

# 研究論文抄録

# 研究論文抄録

## 物質生命理工学科

川崎兼司・尾崎義治：「貫通気孔を有するジルコニアバルーンの合成」Journal of the Ceramic Society of Japan Vol.114, No3, pp.265-271, 2006.3

Zirconia balloon with pores through the crust was synthesized by dispersing polystyrene added  $Zr(OC_4H_9)_4$  benzene solution to formamide. Zirconia balloon precursor was formed in F/B/F (formamide / benzene / formamide) emulsion. As benzene was extracted to formamide from the F/B/F droplets, polystyrene and  $Zr(OC_4H_9)_4$  phase separation occurred, and the F/B/F droplets solidified. In the balloon precursor crust polystyrene spheres dispersed in a  $Zr(OC_4H_9)_4$  matrix. The crust thickness was about  $2\mu m$ . The diameter of the polystyrene spheres was almost the same as the crust thickness. The spheres were removed with extraction by benzene. Spherical pores which were left in the crust opened only to the inner surface of the crust. The spherical pores were opened to the outer surface of the crust by etching the precursor balloons with hydrochloric acid. On heat-treatment at 1300 the precursor balloons after hydrochloric acid treatment were transformed to zirconia balloons with pores through the crust. The size distribution of heat-treated balloons was in the range between  $1\mu m$  and  $35\mu m$  with a mean value of about  $10\mu m$  in diameter.

川崎兼司・尾崎義治：「金属アルコキシドからの多孔質ジルコニア膜の合成」成蹊大学理工学研究報告Vol.42, No2, pp.1-5, 2005.12

Porous zirconia films were prepared from Zr-tetra-n-butoxide and Ca-di-etoxyde mixed benzene solutions. The mixed solutions were dropped on formamide and spread in the shape of a film on the formamide surface. Zr-tetra-

n-butoxide and Ca-di-etoxyde deposited with removal of benzene from the mixed solution and formed porous zirconia film precursors. In this process formamide penetrated in the mixed benzene solution and formed open pores in the pass. The pore shape was controlled by the quantity of the benzene in formamide and the mixed ratio of Ca-di-etoxyde in benzene solution. The precursor film had an asymmetrical structure, and had dense surface layer on one side and porous layer on the other side. After heat-treatment at 500 the precursor films were transformed to porous zirconia films. The film structure was well preserved after heat treatment.

A. Katoh, H. Kudo and R. Saito : "Allosteric Binding of Alkali Metal Ions to a Pseudo-cryptand Formed by a C-pivot Tripodal Ligand Containing 3-Hydroxy-2(1H)-pyridinone and Ga(III)", Heterocycles, Vol. 66, pp.285-297, 2005.12

邦文題目：3-ヒドロキシ-2(1H)-ピリジノンとガリウムイオンを含むC-軸三方向性配位子により形成された擬クリプタンドへのアルカリ金属イオンのアロステリック結合

A novel C-pivot tripodal hexadentate ligand (3,2-HOPOHL) composed of 3-hydroxy-2(1H)-pyridinone as a bidentate ligand, the ethyleneoxy chain as a spacer, and tris(carboxylic acid) as an anchor was synthesized. 3,2-HOPOHL recognized only  $Na^+$  ion, suggesting that it pre-organized a cavity due to the electrostatic interaction among the 2(1H)-pyridinone rings. UV-VIS spectroscopic analysis indicated that 3,2-HOPOHL formed a stable intramolecular 1:1 Fe(III) complex in aqueous solution. The stability constant (log K) of 3,2-HOPOHL-Fe(III) complex was estimated to be 27.6 from the competitive reaction with EDTA.  $^1H$ -NMR titration of

3,2-HOPOHL-Ga(III) complex with Na<sup>+</sup> and K<sup>+</sup> ions in CDCl<sub>3</sub>-CD<sub>3</sub>CN indicated the formation of 1:1 complexes. The binding constants of Na<sup>+</sup> and K<sup>+</sup>-3,2-HOPOHL-Ga(III) complexes were estimated to be 3.3×10<sup>3</sup> and 7.8×10<sup>3</sup> M<sup>-1</sup>, respectively, the ion selectivity of K<sup>+</sup> toward Na<sup>+</sup> being more than two-fold.

M. Yamaguchi, K. Wakasugi, R. Saito, Y. Adachi, Y. Yoshikawa, H. Sakurai and A. Katoh : "Synthesis of Vanadyl and Zinc(II) Complexes of 1-Hydroxy-4,5,6-substituted 2(1H)-pyrimidinones and Their Insulin-mimetic Activities", *J. Inorg. Biochem.*, Vol. 100, pp. 260-269, 2006.1

邦文題目 : 1-ヒドロキシ-4,5,6-置換-2(1H)-ピリミジノン類のパナジル及びジンク錯体の合成とそれらのインスリン様活性

Control of the glucose level in the blood plasma has been achieved *in vitro* and *in vivo* by administration of vanadium and zinc in form of inorganic salts. It has been shown that elements are poorly absorbed in their inorganic forms and required high doses which have been associated with undesirable side effects. Many researchers, therefore, have focused on metal complexes that were prepared from VOSO<sub>4</sub> or ZnSO<sub>4</sub> and low-molecular-weight bidentate ligands. Seven kinds of 1-hydroxy-4,6-disubstituted and 1-hydroxy-4,5,6-trisubstituted-2(1H)-pyrimidinones were synthesized by reaction of N-benzyloxyurea and  $\beta$ -diketones and subsequent removal of the protecting group. Six kinds of 1-hydroxy-4-(substituted)amino-2(1H)-pyrimidinones were synthesized by the substitution reaction of 1-benzyloxy-4-(1',2',4'-triazol-1'-yl)-2(1H)-pyrimidinone with various alkyl amines or amino acids. Treatment with VOSO<sub>4</sub> and ZnSO<sub>4</sub> or Zn(OAc)<sub>2</sub> afforded vanadyl(IV) and zinc(II) complexes which were characterized by means of <sup>1</sup>H-NMR, IR, EPR, and UV-Vis spectroscopies, and combustion analysis. The *in vitro* insulin-mimetic activity of these complexes was evaluated from 50% inhibitory concentrations (IC<sub>50</sub>) on free fatty acid (FFA) release from isolated rat adipocytes treated with epinephrine.

Vanadyl complexes of 4,6-disubstituted-2(1H)-pyrimidinones showed higher insulin-mimetic activities than those of 4,5,6-trisubstituted ones. On the other hand, Zn(II) complexes showed lower insulin-mimetic activities than VOSO<sub>4</sub> and ZnSO<sub>4</sub> as positive controls. It was found that the balance of the hydrophilicity and/or hydrophobicity is important for higher insulin-mimetic activity. The *in vivo* insulin-mimetic activity was evaluated with streptozotocin (STZ)-induced diabetic rats. Blood glucose levels were lowered from hyperglycemic to normal levels after the treatment with bis(1,2-dihydro-4,6-dimethyl-2-oxo-1-pyrimidinolato)oxovanadium(IV) by daily intraperitoneal injections. The improvement in glucose tolerance was also confirmed by an oral glucose tolerance test.

S. Aoyagi and M. Kudo : "Evaluation of Proteins Immobilized on Glass Substrates of Biosensor with TOF-SIMS", *Journal of Surface Analysis, JSA*, Vol.12 No.2, 2005.10

邦文題目 : TOF-SIMSによるバイオセンサのガラス基板上に固定化したタンパク質の評価

Time-of-flight secondary ion mass spectrometry (TOF-SIMS) is capable of chemically visualizing proteins on insulated samples. Measurement of protein distribution on material surfaces is indispensable for the development of high performance biosensors. In this study, an immobilized probe protein, protein A immobilized on a glass plate, and that of a sample protein, immunoglobulin G (IgG) in solution, reacting with protein A on the biosensor surface were measured by means of TOF-SIMS. Each protein immobilized on the glass plate were measured with TOF-SIMS to obtain reference spectra for data analysis using mutual information, calculated as subtraction of a posteriori information entropy from a priori information entropy indicates specific secondary ion peaks related to a certain protein in spectra. Fragment ions specific to protein A and IgG, respectively, were selected to obtain the TOF-SIMS image of the proteins.

N. Saikia, S. Kato and T. Kojima : “Thermogravimetric investigation on the chloride binding behaviour of MK-lime paste”, *Thermochimica Acta*, 444(2006), pp.16-25, 2006.2

邦文題目：メタカオリン・石灰ペースト中での塩素の結合挙動に関する熱重量解析

The hydration products of 2.5, 5 and 10% Cl<sup>-</sup> containing metakaolin (MK)-lime pastes are compared with the same obtained from MK-lime paste to understand the chloride binding behaviour of MK during the hydration of cement. Results indicate that 2.5% Cl<sup>-</sup> addition into the MK-lime paste initially enhances the formation of Friedel's salt (Ca<sub>2</sub>Al(OH)<sub>6</sub>Cl·2H<sub>2</sub>O), but Friedel's salt decomposes at later stages due to the formation of stratlingite (C<sub>2</sub>ASH<sub>8</sub>). In 5 and 10% chloride containing pastes, Friedel's salt is observed throughout the reaction periods along with the high amount of CSH. Small amount of stratlingite is also formed on or after 60 day hydration of 5% Cl<sup>-</sup> containing MK-lime pastes. On the other hand, MK-lime-10% Cl<sup>-</sup> containing pastes show the complete absence of stratlingite and C<sub>4</sub>AH<sub>13</sub> through out the hydration period, which are the major hydration products of MK-lime paste. Measurements of pH of the simulated pore fluids help to understand the decomposition behaviour of Friedel's salt. From the experimental results, chloride binding mechanism of MK-lime paste is also discussed.

N. Saikia, S. Kato and T. Kojima : “Composition and Leaching Behaviours of Combustion Residues”, *Fuel*, 85(2006), pp.264-271, 2006.1

邦文題目：燃焼・焼却残さの組成と溶出挙動

Combustion residues generated from different incineration processes create major environmental problems because these materials contain high amounts of toxic substances. In this communication, we report leaching behaviours of three residues along with their mineralogical compositions. Column leaching experiments at two different pH values were conducted to study the leaching behaviours. Leachants were analyzed to determine the pH, the concentrations of

some toxic elements like Pb, Cr, As, Cd, Se, B, Mo and the volume of leachants passing through the columns. Raw and some treated residues were also characterized by XRD and SEM-EPMA techniques. We found that the concentrations of some toxic elements present in the residues as well as in the leachant fractions collected at different time intervals after leaching were very high. The amounts of soluble salts and toxic elements in the municipal solid waste incinerator (MSWI) ash were higher than those in the other two residues. The order of alkalinities of the three residues was: fly ash (FA)>MSWI ash>sewage sludge ash (SS ash). The final pH of the leachant was related to the volume of leachant passing through the column. Some leachant properties were related to the mineralogical compositions of the residues and to the secondary minerals formed during the leaching period.

T. Hirukawa, N. Asaka, H. Hamano, K. Yamada and T. Kojima : “A Modeling Methodology of Large Scale Water Balance and Salt Accumulation for Afforestation in Arid Land”, *J. Arid Land Studies*, 15(4), pp.247-250, 2006.3

邦文題目：乾燥地植林のための大規模水バランス・塩類集積のモデル化手法

As a countermeasure against global warming, large scale afforestation of arid land has been done by fixing atmospheric CO<sub>2</sub> into plants. In arid land, however most of the rainwater is lost by runoff and evaporation. Effective use of rainwater is required for afforestation. Thus, we made an original runoff model to evaluate water distribution in a research area. In this study, we report the effect of a concentration factor rate of water gathering into creeks determined from DEM (Digital Elevation Model) data. There was a difference of 11.7 % in the numerically computed values for the fraction of the runoff water with and without consideration of the concentration factor. The model including the factor showed reasonable results when compared to an empirically recognized value. Using this model, we investigated a selection of suitable afforestation

places and verified its influence on the water balance.

H. Hamano, N. Saito, T. Kojima, S. Kato, M. Saito, A. Kinnear and K. Yamada: "Death of Trees in the Wheat Belt Western Australia: Identification of the Causes by Chemical Analysis of Soil", *J. Arid Land Studies*, 15(4), pp.231-234, 2006.3

邦文題目：西豪州小麦地帯での樹木枯れ死：土壌の化学分析による原因特定

Establishment of techniques for carbon dioxide (CO<sub>2</sub>) fixation through afforestation have been previously described. Land used for large scale afforestation for carbon sequestration should not compete with agricultural and high productivity areas. Recently, agroforestry has been suggested as a countermeasure for problems caused by salinity or waterlogging. The aim of our research is to determine the optimum method of afforestation for land rehabilitation and the best mix between crops and planting in semi-arid landscapes. Our research area at Nielsen Farm in Western Australia has areas containing both live and dead trees. In this study, we aimed to understand the causes of tree death on this farm. Salinity problems were identified from the results of chemical analysis of soil and plant. However, there were also large seasonal fluctuations in groundwater levels. It was shown that at Nielsen farm, salinity and waterlogging problems occur simultaneously.

S. Kawarasaki, S. Kaneoya, H. Tanouchi, H. Hamano, T. Kojima and K. Yamada: "Effect of temperature and light on germination of 12 afforested trees in South Western Australia", *J. Arid Land Studies*, 15(4), pp.235-238, 2006.3

邦文題目：南西オーストラリアにおける12植樹樹種の発芽に及ぼす温度と光の影響

Germination traits (FGR: final germination rate and  $T_{1/2}$ : half of time to reach final germination) of twelve afforested trees in South Western Australia, where salinity and water logging are reported, were examined. Almost all of them could germinate better at lower temperature.  $T_{1/2}$  became shorter but FGR was not increased under

existence of light.

E. Komaki, Y. Umezawa, S. Kato, H. Hamano and T. Kojima: "Quantitative Evaluation of Soil Improvement by Using Leaves of *Eucalyptus Camaldulensis* as a Soil Conditioner", *J. Arid Land Studies*, 15(4), pp.279-282, 2006.3

邦文題目：ユーカリの葉の混入による土壌改良効果の定量的評価

It is said that the aggregate structure of the soil has high water permeability and water retention capacity, and also it has high soil fertility. In this study, the soil improvement in the arid and semi-arid land is assumed. Because *Eucalyptus camaldulensis* (E.C.) is a native species in the arid land, its leaf was used as a material to be mixed with the black soil for aggregate formation. To investigate the effect of the mixed fraction of leaves, temperature, and water content on the aggregate formation, samples kept under various conditions were prepared. The time variations of the water permeability, water retention capacity and size distribution of aggregate were measured for 20 months. The aggregate rate was increased with time. And, the water permeability of this sample was improved, and the water retention capacity declined with increase in the aggregate rate. The  $d^2$  of the samples with various soil water contents, temperatures and its mixture fractions were measured after 6 months curing. However,  $d^2$  of the samples was hardly changed. It has been found that the size distribution of aggregate greatly influences the soil physical properties.

小島紀徳・鈴木 亨・金子昌弘・加藤 茂・劉 皓・上宮成之：「加圧流動層を用いた石炭チャーのCO<sub>2</sub>ガス化速度の測定」*化学工学論文集*, 31(6), pp.466-469, 2005.11

A batch small-scale fluidized bed was placed in a pressure vessel to measure CO<sub>2</sub> gasification rate of coal char under almost same conditions as in the entrained bed coal gasifiers under development in Japan. This apparatus allowed the rate to be measured under various conditions of

CO<sub>2</sub> concentration, temperature up to 1773 K and pressure up to 0.8 MPa for char produced at high heating rate, without cooling of the produced char. The rate increased with increased total pressure at constant CO<sub>2</sub> concentration as well as with increased concentration at constant total pressure. Thus the gasification rate at a given temperature and its time variation of the char from the coal used in the present study were affected only by the partial pressure of CO<sub>2</sub>, regardless of the total pressure and CO<sub>2</sub> concentration.

J. Fujimoto, T. Ishikawa, M. Jimbo, T. Kaneko, T. Kon, Y. Kurihara, M. Kuroda and Y. Shimizu : “New results from GRACE/SUSY at 1-loop”, Nucl. Phys. Proc. Suppl., Vol.157, pp. 157-161, 2006.3

邦文題目 : 1ループ自動計算GRACE/SUSYの最新結果

We discuss the physical importance of the 1-loop correction for several supersymmetric processes. The on-shell renormalization scheme in the framework of the MSSM is adopted and 1-loop amplitudes are full-automatically calculated with GRACE system. The system GRACE/SUSY is checked by the independence on the nonlinear gauge parameters.

N. Sasaki, A. Toyoda, H. Saitoh, N. Itamura, M. Ohyama and K. Miura : “Theoretical Simulation of Atomic-Scale Peeling of Single-Walled Carbon Nanotube from Graphite Surface”, e-J. Surf. Sci. Nanotech. 4, pp. 133-137, 2006.1

邦文題目 : 単層カーボンナノチューブのグラファイト表面からの原子スケール引き剥がしの理論シミュレーション

We performed the following molecular mechanics simulation of atomic-scale peeling of carbon nanotube (CNT) from the graphite substrate surface. We have first obtained the theoretical “peeling force curve” of the CNT, where CNT physically adsorbed on the graphite substrate surface is gradually peeled. In the simulation the single-walled carbon nanotube (SW-CNT) of the (3,3) armchair type with a length of 40.3Å comprised of 198 carbon atoms is used. It is clarified that the peeling force curve shows a charac-

teristic behavior which exhibits the change of shape of CNT during the peeling process, which can be understood by the conflicts(競合) between van der Waals interaction energy and bending energy of CNT. This simulation shows an elementary process of the peeling for much more longer CNT.

K. Takizawa and Y. Yokota : “High accuracy and high sensitivity measurements of the electrooptic effect in undoped and MgO-doped LiNbO<sub>3</sub> crystals”, Opt. Rev., Vol. 13, No. 3, pp.161-167, 2006.5

邦文題目 : ノンドープおよびMgOドープLiNbO<sub>3</sub>結晶の電気光学効果の高精度・高感度測定

Composite electro-optic coefficients  $r_c$  consisting of the unclamped electro-optic coefficients  $r_{13}$ ,  $r_{33}$  and the piezoelectric  $d$ -constant  $d_{31}$  in undoped and MgO-doped congruent LiNbO<sub>3</sub> were measured with sufficient precision by extracting the fundamental and third harmonic components from photo-detection signals of the parallel Nicol optics including the LiNbO<sub>3</sub> crystal driven by very small sinusoidal voltage. The analysis of relationship between multiple-reflection rays in the electro-optic crystal and the measuring accuracy indicates that anti-reflection films must be coated on the end faces of the crystal for high-accuracy measurements. Measured values of  $r_c$  of undoped and MgO-doped congruent LiNbO<sub>3</sub> crystals at a wavelength of 632.8 nm were  $19.8 \pm 0.1$  pm/V and  $19.2 \pm 0.1$  pm/V, respectively.

K. Takizawa : “Three-dimensional large screen display using polymer-dispersed liquid crystal light valves and a Schlieren optical system: proposal and basic experiments”, Opt. Rev., Vol. 13, No. 1, pp.1-7, 2006.1

邦文題目 : 高分子分散型液晶空間光変調素子とシュリーレン光学系を組み合わせた3次元大画面ディスプレイの提案と基礎実験

A novel stereoscopic projection display used with polarized glasses is proposed. It consists of polymer-dispersed liquid crystal light valves that modulate the projected light based on light scattering, a polarization beam splitter, and a Schlieren projection system. The light valve con-

sists of a quarter-wave plate, a polymer-dispersed liquid crystal layer and a thin film transistor array. The features of the display include a three-dimensional image display with a single projector, half the size and half the power consumption of a conventional three-dimensional projector. Measured electrooptic characteristics of a polymer-dispersed liquid crystal cell with a thickness of 10- $\mu\text{m}$  inserted between crossed and parallel Nicol optical system suggests that the proposed display system has performances such as small cross talk and high-extinction ratio.

K. Takizawa : "Analysis of three-dimensional large screen display using polymer-dispersed liquid crystal light valves and a Schlieren optical system", Opt. Rev. Vol.13, No.1, pp.8-13, 2006.1

邦文題目 : 高分子分散型液晶空間光変調素子およびシュリーレン光学系を用いた3次元大画面ディスプレイの解析

The performance of a novel three-dimensional image projector with polarized eyeglasses is analyzed that consists of polymer-dispersed liquid-crystal light valves and a Schlieren optical system. The light valve consists of a quarter-wave plate, a polymer-dispersed liquid crystal layer and a thin film transistor array. Fundamental characteristics such as the cross-talk and the extinction-ratio of the novel stereoscopic projection display have been calculated by means of Mueller matrices. Quantitative analyses show that the proposed display achieves small cross-talk of less than 1% and sufficient extinction ratio almost the same as the light valve.

H. Fujikake, H. Sato and K. Takizawa : "Voltage-Controlled Optical Filters Using Liquid Crystal for Image Sensing", Photonics in Broadcasting Technology 2005, pp. 113-142, 2006.2

邦文題目 : TV画像処理用液晶光フィルタ

Two types of electrically-controlled optical filter using liquid crystal (LC) for video image sensing have been described. The first device is an LC polarizing filter that reduces undesirable light reflected from a window panel or watery surface.

More than 80% of reflected light is removable by the filter for incident light with an arbitrary polarization direction. It was confirmed that the systems are useful to eliminate reflected-light images for various image sensing, including outdoor location shooting with strong reflected light. The second device is for color-temperature conversion. The filter was designed to compensate the spectral difference between the sun and an incandescent lamp as illumination light sources. The color temperature of light transmitted from the filter was varied almost from 3500K to 5000K by changing voltage applied to the filter. These LC filters have been used in practical program production for television broadcasting.

H. Kikuchi, H. Yamamoto, H. Sato, M. Kawakita, K. Takizawa and H. Fujikake : "Bend-mode liquid crystal cells stabilized by aligned polymer walls", Jpn. J. Appl. Phys., Vol.44, No.2, pp.981-989,2005

邦文題目 : 高分子壁構造のベンドモード液晶素子

We have studied ways of stabilizing the bend configuration in p-cells by forming polymer walls. This novel device with polymer walls, which makes an initial splay-bend transition unnecessary, incorporates minute structures fabricated by applying the processes of local photopolymerization-induced phase separation and field orientation. In fabricating the device, a mixed solution of nematic liquid crystal and an ultraviolet (UV)-curable liquid-crystalline monomer was subjected to an electric field to induce the bend transition, and UV light was illuminated on selected regions in this mixed solution to cause photopolymerization, so that minute aligned polymer walls could be selectively formed inside the device. We examined the operation of the device and found that the bend-alignment cells performed basic functions in the stable bend state, and that this state can be maintained even if the cells are set to a small pre-tilt angle, such as 1°.

L. Jin, K. Takizawa, Y. Otani and N. Umeda : "Multi-wavelength Muller matrix polarimeter", Opt. Rev., Vol. 12, No.4, pp.281-286,2005

邦文題目：ミューラー行列を利用した多波長ポラリメータ

The retardation of two quarter-wave plates designed for a particular wavelength decreases or increases in accordance with the wavelength of input light beam. Compensating the shifted retardation at each measurement wavelength allows us to get Muller matrices of samples at different wavelengths without exchanging the plates. Initial orientation errors of two quarter-wave plates and an analyzer, which remain constant through all wavelengths, are also taken into consideration. The availability and accuracy of this polarimeter is assessed by measurement of a quarter-wave plate designed for 632.8 nm wavelength. The experimental results show that this system is very attractive to measure optical properties and dispersion in samples.

H. Kikuchi, Y. Uchida, Y. Fujisaki, H. Sato, H. Fujikake, T. Kurita, K. Takizawa and F. Sato : "Orientation of organic semiconductor films on photoreactive polyimide films and its influence on field-effect transistor characteristics", Proc. Mater. Res. Soc. Symp. Vol. 871E ,p.I3.7.1-I3.7.6,2005

邦文題目：光反応性高分子膜上に形成された誘起半導体膜の配向と電界効果トランジスタ特性との関係

Field effect transistor consisting of a pentacene active-layer, a photoreactive polyimide layer, a Ta<sub>2</sub>O<sub>5</sub> gate-insulator, a tantalum gate electrode and a glass substrate was fabricated and the relationship between the orientation and mobility of pentacene and the polyimide surface-treatment-layer was investigated. The channel length and width of the transistor was 100μm and 2000μm, respectively. It was confirmed experimentally that an increase in size of grain and the improved orientation of the pentacene because of the irradiation of ultraviolet rays to the polyimide layer. The field-effect hole mobility was improved from 0.3 to 0.8 cm<sup>2</sup>/Vs and on/off current ratio was also improved from 4.9 x 10<sup>2</sup> to 2.3 x 10<sup>6</sup>, respectively by inserting the photoreactive polyimide film between the pentacene-active layer and the Ta<sub>2</sub>O<sub>5</sub>-gate insulator.

H. Kikuchi and K. Takizawa : "Large screen projection displays", Photonics in Broadcasting Technology 2005, pp. 161-196, 2006.2

邦文題目：大画面投射型ディスプレイ

This paper provides an overview of the requirements for large-screen displays that use liquid crystal light valves (LCLVs). Various types of LCLVs are described such as transmission-mode and reflection mode LCLVs consisting of a nematic LC layer and a thin film transistor array, and optically addressed LCLVs consisting of a nematic LC layer, a dielectric mirror, a photoconductive layer, and an ITO transparent electrode films. The analysis and experimental results of the polymer-dispersed liquid crystal light valves developed by authors are reported in detail. This novel light valve has a high performance such as high resolution, high transmission, and high rise/decay times and is suitable for super-high-resolution, large-screen displays. Key technologies relating to LCLVs, trends in LCLV projector application techniques and relevant researches, future tasks and future prospects are also described.

T. Tsukuda, A. Nakamura, T. Arai and T. Tsubomura : "Luminescence of Copper(I) Dinuclear Complexes Bridged by Diphosphine Ligands", Bull. Chem. Soc. Jpn., vol.79, pp.288-290, 2006.2

邦文題目：ジホスフィン配位子で架橋した二核銅(I)錯体のルミネッセンス

Mixed-ligand dinuclear Cu(I) complexes containing both diimine and diphosphine ligands have demonstrated interesting photophysical properties; the complexes are emissive in solution at room temperature, even with 1,10-phenanthroline (phen) lacking a 2,9-substituted group.

K. Saito, T. Tsukuda and T. Tsubomura : "Synthesis and Luminescence of New Cu(I) Complexes Containing a Binap Ligand and a Diimine Ligand", Bull. Chem. Soc. Jpn., vol.79, pp.437-441, 2006.3

邦文題目：BINAP配位子とジイミン配位子を含む新規銅(I)錯体の合成とルミネッセンス

A series of novel Cu(I) complexes with an



s-binap ligand and a diimine ligand, [Cu(s-binap)(bpy)]PF<sub>6</sub>, [Cu(s-binap)(phen)]PF<sub>6</sub>, and [Cu(s-binap)(dmp)]PF<sub>6</sub>, were synthesized, where bpy = 2,2'-bipyridine, phen = 1,10-phenanthroline, dmp = 2,9-dimethyl-1,10-phenanthroline, and s-binap = (S)-2,2'-bis(diphenylphosphino)-1,1'-binaphthyl. All three complexes show intense photoluminescence in the solid state, whereas [Cu(s-binap)(dmp)]PF<sub>6</sub> is a comparatively good emitter in CH<sub>2</sub>Cl<sub>2</sub> solutions. These luminescence bands have been assigned to the emission from <sup>3</sup>MLCT states. The complexes [Cu(s-binap)(bpy)]PF<sub>6</sub> and [Cu(s-binap)(dmp)]PF<sub>6</sub> were characterized by X-ray structure analyses. Although the distorted tetrahedral structures around the central metals of the two complexes are similar, the photophysical properties of the dmp complex differ from those of the other complexes in solution. The structures and the photophysical properties of the three complexes have been discussed.

飯村靖夫・多久島和弘・中野武雄・馬場 茂 : 「電力一定放電下の反応性スパッタリングによる酸化シリコンの組成制御」 “Stoichiometry Control of Silicon Oxide Films by the Reactive Sputter Deposition with Constant Power Operation” , 真空, vol.49, no.3, pp.171-173 , 2006.3

The mode transition of the DC reactive sputter deposition process has been studied for the fabrication and the stoichiometry control of SiOx films. At a fixed Ar flow rate of 20 sccm and a pressure of 1 Pa (hence the pumping speed was also fixed), oxygen flow rate was modified and the transition between the metal and oxide modes was monitored by the cathode voltage. With a constant current operation of a DC power source,

the well known steep and hysteretic mode transition appeared. On the other hand, gentler transition with no hysteretic character was observed in a constant power operation. In the latter case, the composition of deposited films could be controlled by the oxygen flow rate, and the dependence was examined with X-ray photoelectron spectroscopy. The transition of the film composition  $x$  from 0.5 to 2.0 was observed in a flow rate region of oxygen lower than the sputtering mode transition occurred. It can be attributed to the non-uniform deposition of Si atoms which work as oxygen absorber.

S.-J. Seo, Y.-J. Choi, T. Akaike, A. Higuchi and C.-S. Cho : “Alginate/galactosylated chitosan/heparin scaffold as a new synthetic extracellular matrix for hepatocytes”, Tissue Engineering, 12(1), pp. 33-44, 2006.1  
邦文題目 : 肝細胞用の新規な合成細胞外マトリックスとしてのアルギン酸/ガラクトース化キトサン/ヘパリン誘型

A bioartificial liver (BAL) device is expected to be an alternative method for treatment of liver failure, which is mostly dependent on liver transplantation. Formation of multicellular hepatocyte spheroids in the three-dimensional culture is a potential approach for enhancing liver-specific functions in bioartificial liver devices. As a synthetic extracellular matrix for hepatocytes, a highly porous hydrogel scaffold was fabricated with alginate, galactosylated chitosan and heparin through electrostatic interaction. The results suggest that hepatocytes as stable spheroids enhance liver-specific functions in the sponges, providing a new synthetic extracellular matrix to design BAL devices.

## 情報科学科

青木正喜・安田 升 : 「車載遠赤外線カメラを用いた歩行者検出」 コンピュータビジョンとイメージメディア , Vol. 47, No. SIG5(CVIM13), pp. 1-9 , 2006.3

車載遠赤外線カメラを用いた歩行者検出の研究が進んでいる。運転者への視覚支援として遠赤外線画

像を表示する装置, 歩行者を検出してドライバーに知らせ注意を喚起する装置等が実用化されている。本稿ではまず, 遠赤外線の特徴, 遠赤外線カメラの技術動向について解説する。つぎに遠赤外線画像の特徴と画像処理について述べ, 昨年開催された

IV2005とOTCBVS'05の2つの自動車関係の国際学会で発表された論文を中心として、車載カメラを用いた遠赤外線画像の歩行者検出への応用を概観する。

S. Katahara and M. Aoki : “Vehicle Detection Using Double Slit Camera”, Lecture Note in Computer Science Vol. 3852, Computer Vision-ACCV2006 Part II, pp. 162-170, Springer-Verlag, Berlin Heidelberg, 2006  
邦文題目：2重スリットカメラを用いた車両検出

We propose one-directional traffic flow measurement method using double slit camera. Two slit cameras are installed in overhead location with longitudinal alignment. They shoot real traffic scene in downward direction. Slit camera outputs pseudo two-dimensional image that consists of space domain and time domain. We detect vehicles from statistical pixel value of each line of a slit. Standard deviation is effective to detect bright color vehicles. We use the changes of a standard deviation and a change of an average as well as the standard deviation to detect dark color vehicles. We detect traffic flow parameters such as occupancy, time headway and time between two cars using slit camera. In double slit configuration, we detect spot speed of vehicles by the time difference of its appearance at each slit. We estimate vehicle length by normalizing the vehicle region. We also divide vehicles into type of vehicle by length.

池上敦子：「ナース・スケジューリング調査・モデリング・アルゴリズム」統計数理, Vol.53, No.2, pp.231-259, 2005.12

医療の現場では、人の命に関わる業務をおこなっていることから、そのスタッフらで構成される勤務の質が非常に厳しく求められている。特に、24時間切目ない活動が要求される病棟ナースの勤務表作成（ナース・スケジューリング）では、看護の質とスタッフ・ナースの生活の質の両方を守るべきことから、非常に多くの種類の制約が存在し、解くことが困難な組合せ問題となっている。この論文では、現場調査に基づくモデル化から適用までの「問題解決の全過程」を紹介することにより、本研究の最近の成果を報告する。まず、ナース・スケジューリングを数理計画モデルで記述することにより、問題の拘

束条件マトリックスがブロック対角構造を持つことを明らかにする。そして、その構造を利用した部分問題軸アプローチという考え方を提案し、これに基づくアルゴリズムで問題を解く。アルゴリズムは、実際の病棟の問題に対し非常に質の良い勤務表を効率良く与えることができた。提案するモデルとアプローチは、海外のナース・スケジューリングはもちろんだが、医療、介護、サービス業等の中でも、勤務の質が特に要求されるようなスタッフ・スケジューリングに適用可能である。

池上敦子・緒方洋平・森田隼史・土谷 隆：「訪問介護スタッフ・スケジューリング」統計数理研究所共同研究レポート191「最適化：モデリングとアルゴリズム19」, pp.302-316, 2006.3

訪問介護におけるヘルパーのスケジューリングでは、利用者のサービスを確実にカバーすることが何よりも大事であり、穴をあけることは決して許されない。ヘルパーの勤務表と利用者へのサービス提供表を作成する担当者は、利用者が必要とするサービスとその時刻ならびに利用者宅の地理的情報、そして、ヘルパーの勤務可能日や勤務可能時間帯ならびにスキルレベルの情報を頭に入れ、毎月、このスケジューリングをおこなうことになる。この他に、ヘルパーにとっての空き時間を極力作らない、ヘルパー間の負荷の偏りがないようにする、利用者にとってヘルパーの偏りのないようにする、さらに、ヘルパーと利用者の相性等、さまざまな条件を考慮しなければならない。その作成に、昼夜あわせて数日を要する場合もあるという。そこで、本研究では、問題の数理的構造を明らかにし、問題のモデル化やアルゴリズム開発に必要な情報を整理する。具体的には、訪問介護事業所の勤務表作成担当者に対して、スケジューリングにおける考慮点、スケジューリングにおける負荷、利用しているツール等に関するアンケート調査をおこなったので、その結果を報告する。そして、アンケート調査結果から明らかになったスケジューリングのための「制約条件」と「目標となる考慮点」を整理し、この問題を扱う数理モデルを提案する。

T. Abe and M. Iwasaki : “Exact and approximate inferences for an exponential mean from type-I censored data”, Bulletin of Informatics and Cybernetics, Vol. 37, pp. 31-39. 2005. 9

邦文題目：タイプ の打ち切りデータに基づく指数平均の正確および近似推測

Statistical inferences for an exponential mean from Type I right censored data is considered in this paper. Most inferential procedures developed so far are conditional in the sense that they can be used only when the number of observed lifetime data is not zero. One of the aims of this paper is to remove this restriction so that it allows zero observed frequency case. An expression for exact unconditional probability calculus is given. The second aim of this paper is to evaluate certain approximate procedures by using the exact formula developed in this paper whether or not they give sensible numerical values.

岩崎 学・吉田清隆：「稀な事象の生起確率に関する統計的推測 - Rule of Three とその周辺 - 」計量生物学, Vol. 26, No. 2, pp. 53-63. 2005.12

薬剤の市販後に生じる重篤な副作用などの稀な事象の生起に関して Rule of Three なる法則がある。これは「 $n$  人調べて1度も事象が観測されなくても、他の  $n$  人中の3人に事象が観測される可能性がある」というものである。本論文では、このルールを「 $n$  人調べて  $k$  人に観測された事象は、他の  $n$  人中の  $n_k$  人に観測される可能性がある」という形に一般化する。さらに、「 $n$  人調べて  $k$  人に観測された事象が別の  $n$  人で  $m_k$  人以上に観測された場合には事象の発生確率が増えたと判断する」という形のルールも提案する。

M. Iwasaki : "Less conservative distribution-free confidence intervals and tests for the median", Japanese Journal of Biometrics, Vol. 26, No. 2, pp. 65-80. 2005.12

邦文題目：中央値に関する保守的でないノンパラメトリックな信頼区間と検定

The sign test is a best known statistical technique to make inferences about the population median. In spite of their wide applicability the sign test and the confidence interval still have several problems. One notable difficulty is the conservativeness of confidence intervals in the sense that the actual confidence coefficients are greater than the nominal value. The inconsis-

tency between testing and estimation in the presence of ties is another problem. The aim of this paper is to propose a modified procedure to reduce such difficulties. In constructing confidence intervals, the mid-P value is also taken into account in addition to the usual P-value. Consequently, our modified intervals have actual confidence coefficient closer to the nominal value than those obtained by the conventional method. A modification of usual sign test is also introduced, which is consistent with the interval estimation.

T. Ueda and K. Hoshino: "Estimation of firms efficiencies using a Kalman filter and stochastic efficiency model", JORSJ, Vol.48, No.4, pp.308-317, 2005  
邦文題目：カルマンフィルタと確率的効率性モデルを用いた企業効率性の推定

The efficiencies of firms should be evaluated, based on their historical financial data. Here a process for evaluation is proposed. Each historical data set is reduced to a distribution function with a mean and a variance estimated by Kalman filter. Then, a stochastic efficiency model is applied to this reduced data. Then a new efficiency measure is proposed and compared with existing measures. An application is made to three kinds of firms.

山本瑞秋・米倉達広・岡本秀輔・鎌田 賢・荒木俊郎：「状態遷移図を用いたWebブラウザのカスタマイズ手法の提案」電子情報通信学会2種研究会 サイバーワールド(CW)第2回研究会, pp.1-4, 2006.1

本稿では、能動的なWeb ブラウジング支援を目的とした、ユーザ指向のWeb ブラウザの作成手法を提案する。従来のWeb ブラウジングでは、CGIやJavaScript を用いた動的なWeb ページであっても、プログラムはWeb サイト側で記述されるため、情報の受け手でしかなかった。このため、状態遷移図を用いてユーザ自身がWeb ブラウザの振る舞いを決定できるような、Web ブラウザの自動生成システムを試作したので、報告する。

岡本秀輔・米倉達広・鎌田 賢：「対話型アニメのための仮想共有スペース」電子情報通信学会2種研究会 サイバーワールド(CW)第2回研究会, pp.5-8, 2006.1

Islay は対話型アニメを作成するためのツールである。対話型アニメに登場するキャラクターは、アニメ視聴者からのキーやマウスの入力に反応することができる。キャラクターの動作は状態遷移図によって規定されるため、自律的に振る舞うことができるとともに、視聴者の制御の下に動くこともできる。本報告では、このようなキャラクターが登場する対話型アニメのアニメフィールドを、複数の視聴者で仮想的に共有させることで、サイバースペースにおけるアバターとしてキャラクターを振る舞わせるための基本技術とその効果について述べる。

下村達也・岡本秀輔・米倉達広・鎌田 賢：「対話型アニメ作成ツールIslayへの力学法則の導入」電子情報通信学会 2 種研究会 サイバースペース(CW)第2回研究会, pp.39-44, 2006.1

対話型アニメーション作成ツールであるIslay において、キャラクターの動作は有限状態機械として記述される。状態は、出力として表示画像や移動などのアクションをもつ。どのような運動でも移動を細かく指定すれば任意の精度で近似できるが、膨大な数の状態が必要となる。連続的に変化する位置や速度などは、有限個の状態では表現するよりは、むしろ、力学法則によって自動的に定まるべきものである。そこで、本報告では、力を作用させることだけを状態のアクションとして許し、位置や速度などの力学的な状態は力学法則に従って定めるようにIslay 改良する。また、他の物理法則の法則の導入が容易になるように、様々な法則を動的に切り替えて呼び出せるように実装した。

中川昌幸・岡本秀輔・鎌田 賢・米倉達広：「状態遷移図に基づいたFlash Animation記述環境」情報処理学会シンポジウムシリーズ, Vol.2006, No.4(インタラクティブ2006), pp.50-51, 2006.3

Web 上で提供されているオンラインゲームやインタラクティブアニメーションの多くは、Macromedia Flash でかかっている。Macromedia Flash MX などのFlash 制作ツールでインタラクティブなコンテンツを作成しようとすると、図柄のデザインのみならず、ActionScript を駆使したプログラミングが必要である。Flash Maker などのツールは予め決められたアクションパターンの組み合わせとしてアニメーションを作成できる。ユーザはActionScript を記述しなくてもよいが、複雑な動き

を表そうとしたりインタラクティブアニメーションを作ろうとすると複雑化してしまう。対話型アニメーション作成ツールであるIslay では、紙の上で設計した、あるいは頭で思い浮かべた状態遷移図を直接的、直観的にアニメーションにできる初心者に優しいユーザインタフェースを提供している。そこで、本稿ではIslay で記述されたアニメーションをFlash 形式で出力するトランスレータを実装することにより、状態遷移図に基づくFlash Animation の記述環境を実現する。

下村達也・岡本秀輔・米倉達広・鎌田 賢：「対話型アニメ作成ツールIslayへの力学法則の導入」情報処理学会シンポジウムシリーズ, Vol.2006, No.4(インタラクティブ2006),付属CD-ROM, 2006.3

Islay(アイラ) は、キャラクターの動作を有限状態機械として記述する対話型アニメーション作成ツールである。Islay で作成されたアニメはiasl インタプリタによって実行される。一つの状態は、出力として表示する画像とキャラクターの移動を行うアクションに対応している。状態の数を増やして各状態での移動量を細かく設定すれば、どのような運動でも任意の精度で近似できるが、膨大な数の状態が必要になってしまう。連続的に変化する位置や速度などの物理状態は、物理法則にしたがって自動的に決まるべき量であるので、表示画像のような論理状態とは切り離して扱うほうが自然である。そこで、本報告では、論理状態から物理状態への関与として、力を作用させることだけを許し、位置や速度などの物理状態は力学法則に従って定めるように、Islay およびその実行系であるiasl を改良する。この改良において、物理状態の更新機構はプラグインとして実装してある。そのため、プラグインの取り換えるだけで、他の物理法則の導入も容易となっている。

山河旬之介・米倉達広・野口 宏・岡本秀輔：「大規模分散仮想空間の滑らかな操作方法」電子情報通信学会2種研究会 サイバースペース(CW)第3回研究会, pp.29-32, 2006.3

近年、ネットワークをアミューズメント等に用いるソリューションの報告が盛んにされている。特にネットワーク技術の発展と利用者の増大により大規模なオンラインゲームへの要求等が増加している。従来、こうした多人数をサポートする大規模分散仮想環境(以下DVE と略記)は、Server-Client モデ

ルが主流であった。しかしながら，サーバへの負荷の集中などが問題として挙げられており，それらに対する主な方策としてマルチサーバの利用が考案されているが，トラフィックの増大への効率的回避の検討や，効果的な利用に関する考察は充分になされていない。そこで本研究では，分散マルチサーバ型のDVE方式において，DVE空間操作の滑らかさを犠牲にせずに突発的なトラフィック発散の低下を図る具体的な方策を考案したので報告する。

K. Oguchi, K. Tojo, T. Okodo, Y. Tsuchida, T. Yamaguchi and T. Murooka : "Next-generation home networking and relevant technologies", Proc. SPIE Vol. 5626, Network Architectures, Management, and Applications II, pp. 163-168, 2005.2

邦文題目：次世代ホームネットワークとその関連技術

This paper introduces the next generation home network that will accommodate various services with different quality requirements. Technical study items for realizing the network are also described. Current technologies are overviewed to clarify what will be needed for further consideration.

N. Sugimoto, S. Fukushima, Y. Sakai, K. Oguchi and Y. Akatsu : "A small optical Ethernet PC card for fiber-to-the-notebook PCs and its applications", Proc. SPIE Vol. 5625, Optical Transmission, Switching, and Subsystems II, pp. 491-497, 2005.2

邦文題目：ファイバ・ツウ・ザ・ノートブックPC用小型光イーサネットPCカードとその応用

This paper proposes a concept for a new optical Ethernet interface card for FTTH (Fiber-To-The-Desktop), and discusses application areas of the proposed card. Two steps for realizing the concept are described: A one fiber 100 Mbit optical Ethernet PC card was fabricated by applying a hybrid integrated optical transceiver module and an MU connector. And, a Gbit optical Ethernet PC card was fabricated for the first time and its performance was also evaluated. These cards could become the future standard in the coming optical FTTH/FTTN (Fiber-To-The-Notebook PCs) era as they are suitable for notebook PCs and can be operated in

one-fiber WDM system.

K. Okada and K. Oguchi : "Design and verification of wavelength function in WDM networks using wavelength transfer matrix approach", Proceedings of SPIE, Vol. 6022, Network Architectures, Management, and Applications III, pp.438-445, 2006.1

邦文題目：波長伝達マトリクス法を用いたWDMネットワーク波長機能の設計と確認

This paper describes the wavelength transfer matrix that is a powerful approach to designing and verifying the wavelength routing needed for complicated WDM (Wavelength Division Multiplexing) networks. Its basic form and some extensions are first described. Then, a full mesh WDM PON (Passive Optical Network) system that can directly connect both ONUs (Optical Network Unit) and an OLT (Optical Line Terminal) is proposed. Its functionality is also analyzed in terms of wavelength by using the wavelength transfer matrix method. The potential is also verified.

S. Nomura, T. Takizawa, S. Endo and M. Kai : "Electronic States of Lanthanides in the Ternary Thiogallate  $\text{CaGa}_2\text{S}_4$  in View of Relativistic First Principle Calculation", 15th International Conference on Ternary and Multinary Compounds (ICTMC15), 応用物理学会, 2006.3

邦文題目：相対論第一原理計算による三元チオガレート化合物 $\text{CaGa}_2\text{S}_4$ 中のランタノイド元素の電子状態

High efficient visible light emitting devices have been expected on some lanthanide (Ln)-doped thiogallates, especially on  $\text{CaGa}_2\text{S}_4:\text{Ln}$ . Now, detailed knowledge on the optoelectronic mechanism is necessary for the materials design and device engineering.

The electronic states of lanthanide elements doped into the ternary thiogallate  $\text{CaGa}_2\text{S}_4$  are investigated from the relativistic first principle calculations by the discrete variational method with Xa potentials (relativistic DV-Xa), one of the cluster methods of molecular orbital calculations. We have already reported the nonrelativistic calculations using SCAT for the lanthanide-doped

CaGa<sub>2</sub>S<sub>4</sub> as the first stage of our investigation. In this work, we newly produce a parallel processing C++ program of the relativistic DV-Xa on the basis of the original non-parallel processing FORTRAN program of RSCAT. The relativistic DV-Xa is suitable for investigating local electronic states including 4f and/or 5f atomic orbitals. However, the calculation needs a lot of time especially for some rather low symmetrical clusters such as CaGa<sub>2</sub>S<sub>4</sub> (belonging to the orthorhombic crystal system with a space group Fddd:2). Accordingly, the parallel processing computation is practically indispensable for this kind of calculation.

The relativistic DV-Xa calculations are carried out on the spherical clusters of CaGa<sub>2</sub>S<sub>4</sub>:Ln where each Ln atom is set at the cluster center of a Ca site, assuming the Ln<sub>Ca</sub> substitution as is generally accepted. We have reported on the lattice deformation induced by the Ln<sub>Ca</sub> substitution in view of the SCF convergence in the DV-Xa calculation. Some lattice contraction has to be taken into account remarkably around the lightweight lanthanide atoms for the nonrelativistic calculation. For example, the Ce<sub>Ca</sub> substitution induces the lattice contraction by 15%, which is also rec-

ognized in the relativistic calculation. On the other hand, the best SCF convergence without lattice deformation shifts from Yb<sub>Ca</sub> to Ho<sub>Ca</sub> substitutions by taking into account the relativistic quantum effects. Thus, the lattice deformation due to the Ln<sub>Ca</sub> substitution is highly affected by the number of 4f electrons of the lanthanide element.

In general, 4f electrons of lanthanide atoms are considered to be highly localized because of their large orbital angular momentum. In the CaGa<sub>2</sub>S<sub>4</sub> cluster, however, our calculations have shown that they were hybridized with 3p and 3d electrons of the nearest S atoms, and with 4s and 4p electrons of the next nearest Ga atoms, to form molecular orbitals even for nonrelativistic calculations except for Dy and Er. Moreover, the relativistic quantum effects promote the hybridization. As for the valence of Ln, the effective charges of Ln<sub>Ca</sub> in CaGa<sub>2</sub>S<sub>4</sub> are calculated to be typically Ln<sup>+</sup>, or monovalent ions, which is clearly far from the normally accepted feature that the lanthanide elements in crystals tend to be Ln<sup>2+</sup> or Ln<sup>3+</sup>. In addition, the spin-orbit splitting for the 4f levels of Ln is discussed.

## エレクトロメカニクス学科

安達弥真人・二ノ宮晃・瓜生芳久・石郷岡猛・三戸利行・今川信作・柳 長門・関口温朗・山田修一：「ファジー理論を用いた大型ヘリカル装置超電導コイルシステムのクエンチ検出」低温工学, 40巻3号, pp.93-99, 2005

大型超電導コイルの運転状況の把握と早期のクエンチ検出の可能性を検討するために、ファジー理論による検討を実施している。ここで検討したコイルは、核融合科学研究所で実施されている大型超電導ヘリカルコイルである。ここでは、本手法の監視精度の向上を図るために、これまで検討していたコイル電流、バランス電圧、ヘッダー圧力に新たに実行蓄積熱量をメンバーシップ関数に加えて検討評価した。評価表示方法は、警戒率を0~1で表して0.5から0.6を警戒レベル、0.6以上を危険レベルとして評価した。得られた結果からは、クエンチ直前に警戒レベルを超える状況を検出することができ、良好な結果を得ることができた。

T. Ishigohka, T. Tsuchiya, Y. Adachi, A. Ninomiya, N. Yanagi, K.Seo, H. Sekiguchi, S. Yamada, S. Imagawa and T.Mito : "AE Measurement of the LHD Helical Coils", IEEE Transactions on Applied Superconductivity, Vol.15, No.2, 1423-1426, 2005.6

邦文題目：LHDヘリカルコイルのAE計測

本論文は、核融合科学研究所のLHDヘリカルコイルのアコースティック・エミッション(AE)信号を励磁中連続計測して、運転時のコイルの安定性を検討したものである。これまで本装置にはAEセンサが取り付けられてなく、AE信号と擾乱発生の関係が必ずしも明確では無かったが、ここでの計測によりバランス電圧の発生と同期したAE信号が捕らえられており、導体の動きに起因した機械的な擾乱がコイル内に発生していることが本計測により確認することができた。

M. Hamabe, S. Mizutani, A. Sasaki, T. Kasukabe, S. Miwa, T. Yamaguchi, K. Nakamura, S. Yamaguchi, A. Ninomiya, H. Okumura and Ching-Shiang Hwang : “Application of Peltier-Current-Lead for Reduction of Heat Leakage in Helium-Free-Magnet”, Transactions of the Materials Research Society of Japan, Vol.30, No.2, pp.527-530, 2005.6

邦文題目：無冷媒超伝導マグネットの熱侵入低減策におけるペルチェー電流リードの適応

ここでは、ペルチェ電流リード（PCL）を低温システムの熱損失減少に利用させることを提案している。ピスマスーテルルのような熱電半導体は、低熱伝導率とペルチェ効果が期待できる素子である。これを常温部と低温部の境界に利用して通電させることで、低温部への熱侵入を低減させることが期待できる。ここでは、伝導冷却用超伝導マグネットを用いてPCL電流リード部の上下温度を通電電流を変化させながら計測し、電流値に対する特性として検討した。その結果、電流の増加とともにPCL部の上下の温度差が大きくなることを確認した。あわせて従来行われている銅のリード部との比較も行った。これよりPCLが熱侵入低減に大きく寄与することが確かめられた。

大倉元宏・三浦崇路・富永友樹・丸山雄大・池上敦子：「周囲音が視覚遮断直進歩行に及ぼす影響」人間工学, Vol.42, No.2, pp.119-125, 2006.4

The effect of ambient sound conditions on the performance of blindfolded pedestrians to judge direction while walking in a straight line was tested. Subjects were exposed to three different ambient sound conditions while walking in the first experiment. White noise was emitted from one of two loudspeakers placed on the walls of the laboratory half way down path the pedestrians were required to walk down in two out of three conditions. In the other experimental condition, no sound was emitted from the speakers. Twelve blindfolded male subjects aged 21 to 50 years old, were asked to determine the initial walking direction using one of three cues, a sound (white noise), tactile tiles or a wall, at the starting point before walking down the path. Subjects were then asked to walk in a straight line under each ambient sound condition. In experiment 2, the same

sound and tactile tiles as were used in experiment 1 were employed as cues for indicating the initial walking direction. The ambient sound conditions were also the same as those used in experiment 1 except that they differed in intensity (high/low). Thirteen blindfolded male subjects aged 21 to 51 years old participated in the experiment.

Both experiments revealed that exposure to ambient sound had the effect of causing subjects to veer significantly from their paths in a direction that was opposite to the source of the sound. Veering from the path was directly proportional to intensity of the ambient sound. Cues for the initial walking direction had no significant effect on the subjects' paths, but the tendency to veer from paths was greater for the auditory cue compared to the tactile cues.

視覚遮断直進歩行において、歩行中の周囲音が歩行者の方向判断に及ぼす影響を調べた。最初の実験では、3つの周囲音条件を設定した。3つのうち2つの条件では進路の左右に置かれた2つのスピーカのいずれかから、歩行中白色雑音を出力した。残りの1条件では、スピーカから音を出さなかった。被験者は目隠しを施した21歳から50歳の12名の男性であった。被験者は出発地点において、音（白色雑音）、触覚タイル、あるいは壁面のうち、いずれか一つを手がかりとして出発方向を決めた。その後、被験者はいずれかの周囲音条件のもとで、直進歩行を求められた。実験2では、実験1と同じ音と触覚タイルを出発方向の手がかりとして用いた。周囲音条件についても、音圧を2種類（高/低）設定した以外は実験1と同じであった。13名の目隠しをした21歳から51歳の男性を被験者とした。

両実験とも、周囲音が歩行軌跡をその音源とは反対の側に有意に偏軌させるという結果を示した。そして、その音圧が高いと偏軌の程度が強まった。出発方向の手がかりは歩行軌跡に有意な影響は持たないが、触覚に比べて聴覚の手がかりでは、左右への偏軌の程度が大きくなる傾向がみられた。

小方博之・山本紗恵子：「状態認識の不確実性を考慮した実技評価システム」日本テスト学会誌, Vol. 2, No. 1, pp. 101-111, 2006.3

筆者らは、実世界における作業動作をカメラなど

のセンサで観察し，認識することによって，受験者のスキルを定量化する実技評価システムの開発に取り組んでいる。小方・五十嵐(2005)では，実際にシステムを構築することによって，実技評価の自動化の可能性を示したが，同時に作業の認識の不確実性への対処が重要な課題であることも明らかになった。本論文では，作業の認識におけるロバスト性の向上と，認識の不確実性を考慮したスキル定量化法の検討の両面から，この問題への対処を行う。

窪田 悟・小田泰久・高橋由佳：「LCDの画素密度と文字表示品質との関係」映像情報メディア学会誌，Vol.60，No.3，pp.405-408，2006.3

We investigated the effects of pixel density, anti-aliasing, and stroke width on the subjective image quality of characters displayed on high-density liquid-crystal displays (LCDs). We used  $6 \times 4.5$  photographs to simulate the high-density LCDs. The simulated LCDs with 70 different display conditions were consist of 7 pixel densities (100 to 400 ppi stepped by 50 ppi), 5 stroke widths, and 2 font types (anti-aliased font and bi-level font). The character size was fixed at about 3 mm. The display luminance was set to  $150 \text{ cd/m}^2$  and a contrast ratio of 30:1. At a 30-cm viewing distance, 30 subjects assessed the character image quality of the 70 simulated LCDs. The results indicated the subjective evaluation of

character image quality was saturated at about 250 ppi for anti-aliased fonts and 350-400 ppi for bi-level fonts. However, the jaggedness of the bi-level font characters was still perceived at pixel density of 400 ppi. Therefore, the required pixel density for computer displays with bi-level fonts is much higher than the state of the art.

橋本竹夫・波多野滋子・学外者2名：「ポラス吸気ダクトとヘルムホルツレゾネータ併用による車内音の音質改善効果-吸気系の対策効果について-」自動車技術会論文集，Vol.36，No.3，pp.83-89，2005.5

A porous intake duct recently used as a countermeasure to reduce high frequency contents of intake duct noise reduces sharpness of the sound and has a good effect for the improvement of sound quality of car interior noise. On the other hand, by introducing a porous intake duct system, the low frequency contents of sound sometimes dominates and it makes us feel the sound booming. So, in order to avoid this unwanted situation, to make the balance between the low and high frequency contents of intake duct noise properly is important for achieving good sound quality. This paper describes the experimental result how to realize this condition by the parallel use of Helmholtz resonator.

## 共 通 基 礎

K. Tanaka, K. Taguchi, S. Iwata and T. Irie : "Application of Benzoyl-Substituted Hemithioindigo as a Molecular Switch in Porphyrin-Quinone Recognition", *Supramolecular Chemistry*, Vol. 17, No 8, pp. 637-642, 2005.12

邦文題目：ベンゾイル置換したヘミチオインジゴのポルフィリン キノン認識における分子スイッチとしての応用

Irradiation of benzoyl-substituted hemithioindigo 1 produced the [2+4] cycloadduct 2, instead of the usual Z-E isomerization product. The cycloadduct 2 is completely dissociated back to 1 on heating; the interconversion between 1 and 2 shows good repeatability. The reversible prop-

erty is applied to the molecular switch in the hydrogen-bonded quinone recognition of the 5,15-cis-bis (ureidophenyl) porphyrin.