening of Catalysts for the Decomposition of VOCs Using Cycled System	National Institute of Advanced Industrial Science and Technology (AIST)	OHyun-Ha Kim, Atsushi Ogata, and Shigeru Futamura	In this work, various catalysts were tested for the decomposition of VOCs using the cycled system. The potentials of the tested catalyst were evaluated based on the enhancement factor (EF) and adsorption capability. The tested catalysts include TiO ₂ , γ -Al ₂ O ₃ , zeolites and several types of metal catalysts (Pt, Pd, Ag, Au, Mn, W) with different loading amount. Although there is difference in degree of the enhancement, all catalysts tested in this study showed positive EF values. The oxygen content-dependence of VOC decomposition efficiency were not observed with the conventional thermal catalyst reaction and the nonthermal plasma alone.
10pB-4	Oxidation of xylene in air using TiO ₂ and metal loaded TiO ₂ under electron beam irradiation	Saitama Institute of Technology. *, Japan Atomic Energy Agency. **	OKanae MATSUMOTO*, Teruyuki HAKODA**, Koichi HIROTA**, and Tadashi NARITA*	Oxidation of xylene and its byproducts in air using TiO ₂ and metal loaded TiO ₂ were studied under electron beam (EB) irradiation for purification of ventilation gases exhausted from painting factories. EB irradiation experiments were performed mainly under two different conditions: One is the condition, where the layer of TiO ₂ and metal loaded TiO ₂ pellets were placed in an irradiation. The layer of TiO ₂ and metal loaded TiO ₂ pellets were placed in a non-irradiation space under the other condition. The results showed that xylene was decomposed and CO was formed in the gas phase of the irradiation space, while CO ₂ was produced in the gas phase of the irradiation space and on the surface of the TiO ₂ and metal loaded TiO ₂ pellets. The total concentration of CO ₂ became higher, when the pellet layer was in the vicinity of an irradiation space. Chemical reactions on the surface of the catalysts were also studied by comparing the concentrations of xylene and CO _x using the catalysts and non-catalyst pellets.
10pB-5	Decomposition of xylene in air by electron beam irradiation using γ -Al ₂ O ₃	*Japan Atomic Energy Agency, **Saitama Institute of Technology, ***Toyohashi University of Technology	:OTeruyuki HAKODA*, Kanae MATSUMOTO**, Akira MIZUMO*** and Koichi HIROTA*	Oxidation of xylene and its irradiation byproducts in air using γ -Al ₂ O ₃ pellets was studied under electron beam (EB) irradiation for purification of ventilation gases exhausted from painting factories. EB irradiation experiments were performed mainly under the two different conditions: Al ₂ O ₃ pellet layer was placed in an irradiation or a non-irradiation space. The results showed that CO was formed in the gas phase of the irradiation space regardless of the presence of the Al ₂ O ₃ pellets, while CO ₂ was produced both on the surface of those pellets and in the irradiation gas space. The total concentration of CO ₂ that was produced on the Al ₂ O ₃
10pB-6	Roles of Ozone and Catalyst in a Hybrid Plasma Reactor on Toluene Decomposition	National Institute of Advanced Industrial Science and Technology(AIST)*, Saitama institute of technology**, Kyushu University***	Keiichi Saito * , * * , Atsushi Ogata * , Hyun-Ha Kim * , Shigeru Futamura * , Hirofumi Aritani * * , and Einaga Hisahiro * * *	It was known that the decomposition efficiency of VOCs using a nonthermal plasma method was enhanced by combining with a catalyst in single stage, in which the catalyst was directly exposed to the plasma. In the single-stage reactor, not only the decomposition of VOCs but also the generation of ozone occurred. We investigated the roles of ozone and an ozonolysis catalyst in a single-stage method and a two-stage method, i.e., the catalysis followed by an ozone generator, on the decomposition of toluene. Actually, ozone assisted catalysis was observed on both the methods, although its contribution in the single-stage reactor was not so much in the total conversion of toluene. On the basis of energy efficiency and product-analysis, we concluded that the two-stage method was preferable to the single-stage method in this case.
10pB-7	Integral Decomposition of Trichloroethylene by the Nonthermal Plasma combined with Manganese-dioxide supported Alumina.	School of Engineering, The University of Tokyo	Hikaru KURAMOCHI Tetsuji ODA Ryo ONO	Dilute TCE(trichloroethylene) decomposition in a dielectric barrier discharge reactor combined with catalyst was investigated. Four types of the plasma process concerning with the catalyst were compared. In this experiment, the plasma process where the catalyst settled at the down flow of the reactor (named as Outer Catalyst in the paper) was suggested to be superior to Inner Catalyst process (catalyst in the plasma reactor) slightly. At the point of electric discharge power, Inner Catalyst process was inferior to Outer Catalyst process.

10aB-1	High Speed Neutralization utilizing of Photon Air Ionizer for LCD Manufacture	University of Industrial Technology	ORyuta YOSHINO , Kazuo OKANO	A soft X-ray air ionizer is widely used for static control in manufacturing process of electronic device such as LCD because of the contamination free. Unwanted residual space charge distributes above the charged substrate to recombine with wanted charge and reduce the static elimination speed in the eliminating process. The grounded grid located between the soft X ray source and the charged substrate was proposed to absorb the residual charge and increase the elimination speed. It was found that the grid play an important role to increase the static elimination speed. The distribution of the charged particle and the neutralizing current were
10aB-2	Sensing System for Measuring EMI generated from AC Corona Discharge Air Ionizer	University of Industrial Technology	OYuji TSUCHIYA , Kazuo OKANO	The corona discharge air ionizer is one of the most important equipment for controlling electrostatic charges in the manufacture of electronic circuits on printed-circuit boards (PCB). However, the electromagnetic interference (EMI) of the corona discharge air ionizer often can make brakedown in the semiconductor devices. The electric field sensor was designed, made, and evaluated for measuring the electric field distribution on the PCB. The uniformity of the electric field distribution on the PCB decreased with decreasing the distance between the air ionizer and
10aB-3	Static Elimination Characteristics of Soft X-ray Air Jet Ionizer with Control Grid	Ibaraki University 1, University of Industrial Technology 2	OMasafumi SAKUYAMA 1, Manabu TAKEUCHI 1, kyosuke TOKUHIRO 2, Kazuo OKANO 2	The A soft X-ray air ionizer is a promising candidate as a static eliminator used in a semiconductor manufacturing process because the ionizer generates ions without contaminations. However, ions have to be generated in the shielded region and be transported to the charged body. The particles charged in positive and negative would recombine each other in the transport process to reduce the density of the charged particle. As a result, the static eliminating speed decreases with increasing transport time. We propose the soft X-ray air jet ionizer with a control grid to increase the eliminating speed. The speed of the air ionizer was measured as a function of the operating condition such as the position of the control grid, the voltage applied to the control grid, and the airflow velocity. The eliminating speed of the soft X-ray air jet ionizer with the control grid was depended strongly upon the operating condition, and showed 8 times higher than that of the non-
10aB-4	An ion balance performance in the polarity change method	Midori Anzen Co., Ltd.	OTomonori TSUMORI, Naoki SUGITA	High performance of neutralization is required in the microelectronics industry. Especially in the ion balance performance the surface voltage is expected to keep the extremely low level. The comparison between the conventional AC or DC type of the ionizer and a novel type of ionizer which has been developed to improve the ion balance in space and time by using the polarity change system is discussed. The polarity of two pairs of the needle electrodes is changed in a certain period, so the dual charge are present in every moment, and high performance on the ion
10aB-5	Electrostatic nozzleless atomization in liquid-liquid phase	* Department of Chemical and Environment Engineering, Gunma University * * College of Indust., Nihon University	ONaomasa OHKUBO * , Takayuki OHSHIMA * , Masayuki SATO * , and Tomoo NAKANE * *	Recently, the fine particles are used in various application in the field of food industry, pharmaceutical industry, cosmetics industry, and printing industry. The electrostatic atomization has one of the promising protocol for the production of fine particles. Though the metal nozzle has been used essentially as the high-voltage electrode, we studied the electrostatic nozzleless atomization with membrane filter immersed in kerosene as the continuous phase. 30 wt% of water glass was fed through the membrane filter, and dispersed into the continuous phase. The production state of the particle was classified three regions depending on the applied voltage. The silica particle size was depended on the concentration of span80 used as the surfactant dissolved in the continuous phase. When span80 concentration was 2 wt%, fine submicron particles were produced successfully.
10pC-1	Shielding of Drifting Charged Droplets by Conducting Net for Compliance with Positive List System	Tottori Univ.	ORyo NISHIMURA, Katsumi NISHIMORI, Naganori ISHIHARA	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 drifting charged water droplets can be shielded by grounded wire netting. This means that the electrostatic pesticide spraying is effective to prevent drift hazard of pesticides as well as to decrease in the usage of pesticides.

10pC-2	Charging Mechanism of Coating Powders in Corona Charging Spray Gun	Department of Electrical and Electronic Engineering, Ibaraki University	OKen'ichi Kanai, Manabu Takeuchi	In order to study the charging mechanism of coating powders in a corona charging spray gun, charge to mass ratio Q/M was measured as a function of distance from a corona charging spray gun. The amount of free ions collected in a Faraday cage was also measured. An epoxy coating powder, the mean particle size of which was 16mm, was used in this study. The Q/M of the epoxy powder increased with an increase in distance from the corona charging spray gun. This result means that although the powder charges in the corona charging spray gun, but the Q/M of the powder increases further after leaving the spray gun. Acoustic air vibration was given into the space between the spray gun and the work to disturb the motion of free ions. The frequency of the vibration and the level were changed from 10Hz to 200Hz and from 76dB to 90dB, respectively. It was confirmed that the Q/M of powder was increased by the acoustic vibration of air.
10pC-3	A Discussion on Evaluation of Transfer Efficiency in the Atomized Electrostatic Powder Coating System	*1 Zao Electrostatic System Laboratory, *2 Top Industries, Co., *3 I. P. D., Inc., Mitsuru MATSUI*1, Takashi TAKAHASHI*2 and Tsutomu ITO*3	Mitsuru MATSUI*1, Takashi TAKAHASHI*2 and Tsutomu ITO*3	This paper describes a discussion on evaluation of the transfer efficiency in the atomized electrostatic powder coating (APC) system. For most of the conventional coating systems, the conveying air of 80 l/min has been recommended as an empirical standard value, because faster conveying air not only blows off the powder particles deposited on the surface of object, but also decreases the transfer efficiency. Usually, in actual coating lines, the transfer efficiency is evaluated using a simplified method, in which only two or three test pieces are coated. In such tests, the difference in the amount of powder deposited on the test pieces, being dependent on the testing conditions, is not obtained frequently due to wrap-around and fringe effect. In this paper, measurement of the coating thickness is proposed for testing the transfer efficiency. With an experimental investigation using the APC system, about 13% of the increase in coating thickness was derived, when the amount of the conveying air was increased from 80 l/min to 120
10pC-4	Analysis of pulsating electric signals generated in gas-solids pipe flow	Department of Chemical Engineering, Kyoto University	OShuji MATSUSAKA, Hiroshi. FUKUD, Yoshiro. SAKURA and Hiroaki MASUDA	In gas-solids pipe flow, particles are electrostatically charged as a result of repeated impacts on the inner walls. When a section of the pipe made of metal is electrically isolated and the charge leakage to the ground is monitored, pulsating electric signals are detected. In the present work, these signals have been studied both experimentally and theoretically. Micrometer-sized alumina particles were dispersed through an ejector and continuously transported in dilute phase. The pipes used were 6 mm in inner diameter, and a pre-charging pipe and detection pipes were installed in the particle transport system. The pulsating electric signals were found to vary in a wide range from positive to negative. The variation of the electric signals was attributed to two electrostatic phenomena, (i) the induced current caused by the transport of a cloud of charged particles, and (ii) the particle charging caused by repeated impacts on the inner wall. Based on
10pC-5	Preparation of All Solid Electrochromic Device by Pulsed Laser Deposition and its Application	Department of Electrical and Electronic Engineering, Oita University*, Toppan Forms Co., LTD.	OYuki Torii, Yoshihiro Kubo, Hiroki Tanaka, *Takaaki Bando, Syuichi Akamine, Toshikazu Ohkubo	All solid electrochromic device which consists of ITO, WO ₃ electrochromic thin film, solid electrolytes is investigated for the application of electrochromic display device. All solid Electrochromic display device has excellent characteristics such as memory effect, easy to read, no angle dependence, low power consumption. ITO, WO ₃ electrochromic thin film, solid electrolyte thin film LiMn ₂ O ₄ are prepared by pulsed laser deposition (PLD) method at room temperature as a function of Oxygen pressure. In this paper, both transmittances of Li _x WO _{3-x} electrochromic thin film and solid electrolyte thin film LiMn ₂ O ₄ and electrochromic effect of all solid chromic device are studied. For longer spacing between target and substrate, wide uniform thin film can be
10pC-6	Influence of Phthalocyanine Compound upon Tree Initiation in Epoxy Resin	Faculty of Education, Chiba University	OYoshiaki Yamano and Masaaki Iizuka	Tree initiation voltages were measured under ac voltage application using samples of epoxy resin added with additives. The additives used were five kinds of phthalocyanine and anthracene. Each of the five phthalocyanines has a different core metal molecule. The experiments revealed that the tree initiation voltage depends upon the kind of the core metal in phthalocyanine. The phthalocyanines with Ni, Mg and Cu are effective in an increase in the tree initiation voltages. The highest initiation voltage is obtained in phthalocyanine with Cu, which is about 2 times higher than that of the sample without additive. The initiation voltages are not significantly increased by the addition of the phthalocyanines with Fe and without core metal. Although, as shown in the previous study, an addition of anthracene in low density polyethylene is remarkably effective in the increase in tree initiation voltage, the addition in epoxy is not as effective as that in the polyethylene. It was

10pC-7	Investigation of Lighting damage for wind power generation	National Institute of Science and Technology Policy (NISTEP) Ministry of Education, Culture, Sports, Science and Technology (MEXT)	Kuniko URASHIMA	The global warming issued is getting serious problem and we must reduce CO2 emission. The renewable energy such as wind power is one of the candidate for solve this problem and many countries consider to introduce it. With the adoption of wind power generation equipment, Japan has also seen new forms of lightning damage. In the case of winter lightning on the Japan Sea side, one wind power turbine was struck by lightning 119 times in a single year. Other windmills reportedly have had lightning damage repair costs over five years that equalled their original construction costs. Creation of detailed diagrams of the relationship between lightning-prone areas and structures, re-examination of the economics of wind power generation, and research on
10aA-6	LIF Measurement of OH Radical Density and Temperature in Hydrogen-Air Mixture Spark	School of Engineering, The University of Tokyo	○Yuya SAITO, Akihiro MAEKAWA, Ryo ONO and Tetsuji	Two-dimensional distributions of OH density and temperature were measured in incipient hydrogen-air flame by using laser-induced fluorescence (LIF) spectroscopy in order to clarify the ignition process of hydrogen gas due to electrostatic discharge. The spark discharge was generated
10aA-7	Electrostatic neutralization of multilayer-loading silicon wafers by corona discharge ionizer	* Iwate University, * * Hitachi Kokusai Electric	○Takahiro OKUBO * , Masaru OTANI * , Kazunori TAKAHASHI * , Seiji MUKAIGAWA * , Koichi TAKAKI * , Tamiya FUJIWARA * , Takeshi ITO * *	An electrostatic neutralization of multilayer-loading silicon wafers is demonstrated using a corona discharge ionizer in nitrogen atmosphere. We observe a surface potential of the silicon wafer decreases from ±1kV to ±20V within three seconds. Moreover, it is clarified that the neutralization time is affected by the direction of the nitrogen gas flow.
10aA-8	Measurement of gas temperature and OH density in pulsed corona discharge	The University of Tokyo	○Ryo Ono, Tetsuji Oda	Gas temperature and density of OH radicals are measured using laser-induced predissociation fluorescence (LIPF) in H ₂ O(2.8%)/O ₂ (2.0%)/N ₂ pulsed positive corona discharge. The discharge occurs between a 13-mm gap point-to-plane gap with 24 to 32 kV applied voltage. In whole discharge volume except near the anode tip, gas temperature is 400 K at t = 10 us where t is postdischarge time. It increases after discharge and reaches 700 K at t = 100 us. On the other hand, near the anode tip, temperature is quite different. It is 600 K at t = 1 us, rapidly increasing to 1100 K by t = 20 us. Then it decreases to 800 K by t = 300 us. The high temperature near the anode tip causes OH production reactions after discharge, O + H ₂ O → OH + OH and H + O ₂ → OH + O. Therefore, the decay rate of OH density after discharge is much slower than that in the whole volume except near the anode tip. It is shown that OH radicals are mainly produced in secondary streamer. As a result, OH yield per discharge energy increases with discharge voltage. It
10aA-9	Fast Decay of Charge under High Humidity on the Adhesive Tapes which were charged on Peeling - Static Charge changes into a Water Ion and it goes out into Air -	Graduate School of Engineering, Nagoya Institute of Technology	○Yasuro HORI, Hitoshi HASEGAWA, Takuya HIRAO and Takeshi YAMAKAWA	When the charging behavior of adhesive tapes on peeling was investigated, the charges on the adhesive tapes were found to decay fast under high humidity while the charges on a polymer adherend did not decay under the same humidity. On the other hand under low humidity the charges on both of an adhesive tape and a polymer adherend have not decayed. In order to eliminate the contribution of chemicals with low molecular weight other than water and the electrical conduction, the surface charge decay of nylon-6 film on PTFE film has been measured under high humidity in which PTFE is an insulator and nylon-6 may adsorb a lot of water. In this condition, the surface charge on nylon-6 has decayed, and so it has been concluded that the static
10aA-10	Influence of Pulse Width of Pulsed Corona Discharge on Ozone Generation	School of Engineering, The University of Tokyo	○Kazuhiko TOYODA, Ryo ONO and Tetsuji ODA	In this study, the influence of pulse width of pulse corona discharge on ozone generation efficiency was examined. The pulse width of the discharge was changed by the value of the resistance connected in parallel to the discharge gap. It was shown that the ozone generation efficiency increased with decreasing the discharge pulse width.
10pA-1	Preliminary Experiment Related with Tiny Charge Electrostatic Discharge	School of Engineering, The University of Tokyo	Hiraru MIYASAKA Tetsuji ODA	Recent high performance electronic device requires small size causing the minimization of the operation energy. The tiny electrostatic discharge can easily induce misoperation device failure by that. Normal electrostatic discharge (ESD) needs high charge which is roughly equal with high voltage. On the other hand, low voltage ESD should be quite different from the high voltage. Very small voltage switching characteristics is examined as the simulation of that low voltage ESD. The mercury reed relay is used as the discharge device and tested voltage range is from 1.5V to 100V which is very low and ionization current occurs. The observed rising time of the current is 200ps which is the limit of the measuring system. The waveform is quite similar among the tested voltage

10pA-2	Electrification fog which arises in the fast collision of the water	Kanagawa Institute of Technology	○Hideyuki Motai, Hirofumi Simokawa	This study examined the electrification charge quantity of fog that a charged water droplet occurred in doing collision to an aluminum plate. The charge quantity of fog increased with the electric charge of water droplet in the low-induced voltage region. However, in the high-induced voltage region, the charge quantity of fog decreased with the charge of droplet. Fall velocity of water drop was calculated using the high speed camera. In the high-induced voltage side, the small water drop widely dispersed and fell. Then the fall velocity was slower than mean flow velocity in the nozzle. From there velocity, it is found that in the high voltage side, slow velocity small droplet collide with the plate. The momentum of droplet is absorbed in the layer of water, and electric charge of droplet scatters only small quantity, the electrification fog is considered that only a small
10pA-3	Charging of Adhesive Tapes on Peeling (2)	Graduate School of Engineering, Nagoya Institute of Technology	○Takeshi YAMAKAWA, Takuya HIRAO, Susumu OKUDA, Yasuro HORI	Charging behavior of adhesive tapes on peeling was investigated for various adherends. Five types of adhesive tapes were used including 1 acrylic type, 2 silicone rubber type and 2 UV polymerization adhesives, and as adherends 11 different polymers, three metals and a silicon wafer were used. The charge amount of acrylic type and silicone rubber type adhesives has been correlated to the tribo-electric series of adherends. The charge of adhesive tapes on peeling was plus at the minus end of tribo-electric series of adherends as PTFE, and minus at PMMA which is plus end in tribo-electric series. On the other hand the charge of UV polymerization adhesive on peeling is plus for almost all adherends without NY and Metals.
10pA-4	Spray Charging Properties for Metallic Paint Spray		○Shirahata NORIYUKI	Polarity and size distribution in spray charging for metallic paint spray have been investigated experimentally. The metallic paint contained aluminum flakes with a thickness of approximately 30nm in organic solvent. The paint was sprayed by a commercial spray gun with a rate of 10mg/s. The sprayed particles were supplied into a deflection field to separate and collect positive and negative particles. The particles include both positively ones and negatively ones due to the spray charging, where the positive ones exist twice as much as negative one. More than half of negative particles have a diameter less than 2mm, which is significantly smaller than positive one. The size dependence of charged particle can affect the potential of non conductive target because large positive particles can deposit more than small negative particles.
10pA-5	Experimental study of electrification in oil flow through metal channels under the condition of velocity change with time	* The Graduate School of Natural Science and Technology, Okayama University	○Satoshi TAKAHASHI *, Shouxin ZHU *, Seiichi WASHIO *, Tomoki TAZATO *	This present paper deals with basic investigation of flow phenomena in mineral oil flows through metal channels with periodical and transient changes of velocities. The sample oil was kept still in a reservoir and was suddenly or gradually let flow. The current detected from the metal wall rose to a peak value at the beginning of flow, then exponentially decreased until it leveled off with time, approaching a constant value. The smaller the acceleration of velocity was, the smaller the peak value of current was. A pulsating oil flow was let pass through a metal mesh. The current detected from the metal mesh while the flow was pulsating was larger than the one when the same flow rate was steadily provided, and decreased as the frequency of pulsation increased. The delay time of the current behind the pulsating flow rate approached to a constant value as the pulsation
10pA-6	Humidity dependency of Contact Charging of Glass	Faculty of Science & Technology, Tokyo University of Science	○Takanori OYAMA, Yuji MURATA, and Yusuke KUDO	Contact charging and photoemission of various glass samples are measured. It was found that all glass samples had clear differences in charging characteristics. Moreover, it was found that charging characteristics of sample glass depends on humidity. There was a correlation between characteristics of photoemission and electrification.
10pA-7	Gleibüschel of approaching discharges do discharge all of the charges on the electrified surface.	Tokyo University of Agriculture and Technology	○Kaori ISHIKAWA, Yasunori OHKUMA and Yuzo TAKAHASHI	When a grounded object approaches an electrified insulating surface, discharges occur between the object and the surface. The Gleibüschel (large surface discharge) of this "approaching discharge" spreads all over the surface. The measured result shows that the magnitude of Gleibüschel (calculated from the discharge pulse) is same with the magnitude of surface charge of the sheet. It means the magnitude of Gleibüschel becomes very large as the area of electrified surface increases. In industrial practice or on a thermal blanket of solar cell equipped on a spacecraft, the dimension of electrified is measured by m or m ² : the approaching Gleibüschel will be very large. The energy of a Gleibüschel measured in this surface experiment is as large as 600mJ. Therefore the approaching Gleibüschel is very dangerous, and one must take in account that the magnitude of charge released by the Gleibüschel is same as the charge of all electrified surface. In this paper, the reason is explained, why the

11aB-1	Toluene removal by combining discharge plasma and oil film	Toyohashi University of Technology	Okei SUZUMURA, Kenshiro KAWABATA, Kazunori TAKASHIMA,	Recently, removal of Volatile Organic Compounds (VOCs) has been of great concern. Utilization of discharge plasma is one of the novel and effective methods. It is necessary to improve energy efficiency for practical use. In this study, the removal of toluene was studied using a dc corona
11aB-2	Basic Study on Treatment of Indoor Air Pollutants by Microplasma	Innovation and Joint Research Center, Shizuoka University	Masaki KANAMORI and Kazuo SHIMIZU	Microplasma is generated in atmospheric pressure at about 1 kV, since its discharge gap is in an order of micro-meters. Electrical characteristics such as, discharge voltage, current, and power are obtained. Ozone generation with dry air is experimentally investigated. Formaldehyde, which is a major cause of sick-building syndrome, is treated by using microplasma effectively and byproduct analysis is also carried out.
11aB-3	Gas phase toluene decomposition by pulsed plasma and zeolite particle bed	Department of Chemical and Environmental Engineering, Gunma University	Daisuke CHIGIRA	Volatile organic compounds (VOCs) cause health hazard, for instance, sick-house syndrome, carcinogenic and nerve paralyzing, and air or water pollution. Therefore, various studies have been performed about the decomposition of VOC. It has been known that VOC can be decomposed by discharge plasma. We tried the decomposition of toluene that is one of the VOC. In this study, a new system of nonthermal reactor with zeolite particles used as the adsorbent was studied to remove and decompose toluene in gas phase. The reactor was consisted of high-voltage multi-needle electrode and metal mesh, as earth electrode and electrode gap was 22 mm. Pulsed high voltage (23 kV) was applied to the multi-needle electrode. The reactor was packed with zeolite particles, which has an ability to adsorb toluene. 90 % of gaseous toluene was decomposed continuously when bed height was 2.0 mm and 300 ppm toluene gas flow rate was 0.4 L/min.
11aB-4	NOx Treatment Characteristics of Silent Discharge Reactor Using Anodic Porous Alumina as Barriers	Department of Electrical and Electronic Engineering, Nippon Bunri University	Toshiyuki Kawasaki	The simultaneous treatment of gaseous pollutants and suspended particle matter exhausted from a diesel engine is one of the most serious problems in our living environment. Non-thermal plasma skillfully combined with porous ceramics or/and catalysts is very attractive for the simultaneous treatment. In this study, the anodic porous alumina has been focused as the material using together with the non-thermal plasma reactor for gas treatment. In his time, NOx treatment characteristics of the plate-plate type silent discharge reactor were studied using the anodic porous alumina as barriers. The anodic porous alumina barriers with the thickness of about 150mm were prepared on the Al substrate in 1.0M sulfuric acid at 10°C for 5 hours under the constant voltage of 24V. Two anodic porous alumina barriers were faced at the gap length of 1.16mm, and 1kHz high voltage was applied using the Al substrate as electrodes. The treatment gas was NO (200ppm)/dry air at
11aB-5	NOx Aftertreatment System for Diesel Engine Emission Using Thermal Desorption and Plasma Reduction Combined Process	osaka jst plaza	Keiichiro Yoshida	A NOx aftertreatment system which uses adsorption, thermal desorption, and NOx reduction by nonthermal plasma is applied to a real stationary diesel engine. The NOx is first removed by adsorption, then the adsorbent is regenerated by thermal desorption using waste heat of the exhaust gas. In the regeneration process, hot exhaust gas passes through the heat exchangers surrounded by the adsorbent pellets. The desorbed NOx is subsequently reduced to N2 by nitrogen nonthermal plasma. This system continuously reduces more than 60% of 240 ~ 290 ppm NOx emitted by the generator for 55 hours. It shows an excellent overall energy efficiency of 154
11aB-6	Study of NOx removal by low discharge voltage by using atmospheric micro	Innovation and Joint Research Center, Shizuoka University	Takeki Sugiyama, Kazuo Shimizu	Removal of nitrogen oxides by using micro plasma is investigated which is occurred with a pair of electrodes covered with dielectric barrier. In this paper, characteristics of micro plasma, such as the discharge voltages and the discharge power, which is obtained with the help of Lissajous
11aS-1		National Institute of Advanced Industrial Science and Technology	Masayoshi Takahashi	
11pB-1	NOx Reduction for Boiler Emission Using the Second Prototype Pilot-Scale Plasma-Chemical Hybrid System	* Osaka Prefecture University, * * Japan Science and Technology Agency, Innovation Plaza Osaka, * * * Takao Iron Works Co.,Ltd., * * * * Musashi Institute of Technology	O Tomoyuki KUROKI * , Hidekatsu FUJISHIMA * * , Keiichi OTSUKA * * * , Tomohiro ITO * Masaaki OKUBO * , Toshiaki YAMAMOTO * * * * and Keiichiro YOSHIDA * *	NOx removal from an actual boiler flue gas is investigated using an indirect plasma and chemical hybrid system comprising a commercial ozonizer and an Na2SO3 chemical scrubber. A high NOx removal efficiency in the continuous operation of a commercial-scale apparatus is achieved by controlling pH and oxidation reduction potential (ORP) and injecting additional Na2SO3 and NaOH aqueous solutions into the scrubber sump when required. Ozone injection is demonstrated to be extremely effective for NO oxidation. The relation between the ORP and NOx removal efficiency, which is essential for the optimal operation of this system, is obtained.

11pB-2	Generation of sliding discharge on an insulator surface	Department of Ecological Engineering, Toyohashi University of Technology	Mitsuyoshi Kimura, Satoshi Sato, Kazunori Takashima, and Akira	Since particulate matter (PM) in diesel engine exhaust have caused serious air pollution, control of their emission is an urgent problem. Electrostatic precipitator is one of the potential alternatives because it can remove nano to micro-meter size particles effectively with very low pressure drop.
11pB-3	Electrical Discharge in Supercritical Carbon Dioxide and its Application to Chemical Reaction	Graduate School of Science and Engineering, Tokyo Institute of Technology	Hidetoshi SEKIGUCHI and Sayaka HORIUCHI	The purposes of the research are to study the electrical discharge phenomenon in supercritical carbon dioxide by measuring the breakdown voltage and to investigate the possibility of the plasma chemical reaction in the medium. The experimental data of the breakdown voltage at various temperatures and pressures for pure carbon dioxide were settled on a smooth curve from the vapor phase to the supercritical phase, suggesting that the breakdown voltage depended on the bulk density of carbon dioxide. When 1-octene was introduced into the reactor, the breakdown voltage increases at lower pressure as compared with that in pure carbon dioxide. However pressuring the mixture resulted in the disappearance of the difference of breakdown voltage. The formation of solvation was considered to cause the disappearance.
11pB-4	Oxidation of Carbon Double Bond Using Atmospheric Pressure Non-equilibrium Plasma Jet Generated with Low Frequency Plasma Power Supply	Graduate School of Science and Engineering, Tokyo Institute of Technology	Hidetoshi SEKIGUCHI and Yoshinori SUGA	Oxidation of 1-decene having a carbon double bond was studied using a non-equilibrium plasma jet at atmospheric pressure. The plasma jet was generated with a low frequency (LF) power source below a frequency of 10kHz to compare the previous results using a radio frequency (RF) power source. The experimental results showed that 1-nonanal was most produced among oxidation products and its production closely related to ozone concentration in the jet, suggesting that ozone oxidized the carbon double bond by different reaction mechanism as compared with the oxidation with RF plasma jet where oxygen atom was a key species. The comparative experiments were further carried out using styrene and the results confirmed that the different oxidation mechanisms predominantly proceeded for LF and RF plasma jets similarly to the oxidation of 1-
11pB-5	Reaction Analysis for Steam Reforming of Aliphatic Hydrocarbons with Nonthermal Plasma Using Energy	National Institute of Advanced Industrial Science and Technology (AIST)	OMasami SUGASAWA, Tomoyuki TERASAWA, Shigeru FUTAMURA	Steam reforming of methane (CH ₄), propane (C ₃ H ₈) and neopentane (C ₅ H ₁₂) was performed with a ferroelectric packed-bed reactor (FPR). Effects of temperature and water content on the steam reforming were investigated comprehensively in terms of energy efficiencies for the decomposition of the substrates and production of H ₂ , CO and CO ₂ . Consequently, it has been found that the almost same compositions of synthesis gases can be formed irrespective of water content and temperature in the reforming of C ₃ H ₈ .
11pB-6	Plasma enhanced ammonia production at low temperature from solid urea	Toyohashi University of Technology	OHiroki YAMAUCHI, Yoshihiro IITSUKA, Kazunori TAKASHIMA,	Urea reforming to ammonia in low temperature using discharge plasma was studied for the NO _x selective catalytic reduction of diesel engine exhaust. In this study, a packed bed discharge was used, and results showed that ammonia generation was enhanced significantly by discharge plasma
11aC-1	Fundamental Investigation on the Transportation Model of Single Microorganism for	Tokyo Metropolitan Univ.	Shintaro IMAFUKU, Satoshi UCHIDA, Fumiyoshi	Dielectrophoretic devices are powerful equipment in bioscience and bioengineering, since the electrostatic force is dominant for behavior of bioparticles in micro space. However, the kinetic relationship between many bioparticles is extremely complicated because electric and fluid fields
11aC-2	Cultivation profiles and PEF inactivation of blue-green algae Microcystis aeruginosa	Department of Chemical and Environmental Engineering, Gunma University	Shingo ISHIDA	Water-bloom in the hydrosphere has become a problem, which generates some toxic and odorant materials. Water-bloom is an outbreak of algae, and Microcystis aeruginosa is one of the major algae in it. In this study, we cultivated M. aeruginosa under various temperature conditions, and PEF inactivation of M. aeruginosa cell was studied. The efficiency of PEF treatment was depended on the applied voltage, and 10kV or more PEF treatment was effective to inactivate M. aeruginosa. 90% of M. aeruginosa cells could be inactivated within 30 min of PEF treatment. During inactivation, color change of M. aeruginosa suspension, green, white, and yellow, was recognized.
11aC-3	Cell Destruction by Dielectric Barrier Discharge for Real-time Monitoring of Bio-particles	Toyohashi University of Technology	Mai HASHIMOTO, Masudur RAHMAN, Masakazu TANINO, Michihiko NAKANO, Hachiro YASUDA, 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 20 sec, E-coli and other cells can be destroyed. 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. From the experimental results, detection of bio-particles will be possible within 10 min. by

11aC-4	Electrostatic Elimination for Small Particles in Cutting Oil	* Department of Electrical Engineering, Nara National College of Technology, * * Sanwa Daiya Kouhan Cooperation	OHaruhisa FUJII * , Hiromi KITANI * and Masatoyo MATSUDA * *	Electrostatic elimination experiments for small dust particles in cutting oil were carried out in order to suppress the environmental pollution due to used cutting oil. Used oil including small conductive dust particles was circulated through an electrostatic elimination part which was consisted of ten bar electrodes covered with non-woven paper. Elimination efficiency wasevaluated as a parameters of the flow rate of oil, the applied voltage on the bar electrodes and the application
11pC-1	Study of Pulsed Power Source using Semiconductor Switches for Microplasma Applications	Innovation and Joint Research Center, Shizuoka Univercity	OTatsuya ISHII, Kazuo SHIMIZU	Non-thermal plasma is obtained by pulsed power discharge in atmospheric pressure. In the case of atmospheric microplasma, the discharge voltage can be adjusted to about 1 kV,since its discharge gap is in an order of micro-meters. This paper describes the development of pulsed power source for microplasma by Marx generator using semiconductor switches. An experimental Marx generator provides discharge voltage of -1.1 kV and duration period of 520 ns.
11pC-2	Basic study of sterilization technique at low discharge voltage by using Microplasma	Innovation and Joint Research Center, Shizuoka University	Masahiro YAMADA and Kazuo SHIMIZU	Sterilization of microorganism such as Escherichia coli is experimentally investigated by using microplasma. Microplasma is expected for practical application for sterilization, since its discharge voltage is low. In this study, Escherichia coli HB101 is used as the target to be sterilized. From the series of experimental, decrease in the amount of germs is effectively obtained after microplasma treatment. In addition, the effect of sterilization increases as the discharge voltage increases.
11pC-3	Improvement of Efficiency of Water Treatment Using Pulsed Power Discharge in Bubbling-up Water	Yamagata University	OTaichi Sugai,Ayato Suzuki,Yasusi Minamitani,Yoshio Higashiyama	Water pollution is one of the global environmental issues at present. We are studying water treatment using pulsed power discharge in water and air mixture. In this paper, water in a pulsed discharge reactor was injected with airflow to bubble with air. Decolorization time of indigo carmine by treatment in bubbling-up water is 5.3 times faster than that of non bubbling-up water. As the airflow for bubbling-up increased, the decolorization time decreased. Likewise, as length of the electrode on water increased, the decolorization time decreased. These results show that more discharge space in air makes the decolonization time decrease in the water treatment.
11pC-4	Basic study of Liquid purification of water at Low Voltage Discharge	Innovation and Joint Research Center, Shizuoka University	OTomonori SONODA and Kazuo SHIMIZU	Efficient use of water resources is necessary for development of industry and world population growth. In particular, degradation of volatile and toxic organic compounds (e.g. trihalomethane, trichlorethylene) and removal of protozoa (e.g. cryptosporidium) in water is demanded. Discharge in liquids are able to produce ultra violet ray, high electric field, shock waves, ozone, free radical, which could decompose such molecules and materials and sterilize microorganisms. In order to investigate degradation capability of organic compounds using low voltage discharge, experiments on decolorization of indigo carmine solution are carried out. As a result, indigo carmine solution is decolorized at less than discharge voltage of 2kV.
11pC-5	Electrostatic regeneration of fluorocarbons for recycle or improvement of efficiency	* Nagoya Institute of Technology * * Asada Corporation * * * National Institutes of Advanced Industrial Science and Technology * * * * Toyohashi University of Technology	OMakoto OHNO * , * * Taizo ONO * , * * * Akira MIZUNO * * *	An experimental apparatus was build 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 results have proved that the apparatus could regenerate contaminated fluorocarbons nearly to their initial quality. With this regeneration, destruction of contaminated CFCs can be avoided in many cases, and efficiency of air conditioning system will be improved, resulting in reduction of CO2 emission.
11pC-6	Adhesion Improvement Technology of Fluoropolymer Film Using Atmospheric-pressure Plasma Graft-Polymerization	ODepartment of Mechanical Eng. Osaka Prefecture University * , Technology Research Institute of Osaka Prefecture * * , Pearl Kogyo Co., Ltd. * * * , Department of Electrical and Electronic Eng. Musashi Institute of Technology, Tokyo * * * *	OToshitomo HIBINO * , Masaaki OKUBO * , Mitsuru TAHARA * * , Noboru SAEKI * * * , Tomoyuki KUROKI * and Toshiaki YAMAMOTO * * * *	Flexible thin solid films made of fluorocarbon polymers such as PTFE, PFA and PCTFE have excellent properties on flexibility, gas and moisture barriers, etc. Many electrical devise applications on such as multi-layer flexible electric circuit and flexible displays with long life are possible if the adhesion property can be improved. We developed a surface modification technique of the films for adhesion using atmospheric-pressure nonthermal plasma application followed by the graft-polymerization of hydrophilic monomer. It was confirmed that the transparent hydrophilic layer whose thickness is an order of 100 nm are created on the film surface. Results of T-type peeling test shows that peeling strength is thirty times larger than that for untreated one. The SEM picture shows very smooth and flat surface. It is confirmed from the XPS surface analysis that few F atoms exist on the surface and hydrophilic layer is confirmed due to the grafting.

11aA-1	Influence of Surface Tension on Negative Corona Onset Voltage from a Fine water Droplet	Yamagata University	OYuya Ohnishi, Yoshio Higashiyama	Corona discharge phenomenon was investigated from a water droplet located at a tip of grounded rod electrode facing to a ring electrode where positive high voltage was applied. De-ionized water and surface-active agent aqueous solution were used as a water droplet. Viscosity and surface tension of water was varied with water temperature or existence of surface-active agent. Corona onset voltage for de-ionized water droplet with temperature from 2 to 80 degrees and that for surface-active agent were obtained. Corona onset voltage was hardly affected by temperature of water droplet, although the value of surface tension varied considerably. Corona onset voltage was decreased drastically with surface-active agent due to decrease of surface tension. Negative corona discharge from a water droplet has a unique waveform. A water droplet located at the rod electrode forms a water cone periodically. As a result, negative corona discharge with trains of Trichel-like pulse occurred after formation of a cone jet. Water temperature affected the internal
11aA-2	Influence of a Induced Current on Electrostatic Discharge Occurring toward a Charged Particle Cloud	Graduated School of Science and Engineering, Yamagata University	OKenji Toki, Shin-ichi Migita and Yoshio Higashiyama	Electrostatic discharge occurring between a large-scale charged particle cloud and a grounded spherical electrode was investigated. The charged particle cloud was formed by the cloud generators consisting of a blower and corona charger. Powder particles with diameters ranging
11aA-3	Measurements of Contact Potential Difference and TSC in Styrene-Acrylic Polymer Powder		Akihiro Suzuki, Manabu Takeuchi	Tribocharging mechanism of a styrene-acrylic polymer powder with ferrite carriers was studied by measuring the contact potential differences and TSCs. Several kinds of ferrite carriers with various contact potential differences were used in this study. The tribocharges Q/M of polymer powder were approximately proportional to the contact potential difference between the polymer and the ferrite carrier. TSC measurements showed that charge carriers were mainly trapped at shallow levels of the styrene-acrylic polymer when the contact potential difference was large, and that charged at whole levels when the contact potential difference was small.
11aA-4	A Study on discharge current and radiation noise of ESD from charged metal using	Department of Electrical Engineering, Tokyo University of Science	Takahiro YOSHIDA , Atsushi SUMIDA, Noriaki MASUI	In this study, we measure the discharge current and the radiation noise of electrostatic discharge from charged metal synchronously to investigate the characteristics of the noise of the ESD. We discuss the partial distributions of the radiation noise
11aA-5	Dependence of the electrostatic discharge occurred between metals on the applied voltage	Department of Electrical Engineering, Tokyo University of Science	OAtsushi SUMIDA, Takahiro YOSHIDA and Noriaki MASUI	In the electrostatic discharge between metals which closes to each other at constant speed, gap length of discharge inception is widely distributed even in the constant applied voltage. When the metals close to each other at the constant speed, the volume of the discharge space decreases with the time. Time-lag of spark is generated, since the volume of discharge space decreases and the probability of existence of initial electron in the gap decreases. It seems to widely distribute the gap length of discharge inception, when the spark delay arises. The gap and metal electrode were irradiated by the ultraviolet ray in order to sufficiently generate the initial electron, and the characteristics of discharge were investigated in the condition without time-lag of spark. Most discharge was generated in the high electrical field over 100kV/cm, when ultraviolet ray was not irradiated. Discharge is generated in the electric field from about 40kV/cm to 60kV/cm, when
11pD-1	Electrification of a Human Body and Tools from Cleaning Work in an Oil Storage Tank	National Research Institute of Fire and Disaster *、Yokohama City Safety Management Bureau * *	OHiroyuki TAMURA *、Masayuki KURIHARA * *	While seven workers were cleaning to eliminate sludge in an oil storage tank with floating roof, a fire occurred and five workers out of them died. It is thought one of the fire causes is fire ignition by electrostatic discharge. We investigated into the potential risk of electrostatic discharge. Taking up some works which are likely to cause electrostatic electrification during the works in the tank, we measured the surface potential of a human body or tools, and verified the potential risk of electrostatic discharge. We carried out operations which simulated the cleaning works in the tank. The surface electric potential of a human body and clothes at that time were measured. The surface electric potential did not rise greatly only by work operations. The metal tool with resin coating has a high possibility to be charged with electricity in a resin part. There was a possibility that high electric potential appeared in a metal part by this electrification and an electric discharge was generated. Moreover this electric discharge energy can exceed the minimum ignition energy of
11pD-2	Measurement of ignition energies and explosive limits for organic solvent vapors, featuring temperature characteristics	National Institute of Occupational Safety and Health	Mizuki YAMAGUMA	Ignition energies and explosive limits for 15 solvent vapors, as well as the effectiveness of water vapor as an inert gas, were measured using a newly-developed temperature-adjustable ignition test apparatus. For all the solvent vapors the minimum ignition energies increased exponentially and explosive limits expanded as the test temperature increased. Acetone vapor, among others, depended strongly on temperature — the MIE at 25 C was less than one third that at 100 C. The difference of two explosive limits, the limit by an electrostatic spark and by an ac spark, was greater for a vapor with a wider explosive limit. Acetone vapor was effectively inactivated when the water vapor concentration was 30 % or more at 100 C. At 50 C, however, no significant effect

11pD-3	Application of an assessment method of static ignition risk by a charged cloud in grounded vessels to a jet washing machine with ultra-high water pressures	National Institute of Occupational Safety and Health	Atsushi Ohsawa	This paper presents required conditions of space charge density and wall electric field to prevent an incendiary brush discharge between a protrusion on a vessel wall and a charged cloud in vessels grounded and an assessment method of electrostatic ignition risks based on the prevention conditions. The method is applied to a jet washing machine with ultra-high water pressures up to 84 MPa.
11pD-4	Performance of Flange-Type Explosion Protection Electrostatic Neutralizer	Kasuga Denki INC *, Japan national Institute of occupational safety and health**	Teruo SUZUKI*, Tomofumi MOGAMI*, Mizuki Yamaguma**, Kwang-Seok CHOI**	In order to avoid electrostatic discharges produced from charged powder in industrial process, a flange-type of high-voltage neutralizer was previously proposed. The flange-type neutralizer performed quite well in general in laboratory tests of a full-size pneumatic powder transporting facility. With regard to practical use, a pressurized type of the neutralizer, which was added a function of explosion protection, was developed. In this current study, we evaluated the current version of pressurized type of the neutralizer through real industrial situation tests. As the results, we confirmed that the pressurized type of neutralizer is markedly effective for reducing electrostatic charges from polymer materials as well as, it can be used in explosive atmosphere.
11pD-5	Development of ion conveying type ionization system — Generation of large charged	* Technical R&D Center, Techno Ryowa Ltd. * * Dept. of Ecological Engineering, Toyohashi University of	○Masanori SUZUKI * , Takashi MATSUDA * , Hideaki	We have conducted the development of ionization system conveying ions through tubes, in order to control static electricity in narrow space such as space in ULSI and LCD manufacturing equipments. In previous paper, we reported the results of evaluation in terms of the influence of