

SemiconNano2019



24th-27th September, 2019
Convention Hall of Integrated Research Center,
Kobe University, Kobe, Japan

Foreword

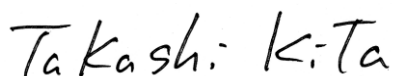
On behalf of the conference committees, we would like to welcome all of you to 7th International Workshop on Epitaxial Growth and Fundamental Properties of Semiconductor Nanostructures (SemiconNano2019), which is being held at Convention Hall of Integrated Research Center, Kobe University, Kobe, Japan, September 24-27, 2019.

SemiconNano is the international workshop on epitaxial growth and fundamental properties of semiconductor nanostructures. The previous SemiconNano conferences have been held in Bonassola, Italy (2006), Anan, Japan (2009), Traunkirchen, Austria (2011), Lake Arrowhead, USA (2013), Hsinchu, Taiwan (2015), and Como, Italy (2017).

SemiconNano has a rich tradition of bringing together specialists and students in semiconductor nanostructures into a vibrant and highly integrative workshop that is conducive to sharing information, gaining knowledge, strengthening collaborations and moving forward fundamental physical properties, device fabrication as well as theoretical modeling of semiconductor nanostructures from basic and applied research. The topics of SemiconNano2019 are as follows:

1. Semiconductor nanostructures based quantum information
2. Fundamentals of light matter interaction in nanostructures
3. Spin phenomena in semiconductor nanostructures
4. Novel photonic, electronic and plasmonic phenomena in materials
5. Fundamentals of semiconductor nanostructure growth
6. Quantum dots and nanowires
7. 2D materials and topological insulators
8. Semiconductor nanostructures for micro- and opto-electronics applications
9. Advanced and highly efficient photovoltaics

At SemiconNano2019, a plenary talk is given by Prof. Hiroshi Amano, Nagoya University, Japan entitled “Transformative Electronics for Establishing Sustainable, Smart, Safe and Secure Society”. Also we invite three keynote speakers; Prof. Paul Koenraad, Eindhoven University of Technology, Netherlands, Prof. Tomoki Machida, The University of Tokyo, Japan, and Prof. Stefano Sanguinetti, Università degli Studi di Milano-Bicocca, Italy. The technical session consists of 30 invited talks, 16 oral talks, and 30 poster presentations. We sincerely appreciate your contribution and hope that SemiconNano2019 turns out to be worthwhile and memorable for all the participants.



Takashi Kita
Conference Chair
Kobe University



Hiroyuki Yaguchi
Program Chair
Saitama University

Conference Committees

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Sponsors

Sponsorship

Kobe University (神戸大学)

Research Center for Advanced Smart Materials, Graduate School of Engineering, Kobe University

Seminar on Quantum Nanostructure Materials (量子ナノ材料セミナー)

Endorsement

The Society of Materials Science, Japan

The Japan Society of Applied Physics

Sponsors

Masuda Science Foundation, Kobe University

(益田奨学基金, 神戸大学)

Meet in Kobe and Portopia '81 Memorial Fund and KOBE Convention Bureau

(ポートピア'81 記念基金補助金, 神戸市観光局・神戸コンベンションビューロ)

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(公益財団法人中内カコンベンション振興財団)

Information

Lunch

12:15 ~ 13:30

24th, 25th, and 27th, September

KOBE ANIMAL KINGDOM

神戸どうぶつ王国

Please show your name tag at the entrance.

Welcome Dinner

19:00~21:00

24th Tuesday, September

Sky Grill Buffet GOCOCU, Main building 30F, PORTOPIA HOTEL

Please show your name tag at the entrance.

Excursion and Banquet

12:15~21:00

26th Thursday, September

Conference Venue in Port Island (12:15 ~) == Bus ==

Kobe Shushin Kan Sake-Breweries (for Lunch) (12:45 ~ 13:45) == Bus ==

Concerto (Cruise) (14:20 ~ 16:15) . . Walk . .

Harbor Land (16:15 ~ 17:15) . . Walk . .

Banquet in FISH IN THE FOREST (17:30 ~ 21:00) == Bus ==

JR SANNOMIYA STATION and PORTOPIA HOTEL

Kobe Shushin Kan Breweries

Kobe Shu-shin-kan Breweries Compound, a brewery of sake "Fukuju" is established in 1751. You can purchase handmade sake from a barrel after sake tasting. There are facilities you can relax and spend artistic time including "Sakabayashi", a fine dining offering handmade tofu. Here will be the restaurant for lunch.

Concerto ~ Luxury Cruise ~

From our cruise, you can see the city of Kobe, the sea and the sky integrating into one attractive scenery. During the day, the view is comfortable and broad. You can appreciate the scenery unavailable on land. You will take afternoon tea cruise. Please enjoy a delicious cake and drinks.

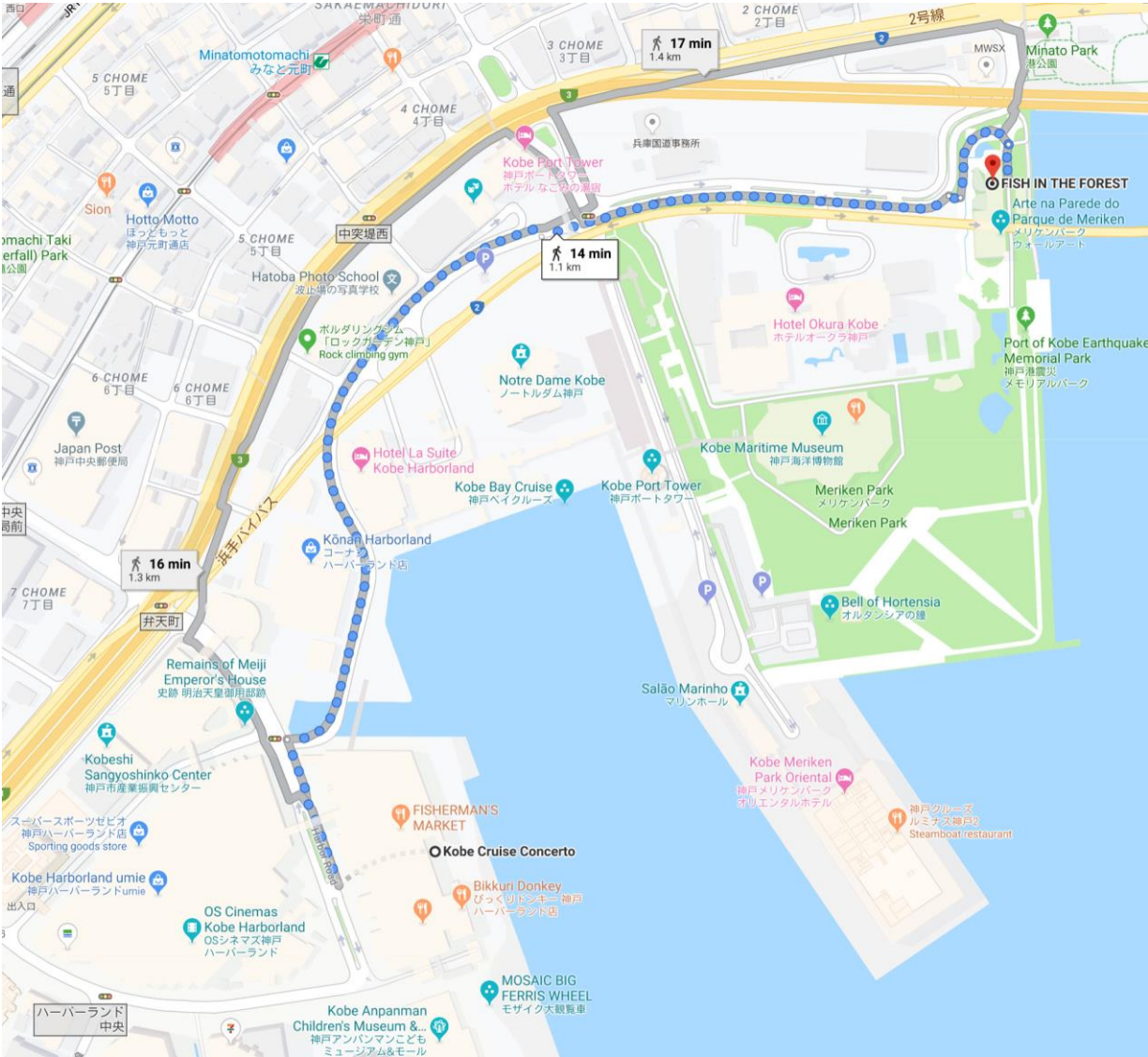
Harbor Land

Kobe Harborland, a premier commercial and sightseeing destination on the site of the former Japan National Railways Minatogawa Cargo Station, opened in October 1992 as a cultural hub that links the city and the sea.

Kobe Harborland features an array of large-scale commercial sites, from department stores, superstores, and specialty shops to hotels.

Banquet in FISH IN THE FOREST ~ TOOTH TOOTH x Sora Botanical Garden

Standing right near the Kobe Earthquake Memorial Park and the beautiful Meriken park, it's located in extremely accessible area. You will see our wire-woven carp object--standing as a recognizable landmark. This restaurant is based on the concept of food, nature and culture. Space of botanical garden handled by Seiji Nishihata, representative of the sky botanical garden spreads inside and outside. It expresses a fantastic world view of "FISH IN THE FOREST ~ TOOTH TOOTH x Sora Botanical Garden ~".



Tuesday, 24 September

8:30 AM
Opening

8:45 AM Plenary

Transformative Electronics for Establishing Sustainable, Smart, Safe and Secure Society

Hiroshi Amano

Center for Integrated Research of Future Electronics, Institute of Materials and Systems for Sustainability, Nagoya University, Nagoya, Japan

9:45 AM Photo and Coffee Break

10:15 AM I-01

New Development of Plasmonics Towards High-Efficiency InGaN-Based LEDs

Koichi Okamoto

Department of Physics and Electronics, Osaka Prefecture University, Japan

10:45 AM I-02

GaN/AlN Ultrathin Quantum Wells for UV Emitters

Mitsuru Funato and Yoichi Kawakami

Department of Electronic Science and Engineering, Kyoto University, Japan

11:15 AM I-03

Atomic and Electronic Structures of Threading Screw Dislocations in GaN

Kenji Shiraishi^{1,2}, Takashi Nakano², Kenta Chokawa², Yosuke Harashima¹, Masaaki Araidai^{1,2}, Atsushi Tanaka¹, Yoshio Honda^{1,2}, Yoshihiro Kangawa^{1,3}, Atsushi, Oshiyama¹, and Hiroshi Amano^{1,2}

¹Institute of Materials and Systems for Sustainability, Nagoya University, Japan.

²Graduate School of Engineering, Nagoya University, Japan

³Research Institute for Applied Mechanics, Kyushu University, Japan

11:45 AM O-01

The Relationship between Nanopipe Formation of GaN and PN Diode Leakage Current

Yoshio Honda^{1,2}, Shigeyoshi Usami³, Atsushi Tanaka⁴, and Hiroshi Amano^{1,5,6}

¹Institute of Materials and Systems for Sustainability, Nagoya University, Japan

²Institute for Advanced Research, Nagoya University, Japan

³Department of Electronics, Nagoya University, Japan

⁴National Institute for Materials Science, Japan

⁵Venture business laboratory, Nagoya University, Japan

⁶Akasaki research center, Nagoya University, Japan

12:00 PM O-02

Fabrication of (11-22) AlGa_N Quantum Wells on m-Plane Sapphire Substrates

Masafumi Jo¹, Yuri Itokazu^{1,2}, Shunsuke Kuwaba^{1,2}, Norihiko Kamata² and Hideki Hirayama¹

¹RIKEN, Japan

²Saitama Univ., Japan

12:15 PM Lunch

1:30 PM I-04

Nitride/Oxide Nanostructured Photoelectrodes for Artificial Photosynthesis

Kazuhiro Ohkawa, Martin Velazquez-Rizo, and Daisuke Iida

Computer, Electrical and Mathematical Sciences and Engineering Division, King Abdullah University of Science and Technology, Saudi Arabia

2:00 PM I-05

Enhancing Electron Mobility of GaN-based HEMTs Grown on Si by MOCVD

Jen-Inn Chyi, Indraneel Sanyal, Yu-Chih Chen and Ying-Hao Ju

National Central University, Department of Electrical Engineering, Taiwan R.O.C

2:30 PM I-06

Realizing High Quality Single Photon Emission from III-Nitride Quantum Dots

M. Holmes^{1,2}, K. Gao², M. Arita², and Y. Arakawa²

¹Institute of Industrial Science, The University of Tokyo, Japan

²Institute for Nano Quantum Information Electronics, The University of Tokyo, Japan

3:00 PM I-07

InGa_N Laser Pumped Nitride Semiconductor Transverse Quasi-Phase-Matched Waveguide Second Harmonic Generation Devices

M. Uemukai¹, S. Yamaguchi¹, A. Yamauchi¹, D. Tazuke¹, A. Higuchi¹, R. Tanabe¹, T. Tanikawa¹, T. Hikosaka², S. Nunoue², Y. Hayashi³, H. Miyake³, Y. Fujiwara¹ and R. Katayama¹

¹Graduate School of Engineering, Osaka University, Japan

²Corporate R&D Center, Toshiba Corporation, Japan

³Graduate School of Regional Innovation Studies, Mie University, Japan

3:30 PM Coffee Break

4:00 PM I-08

Manipulation of Eu Emission from GaN Using Control of Photon Fields

Yasufumi Fujiwara, Shuhei Ichikawa, Dolf Timmerman, Delphine Lebrun, and Jun Tatebayashi

Graduate School of Engineering, Osaka University, Japan

4:30 PM I-09

Magnetic Properties of Mn-Doped GaN Thin Films and Nanorods Grown by Plasma Assisted Molecular Beam Epitaxy

Li-Wei Tu¹, Paritosh Vilas Wadekar¹, Yuan-Ting Lin¹, Che-Min Lin¹, Ching-Wen Chang¹, Quark Yung-Sung Chen¹, W. C. Lai², J. K. Sheu², Tsan-Chuen Leung³ and Cheng-Maw Cheng⁴

¹Department of Physics and Center of Crystal Research, National Sun Yat-Sen University, Taiwan, ROC

²Department of Photonics, National Cheng Kung University, Taiwan, ROC

³Department of Physics, National Chung Cheng University, Taiwan, ROC

⁴National Synchrotron Radiation Research Center, Taiwan, ROC

5:00 PM I-10

Control of Atomic Emission from Eu³⁺ Ions Doped into GaN for Color-Tunable LEDs

B. Mitchell^{1,2}, R. Wei³, D. Timmerman², T. Gregorkiewicz^{2,4}, Y. Fujiwara², and V. Dierolf³

¹Department of Physics and Engineering, West Chester University, USA

²Graduate School of Engineering, Osaka University, Japan

³Department of Physics, Lehigh University, USA

⁴Van der Waals-Zeeman Institute, University of Amsterdam, The Netherlands

5:30 PM I-11

Investigation on Compound Semiconductor Crystal Growth Mechanism by STMBE Which Performs True *In-Situ* STM Imaging during MBE Growth

Shiro Tsukamoto

Dipartimento di Scienza dei Materiali, Università degli Studi di Milano-Bicocca, Italy

National Institute of Technology, Anan College, Japan

Wednesday, 25 September

8:30 AM K-01

Droplet Epitaxy of Semiconductor Nanostructures for Quantum Photonics

Stefano Sanguinetti

L-NESS and Dipartimento di Scienza dei Materiali, Università di Milano-Bicocca, Italy

9:15 AM I-12

Highly Entangled Photon Pairs from Semiconductor Quantum Dots

Armando Rastelli, Daniel Huber, Marcus Reindl, Saimon Filipe Covre da Silva, Rinaldo Trotta

Johannes Kepler University Linz, Austria

9:45 AM I-13

Highly Efficient Quantum Light Sources Based on Quantum Dots in Photonic Nanostructures

Jin Liu

School of Physics, Sun Yat-Sen University, China

10:15 AM Coffee Break

10:45 AM I-14

Advanced 3D Architectures on Crystal Structure Engineered III-V Nanowires

Víctor J. Gómez¹, Claes Thelander¹, Kimberly A. Dick^{1,2} and Sebastian Lehmann¹

¹Solid State Physics and NanoLund, Lund University, Sweden

²Centre for Analysis and Synthesis, Lund University, Sweden

11:15 PM O-03

Colloidal Nanoparticle Assisted MBE Growth and Thermal Decomposition of GaAs Nanowires

Alexei Bouravlev¹⁻⁴, Igor Ilkiv¹

¹St.Petersburg Academic University RAS, Russia

²Ioffe Institute, Russia

³St.Petersburg Electro-Technical University, Russia

⁴Institute for Analytical Instrumentations RAS, Russia

11:30 AM O-04

Outermost Native Oxide AlGaOx Shell for GaAs Related Core-Shell Nanowires

Naoki Tsuda, Fumitaro Ishikawa

Graduate School of Science and Engineering, Ehime University, Japan

11:45 AM O-05

Size-Modulation-Induced Spin Amplification in Quantum Nanocolumn

Satoshi Hiura¹, Shotaro Saito¹, Junichi Takayama¹, Takayuki Kiba² and Akihiro Murayama¹

¹Faculty of Information Science and Technology, Hokkaido University, Japan

²Kitami Institute of Technology, Japan

12:00 PM O-06

Photophysics of Organic Single Crystal Microcavities

Kenichi Yamashita

Faculty of Electrical Engineering and Electronics, Kyoto Institute of Technology, Japan

12:15 PM Lunch

1:30 PM I-15

Donor and Acceptor Pair Luminescence in Colloidal Silicon Quantum Dots

Minoru Fujii and Hiroshi Sugimoto

Graduate School of Engineering, Kobe University, Japan

2:00 PM I-16

1.3 μm High Performance Epitaxial Quantum Dot Lasers on Silicon

F. Grillot^{1,2}, J. Duan¹, H. Huang¹, B. Dong¹, J. Norman³, Z. Zhang⁴, and J. E Bowers^{3,4,5}

¹LTCl, Télécom Paris, Institut Polytechnique de Paris, France

²Center for High Technology Materials, University of New-Mexico, USA

³Materials Department, University of California, Santa Barbara, USA

⁴Electrical & Computer Engineering Department, University of California, Santa Barbara, USA

⁵Institute for Energy Efficiency, University of California, Santa Barbara, USA

2:30 PM I-17

In-Situ DFT-Assisted STS Tomographic Identification of Crystal Phase and Composition in Multicomponent Epitaxial Nanostructures

Matan Dascalu¹, Oswaldo Diéguez¹, Liwei D. Geng², Ranjit Pati³, Yongmei M. Jin², Ilan Goldfarb¹

¹Department of Materials Science and Engineering, Tel Aviv University, Israel

²Department of Materials Science and Engineering, Michigan Technological University, USA

³Department of Physics, Michigan Technological University, USA

3:00 PM O-07

Formation of In(P)As Quantum Dots by Exchange of P and As Atoms in Molecular Beam Epitaxy

Kouichi Akahane, Atsushi Matsumoto, Toshimasa Umezawa, Naokatsu Yamamoto
National Institute of Information and Communications Technology, Japan

3:15 PM O-08

Characterization of 1.1- μm -Centered Tunable Laser Based on InAs Quantum Dots for Swept Source Optical Coherence Tomography Application

Nobuhiko Ozaki^{1,2}, David Childs¹, Aleksandr Boldin¹, Hirotaka Ohsato³, Eiichiro Watanabe³, Naoki Ikeda³, Yoshimasa Sugimoto³, and Richard Hogg¹

¹School of Eng., University of Glasgow, U.K.

²Faculty of Systems Eng., Wakayama University, Japan

³National Inst. Materials Science, Japan

3:30 PM O-09

Polarization-Insensitive Optical Gain of Highly Stacked InAs/GaAs Quantum Dot Semiconductor Optical Amplifier

Toshiyuki Kaizu, Tomoya Kakutani and Takashi Kita

Department of Electrical and Electronic Engineering, Graduate School of Engineering, Kobe University, Japan

3:45 PM O-10

Direct Determination of Multiple Exciton Generation Rate

Dolf Timmerman¹, Eiichi Matsubara², Leyre Gomez³, Tom Gregorkiewicz³, Masaaki Ashida⁴, and Yasufumi Fujiwara⁵

¹Graduate School of Engineering, Osaka University, Japan

²National Institute of Technology (KOSEN), Asahikawa College, Japan

³Institute of Physics, University of Amsterdam, The Netherlands

⁴Graduate School of Engineering Science, Osaka University, Japan

⁵Graduate School of Engineering, Osaka University, Japan

4:00 PM - 6:00 PM Poster Presentations

P-01

P-doping Effects on Temperature-Dependent Spin Dynamics in InGaAs Quantum Dots

Shino Sato, Satoshi Hiura, Junichi Takayama and Akihiro Murayama

Faculty of Information Science and Technology, Hokkaido University, Japan

P-02

Electric-Field-Effect Optical Spin-Injection Device Using p-Doped InGaAs Quantum Dots

Soyoung Park, Hang Chen, Satoshi Hiura, Junichi Takayama, and Akihiro Murayama

Faculty of Information Science and Technology, Hokkaido University, Japan

P-03

Temperature Dependence of Modal Gain at Excited States in High-Density InGaAs Quantum Dots by Variable Stripe Length Method

Akihisa Ohtake, Satoshi Hiura, Junichi Takayama and Akihiro Murayama

Faculty of Information Science and Technology, Hokkaido University, Japan

P-04

Temperature-Persistent Spin Relaxation in InGaAs/GaAs Dots-in-Well Structure

Mizuki Takishita, Satoshi Hiura, Junichi Takayama and Akihiro Murayama

Faculty of Information Science and Technology, Hokkaido University, Japan

P-05

Temperature-Dependent Spin Dynamics in InGaAs Quantum Dots Embedded with GaAs Capping Layer Grown at Low Temperature

Yuto Nakamura, Satoshi Hiura, Shino Sato, Junichi Takayama, and Akihiro Murayama

Faculty of Information Science and Technology, Hokkaido University, Japan

P-06

Dependence of In Droplets Self-Organization Processes on the GaAs Surface Morphology Peculiarities During Droplet Epitaxy

N. E. Chernenko¹, S. V. Balakirev², M. M. Eremenko¹, M. S. Solodovnik¹ and O. A. Ageev¹

¹Research and Education Center “Nanotechnologies”, Southern Federal University, Russia

²Department of Nanotechnologies and Microsystems, Southern Federal University, Russia

P-07

Wetting Layer Analysis in In/GaAs System Grown by Droplet Epitaxy

M. M. Eremenko¹, S. V. Balakirev², N. E. Chernenko^{1,3}, O. A. Ageev¹ and M. S. Solodovnik^{1,2}

¹Research and Education Center “Nanotechnologies”, Southern Federal University, Russia

²Department of Nanotechnologies and Microsystems, Southern Federal University, Russia

³Department of Radio Engineering Electronics, Southern Federal University, Russia

P-08

Reciprocal Relationship between Photoluminescence and Photocurrent in Two-Step Photon Up-Conversion Solar Cell

Noriyuki Kinugawa, Shigeo Asahi, and Takashi Kita
Kobe University, Japan

P-09

Laser Cooling Utilizing Anti-Stokes Photoluminescence in Yb-Doped Yttrium Aluminum Garnet

Yuta Nakayama, Yukihiro Harada, and Takashi Kita
Graduate School of Engineering, Kobe University, Japan

P-10

Enhancement of Photoluminescence of InAs Quantum Dots grown on SiO_x Films by Molecular Beam Deposition

Yuta Tanaka, Kazumu Sasaki, Akinori Makaino and Koichi Yamaguchi
Department of Engineering Science, The University of Electro-Communications, Japan

P-11

Growth of Dilute Nitride Core-Multishell Nanowires

Ryo Fujiwara, Mitsuki Yukimune, Fumitaro Ishikawa
Graduate School of Science and Engineering, Ehime University, Japan

P-12

Photoluminescence Intensity Change of GaPN by Laser Irradiation

Sultan Md. Zamil, Akinori Shiroma, Shuhei Yagi, Kengo Takamiya, and Hiroyuki Yaguchi
Graduate School of Science and Engineering, Saitama University, Japan

P-13

Infrared Photodetector Sensitized by QDs Inserted at the Hetero-Interface

Takahiko Murata, Shigeo Asahi and Takashi Kita
Graduate School of Engineering, Kobe University, Japan

P-14

A p -Channel SnO_x Thin-Film Transistor with a SiO_2 Passivation Layer

Kota Iwasa, Hiroki Iwata, Yoshinari Kimura, and Masatoshi Kitamura

Department of Electrical and Electronic Engineering, Graduate School of Engineering, Kobe University, Japan

P-15

Current Stability in SnO_2 Thin-Film Transistors with Ultra-Thin Channel Layers toward Gas Sensor Application

Hiroki Iwata, Kota Iwasa, Yoshinari Kimura, and Masatoshi Kitamura

Department of Electrical and Electronic Engineering, Graduate School of Engineering, Kobe University, Japan

P-16

Controlling Diamond Properties by Ion Implantation and High Pressure and High Temperature Treatment

Rei Fukuta¹, Yohei Murakami¹, Fumitaro Ishikawa^{1,2}, Masafumi Matsushita^{1,2}, Toru Shinmei², Hiroaki Ohfuji², Tetsuo Irifune²

¹Graduate School of Science and Engineering, Ehime University, Japan

²Geodynamics Research Center, Ehime University, Matsuyama, Japan

P-17

Plasmonic Metal Nanostructures for Enhanced Deep UV Emission from AlGaN Quantum Wells

K. Shimano¹, R. Hasegawa¹, F. Murao¹, T. Matsuyama¹, K. Wada¹, H. Miyake², and K. Okamoto¹

¹Department of Physics and Electronics, Osaka Prefecture University, Japan

²Graduate School of Regional Innovation Studies, Mie University, Japan

P-18

Micro-Photoluminescence Mapping of Surface Plasmon Enhanced Emissions from Polar/Semipolar InGaN/GaN

J. Kametani¹, F. Murao¹, T. Matsuyama¹, K. Wada¹, N. Okada², K. Tadatomo², and K. Okamoto¹

¹Department of Physics and Electronics, Osaka Prefecture University, Japan

²Graduate School of Sciences and Technology for Innovation, Yamaguchi University, Japan

P-19

Emission Enhancements of InGaN/GaN MQW beyond Skin Depth of Surface Plasmon Polariton

F. Murao¹, T. Matsuyama¹, K. Wada¹, M. Funato², Y. Kawakami² and K. Okamoto¹

¹Department of Physics and Electronics, Osaka Prefecture University, Japan

²Department of Electronic Science and Engineering, Kyoto University, Japan

P-20

Extensively-Prolonged Electron Lifetime Within Room Temperature Upon InAs/GaAs Quantum Dot-in-Well Solar Cell

Yaxing Zhu, Shigeo Asahi and Takashi Kita

Department of Electrical and Electronic Engineering, Graduate School of Engineering, Kobe University, Japan

P-21

Adding p-type Conductivity to AlN Surfaces by Deposition of Ultrathin Carbon-Containing Layers

Katsuhiko Kishimoto, Mitsuru Funato and Yoichi Kawakami

Department of Electronic Science and Engineering, Kyoto University, Kyoto 615-8510, Japan

P-22

Input Focusing Grating Coupler for AlN Deep UV Waveguide SHG Device

Y. Morioka¹, M. Uemukai¹, T. Tanikawa¹, K. Uesugi², K. Shojiki², H. Miyake², T. Morikawa¹, Y. Fujiwara¹, and R. Katayama¹

¹Graduate School of Engineering, Osaka University, Japan

²Graduate School of Engineering, Mie University, Japan

P-23

Effect of Interface State Density on Channel Mobility in GaN Lateral MISFET

Yuto Ando^{1,6}, Tohru Nakamura², Manato Deki², Noriyuki Taoka¹, Atsushi Tanaka^{2, 3}, Hirotaka Watanabe², Maki Kushimoto¹, Shugo Nitta², Yoshio Honda², Hisashi Yamada⁶, Mitsuaki Shimizu^{2,6}, and Hiroshi Amano^{2,3,4,5}

¹Department of Electronics, Nagoya University, Japan

²Institute of Materials and Systems for Sustainability, Nagoya University, Japan

³National Institute for Materials and Science, Japan

⁴Akasaka Research Center, Nagoya University, Japan

⁵Venture Business Laboratory, Nagoya University, Japan

⁶National Institute of Advanced Industrial Science and Technology, GaN-OIL, Japan

P-24

Fabrication of Cubic InN Nanowires on GaN V-Groove Structures

Yusuke Nishimura, Shuhei Yagi, and Hiroyuki Yaguchi

Graduate School of Science and Engineering, Saitama University, Japan

P-25

Upconversion Luminescence from GaPN Alloys with Various N Compositions

Kengo Takamiya¹, Wataru Takahashi¹, Shuhei Yagi¹, Norihiko Kamata¹, Yuji Hazama², Hidefumi Akiyama², and Hiroyuki Yaguchi¹

¹Graduate School of Science and Engineering, Saitama University, Japan

²Institute for Solid State Physics, The University of Tokyo, Japan

P-26

Growth of InN nanocolumns using a cubic GaN interlayer by RF-MBE

Rikiya Onuma, Shuhei Yagi, and Hiroyuki Yaguchi

Graduate School of Science and Engineering, Saitama University, Japan

P-27

Metal Droplet Effects on Ternary Nitrides Growth by Molecular Beam Epitaxy

Mani Azadmand¹, Stefano Vichi¹, Sergio Bietti¹, Emiliano Bonera¹, Alexey Fedorov², Shiro Tsukamoto¹, Richard Nötzel³, and Stefano Sanguinetti¹

¹QUCAT and Dipartimento di Scienza dei Materiali, Università di Milano-Bicocca, Italy

²L-NESS and IFN-CNR, Italy

³QUCAT and Academy of Advanced Optoelectronics, South China Normal University, China

P-28

Energy Levels of Type-II GaAsSb/GaAs Quantum Dots for Intermediate Band Solar Cell

Yusuke Oteki^{1,2}, Naoya Miyashita², Yasushi Shoji³, Yoshitaka Okada^{1,2}

¹School of Engineering, The University of Tokyo, Japan

²Research Center for Advanced Science and Technology (RCAST), The University of Tokyo, Japan

³Research Center for Photovoltaics, National Institute of Advanced Industrial Science and Technology (AIST), Japan

P-29

Fabrication of Mid-Infrared LEDs Using InAs/InGaAsSb Superlattice Structures Grown by MBE

Ko Uno, Naoto Iijima and Koichi Yamaguchi

Department of Engineering Science, The University of Electro-Communications, Japan

P-30

STMBE and RHEED Observations of InAs Quantum Dots Growing on GaAs(001) by Using Intermittent Supply Method

Takashi Toujyou^{1,2}, Tomoya Konishi¹, Motoi Hirayama¹, Koichi Yamaguchi², and Shiro Tsukamoto^{1,3}

¹National Institute of Technology, Anan College, Japan

²The University of Electro-Communications, Japan

³Università degli Studi di Milano-Bicocca, Italy

Thursday, 26 September

8:30 AM K-02

Quantum Transport and Robotic Fabrication of van der Waals Junctions of Graphene and 2D Materials

Tomoki Machida^{1,2}, Satoru Masubuchi¹, Momoko Onodera¹, Yuta Seo¹, Yusai Wakafuji¹, Sabin Park¹, Kei Kinoshita¹, Rai Moriya¹, Kenji Watanabe³, Takashi Taniguchi³

¹Institute of Industrial Science, University of Tokyo, Japan

²CREST, Japan Science and Technology Agency, Japan

³National Institute for Materials Science, Japan

9:15 AM I-18

Defect-Mediated Growth of Atomically Thin Hexagonal Boron Nitride on Graphene by Molecular Beam Epitaxy

J. Marcelo J. Lopes

Paul-Drude-Institut für Festkörperelektronik, Leibniz-Institut im Forschungsverbund Berlin e. V., Germany

9:45 AM I-19

About Surface Engineering to Tune the Growth of Semiconductor Nanostructures

Henri Mariette

Institut N.el / CNRS, University Grenoble, France

Graduate School of Pure and Applied Sciences, University Tsukuba, Japan

10:15 AM Coffee Break

10:45 AM I-20

Progress and Approaches to High-Efficiency Intermediate Band Photovoltaics

Yoshitaka Okada

Research Center for Advanced Science & Technology (RCAST), The University of Tokyo, Japan

11:15 AM O-11

Effect of the Accumulated Electron Density at the Hetero-Interface in Two-Step Photon-Up Conversion Solar Cells

Shigeo Asahi and Takashi Kita

Kobe University, Japan

11:30 AM O-12

Low Temperature Absolute Photoluminescence Spectroscopy on InAs Quantum Dot Solar Cells

Ryo Tamaki¹, Yasushi Shoji², and Yoshitaka Okada¹

¹Research Center for Advanced Science and Technology (RCAST), The University of Tokyo, Japan

²National Institute of Advanced Industrial Science and Technology (AIST), Japan

11:45 AM O-13

Excitation Energy Dependence of Hot-Carrier Extraction Process in InAs/GaAs Quantum Dot Superlattice Solar Cells

Yukihiro Harada, Naoto Iwata, Shigeo Asahi, and Takashi Kita

Department of Electrical and Electronic Engineering, Graduate School of Engineering, Kobe University, Japan

12:00 PM O-14

Strain Compensated Dilute Nitride MQWs as New 1 eV Solar Cell Absorber

Naoya Miyashita and Yoshitaka Okada

Research Center for Advanced Science and Technology (RCAST), The University of Tokyo, Japan

12:15 PM Excursion & Banquet

Friday, 27 September

8:30 AM K-03

Isoelectronic Doping Atoms in III/V Materials Studied at the Atomic Scale by Cross-Sectional Scanning Tunneling Microscopy

P. M. Koenraad

Eindhoven University of Technology, the Netherlands

9:15 AM I-21

Approaches to the Origin of Surface Atomic-structure Formation on Compound Semiconductor through Statistical Analysis

Tomoya Konishi¹, Shiro Tsukamoto^{1,2}, Gavin R. Bell³, Tomonori Ito⁴ and Toru Akiyama⁴

¹National Institute of Technology, Anan College, Japan.

²Universit. degli Studi di Milano-Bicocca, Italy.

³Department of Chemistry, University of Warwick, United Kingdom.

⁴Department of Physics Engineering, Mie University, Japan.

9:45 AM I-22

In Situ Study of Growth Dynamics in Nitride Semiconductors Using Synchrotron X-Rays

Takuo Sasaki and Masamitsu Takahashi

National Institutes for Quantum and Radiological Science and Technology (QST), Japan

10:15 AM Coffee Break

10:45 AM I-23

Metamaterial Quantum Well Infrared Photodetectors Based on Plasmon-Enhanced Intersubband Transition

H. T. Miyazaki, T. Mano, T. Kasaya, H. Oosato, K. Watanabe, Y. Sugimoto, T. Kawazu, T. Ochiai, Y. Arai, and A. Shigetou

National Institute for Materials Science, Japan

11:15 AM I-24

Resonantly Excited Excitons for Second-Order Optical Non-Linearity and Realisation of a Broadly Tuneable THz Source and Absorption Spectrometer

Avan Majeed¹, Pavlo Ivanov², Benjamin Stevens¹, Edmund Clarke³,

Iain Butler², David Childs², Osamu Kojima⁴, Richard Hogg²

¹Department of Electronic and Electrical Engineering, University of Sheffield, UK

²James Watt School of Engineering, University of Glasgow, UK

³EPSRC National Centre for III-V Technologies, University of Sheffield, UK

⁴Department of Electrical and Electronic Engineering, Graduate School of Engineering, Kobe University, Japan

11:45 AM I-25

Exploring New Markets and Applications for Semiconductor Lasers

Takeo Kageyama

QD Laser, Inc., Japan

12:15 PM Lunch

1:30 PM O-15

Localized Surface-Plasmon-Enhanced GaN:Eu-Based Red Light-Emitting Diodes with Silver Nanoparticles

J. Tatebayashi, T. Yamada, T. Inaba, D. Timmerman, S. Ichikawa and Y. Fujiwara
Division of Materials and Manufacturing Science, Graduate School of Engineering, Osaka University, Japan

1:45 PM O-16

Control of Exciton Interference in GaAs/AlAs Multiple Quantum Wells

Osamu Kojima and Takashi Kita

Department of Electrical and Electronic Engineering, Graduate School of Engineering, Kobe University, Japan

2:00 PM I-26

Emerging Optical Physics and its Application of Extreme-Low Dimensional Materials

Kazunari Matsuda

Institute of Advanced Energy, Kyoto University, Japan

2:30 PM I-27

Atomic Scale Effects at the Interfaces between Spin-Polarised and Semiconducting Materials

Gavin Bell

Department of Physics, University of Warwick, UK

3:00 PM I-28

Selective-Area Epitaxy of III-V Nanowires on Si and Their Switching Applications

Katsuhiro Tomioka and Junichi Motohisa

Graduate School of Information Science and Technology, and Research Center for Integrated Quantum Electronics (RCIQE), Hokkaido University, Japan

3:30 PM I-29

The Structure of InAs/GaAs(110) Quantum Dots with Bi Supply

W. Martyanov¹, R. B. Lewis², H. Janssen¹, A. Lenz¹, L. Geelhaar², and H. Eisele¹

¹Technische Universität Berlin, Institut für Festkörperphysik, Germany

²Paul-Drude-Institut für Festkörperphysik, Germany

4:00 PM I-30

Fully Reversible Nanowire Formation of Ge on Vicinal Si (001) Driven by Entropy Effects Studied by in Vivo STM and X-ray Scattering

G. Springholz¹, C. Grossauer¹, I. Daruka¹, D. Kriegner², V. Holy²

¹Institute of Semiconductor and Solid State Physics, Johannes Kepler University, Austria

²Department of Condensed Matter Physics, Charles University, Czech Republic

4:30 PM

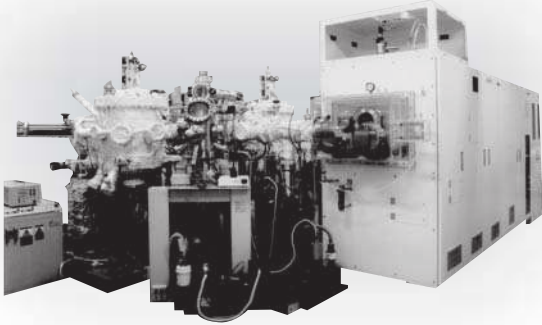
Closing

Exhibition and Cooperation

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Ocean Photonics, Inc. (オーシャンフォトンクス株式会社)
R-DEC Co., Ltd. (株式会社アールデック)
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Japan Laser Corp. (株式会社日本レーザー)
MITSUWA FRONTTECH CORP. (株式会社ミツワフロンテック)
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In search of infinite possibilities for Epitaxial technology

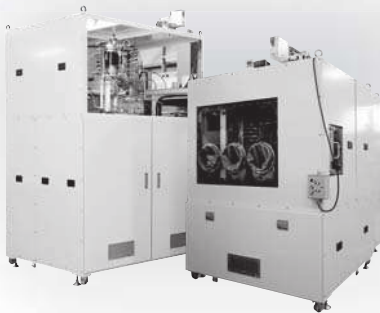
We've been questing epitaxial technology since 1984.



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MBE system for Oxide



High Temperature MOCVD system



High Pressure MOCVD system



K-Cells



Oxidation system for VCSELs



KOH Etching System



Tube furnace for research purposes

EQ
EpiQuest

EpiQuest, Inc.

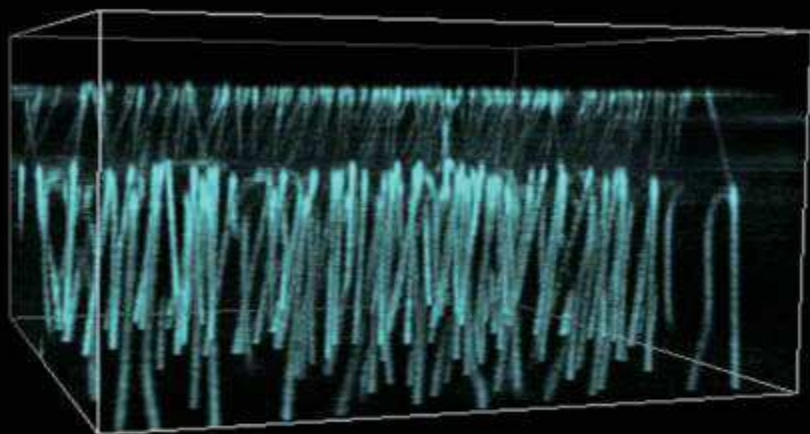
51 Nakagawara, Kamitoba, Minami-Ku, Kyoto-Shi, 601-8142 Japan

Tel 81-75-693-3356 Fax 81-75-693-3357

E-mail : info@epiquest.co.jp URL : <https://www.epiquest.co.jp>

多光子励起フォトルミネッセンス法による **非破壊** GaN・SiC・Ga₂O₃結晶の貫通転位の3次元イメージング

観察例① GaN結晶の貫通転位の3次元イメージング



GaN基板の上にホモエピタキシャル成長したGaN薄膜の二光子励起フォトルミネッセンス像。貫通転位が暗線として観察され、GaN基板中の転位がホモエピタキシャル層に貫通している様子が観察された。

なお、暗線を可視化するためにコントラストを反転して表示している。

サンプル：GaN結晶

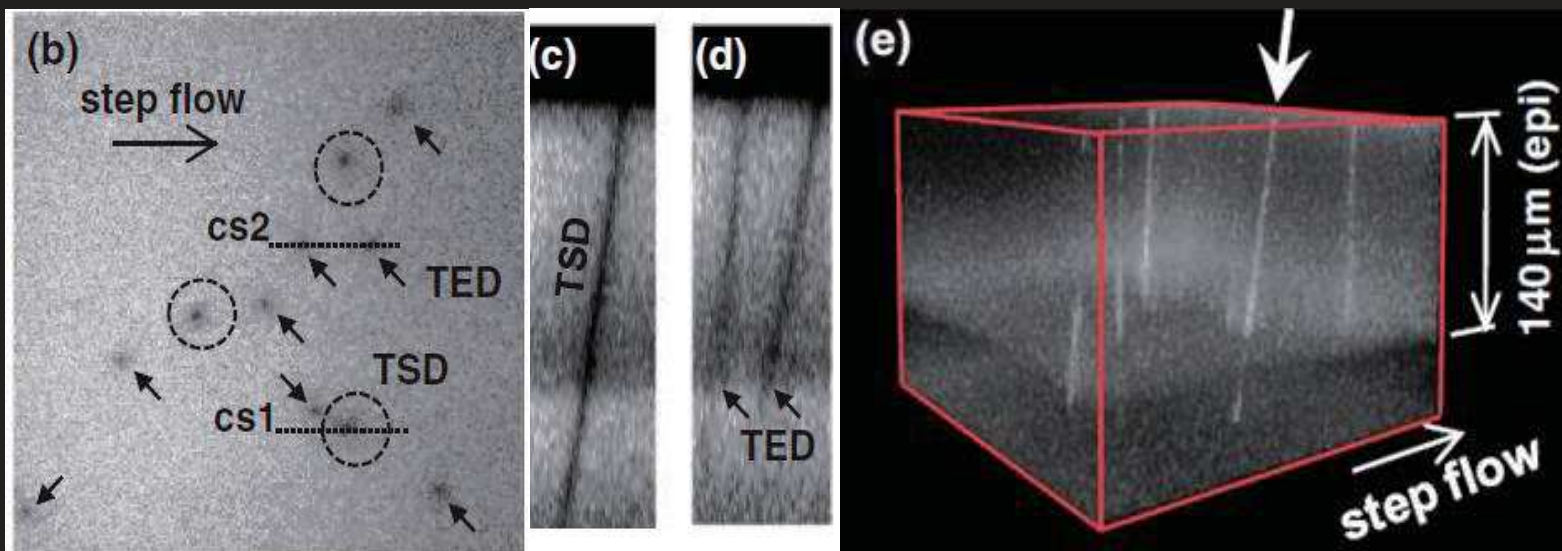
システム：A1MP+

対物レンズ：50x 励起波長：700nm

作例ご提供：東北大学 金属材料研究所 谷川 智之 先生、松岡 隆志 先生

第78回応用物理学会 秋季学術講演会にてご発表

観察例② 4H-SiC結晶の貫通転位の3次元イメージング



サンプル：4H silicon carbide (4H-SiC)

システム：A1MP+

倍率：20x, 50x 励起波長：700nm

作例ご提供：一般財団法人電力中央研究所 材料科学研究所 機能材料領域 田沼 良平 先生

Applied Physics Express 7, 121303 (2014) 引用

電子冷却裏面入射型 高S/N比ファイバマルチチャンネル分光器 **QEPro**

**微弱光測定から高分解能測定まで幅広く対応
新機能: スペクトルバッファリングで安定したデータ取得を実現**



- 1 入射スリットの交換が可能
- 2 最大15,000スペクトルのバッファリングが可能
- 3 A/D分解能: 18bit
- 4 90%ピークの高い量子効率
- 5 電子冷却により低ノイズ・低ダークシグナルを実現

仕様

- 受光素子: 電子冷却裏面入射型CCD
- 有効素子数: 1024×58 pixel
- 測定波長範囲: 200 ~ 950 nm (HC-1グレーティング選択時)
- 波長分解能: 1.90 nm (HC-1グレーティング、25 μmスリット選択時: 参考値)
- S/N比: 1000:1
- インタフェース: USB2.0

アプリケーション

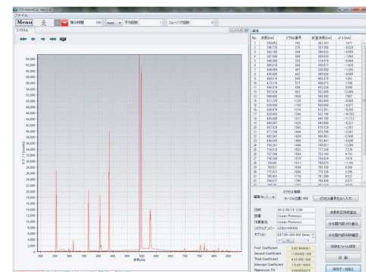
- LED全光束測定
- LED配光測定
- 量子効率測定
- ラマン分光
- 蛍光測定
- プラズマモニタ



波長校正係数作成ソフトウェア

OPwave-Calはオーシャンインサイト社製分光器用の波長校正係数作成ソフトウェアです。分光器の波長校正を行う際の水銀やアルゴンなどの基準光のスペクトル輝線より、簡単に波長校正係数を算出できます。

QE Proはスリット交換可能という特長があります。スリット交換のたびに分光器の波長校正を行う必要がありますが、その際に非常に有効なソフトウェアです。もちろん、QE Pro以外の同社製分光器の波長校正係数作成にもお使いいただけます。



ハード・ソフト両面から特注に対応します。ぜひご相談ください。 デモ測定&デモ機貸し出し随時受付中

基板の表面温度 ひずみ・膜厚の リアルタイム計測

kSA BandiT

バンドエッジ波長を検知し、
非接触で基板表面温度を正確に測れます。



kSA MOS

エタロンを使用した平行配列ビームにて、
基板のひずみ、応力、膜厚の in-situ 測定が出来ます。



RHEED



国内実績 No.1

- ・90 μ mの安定した電子ビームが得られます。
- ・据付時に軸合わせが不要です。
- ・放電しにくい低ガス放出設計。
- ・kSA400のガスコントロール(オプション)により、ソフトウェア上から外部制御可能

kSA 400 RHEED回折像の解析システム



88fps CCD又は112fps CCDから選択



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350台以上の納入実績。
30keV RHEEDと
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kSA ICE

MOCVD 用
オールインワンモデルです。



ホットリップSUMOセル

- ・シリンダー型の特長である材料を多く充填できること及び、コニカル型の特長である均一性が良いことの両方の利点を兼ね備えており、長時間に亘り安定したフラックスの供給ができます。
- ・Ga, Inに最適なセルです。

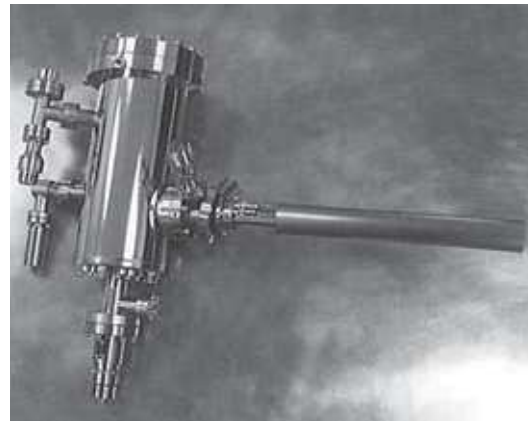
対象材料

Ag	BaF ₂	In	Mn	CaF ₂
Cu	Ga	Ge	Sc	ZnS



As用バルブドクッカーセル

- ・シャワーノズル仕様で使用時間が大幅にUP
- ・サーボモーターコントローラによりフラックスを自動に制御



高温セル

- ・耐酸化構造により、操作温度MAX2000 $^{\circ}$ Cを実現しました。
- ・Fe, Co, Ni等磁性材料に最適です。
- ・使用する材料により、ルツボとライナーの材質を変更することが出来ます。
- ・お客様にてフィラメントの交換ができます。

対象材料

Ag	Au	B	BaF ₂
CaF ₂	Co	Cr	Cu
Ge	Sc	Y	



(注) ルツボの他にライナーが必要になります。

ルツボの種類 : PBN, PG, Al₂O₃, BeO, Ta, W
ライナーの種類 : Al₂O₃, PG, BeO, ZrO₂

株式会社 アールデック

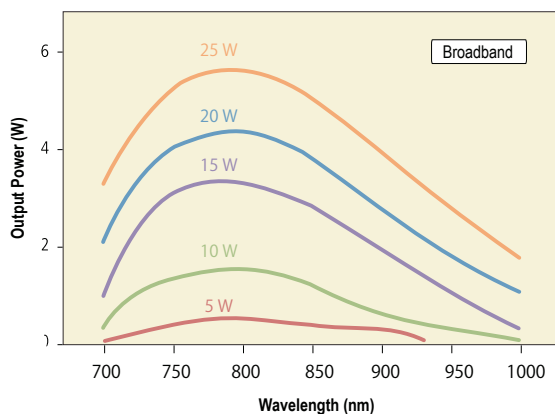
本社 〒305-0051 茨城県つくば市二の宮1丁目16番10号
Phone: 029-858-0211(代表) Fax: 029-855-9877
東京支社 〒113-0033 東京都文京区本郷3丁目15番4号 本郷小林ビル5F
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Compact Ultra-Narrow Linewidth Ti:Sapphire Tunable Ring Laser



Matisse C Tuning Curves
with a Single Broadband Mirror Set.



Frequency Stabilization

Matisse CR

A unique phase lock loop technique provides <2 MHz linewidth with passive frequency stabilization. The Matisse CR can be readily upgraded to the higher resolution Matisse CS.

Matisse CS

The Matisse CS actively-stabilized Ti:Sapphire ring laser utilizes a reference cavity and offers a spectral linewidth of <50 kHz.

Matisse CX

The Matisse CX provides spectral linewidths to below 20 kHz. This ultra-narrow linewidth is achieved by use of an intra-cavity electro-optic modulator (EOM) and the Pound-Drever-Hall stabilization scheme with a high finesse external reference cavity.

Matisse C Advantage

- Compact, sealed, fully automated design
- Hands free operation
- Broad tuning range (>300 nm) with one optics set
- Widest mode-hop-free piezo tuning >50 GHz
- Scan Stitching for mode-hop-free tuning up to 300 nm
- Extended scans over nanometers (requires wavemeter)
- Highest output power available >6.5 W
- Narrowest linewidth <20 kHz rms

Applications

- High-resolution spectroscopy
- Atom cooling and magneto-optic trapping
- Atomic clocks
- Bose-Einstein condensates
- Frequency combs
- Quantum computing
- Microcavity resonators
- Quantum applications



レーザー学会産業賞 貢献賞
Laser Industry Contribution Award

The World's Sales Leader in Thin-Film Thickness Measurement



Profilm3D 3D Optical Profiler

- ◆ Low cost - High Accuracy
- ◆ Non-contact measurement using state-of-the-art white light interferometry
- ◆ A 100mm Auto-XY Stage
- ◆ Measure 50nm-10mm three-dimensional shape
- ◆ Measure down to 1nm with PSI mode
- ◆ 2mm square wide field of view when using 10x lens
- ◆ Supports various objective lens with digital zoom



Zeta-20 Optical Profiler

- ◆ Measure 3D shape in one scan
- ◆ Fast 3D shape measurement with unique Zdot™ technology
- ◆ Flexible data display : 2D and 3D height
- ◆ Supports objective lens of 2.5x - 150x
- ◆ Measure high reflection and low reflection simultaneously



F50 series Thin-film Thickness Mapping Systems

- ◆ Automated film thickness mapping
- ◆ Supports samples of various sizes 2inch to 450mm in diameter
- ◆ Map patterns : polar, rectangular, linear, or your own with no limit number of measurement points
- ◆ Film thickness distribution can be displayed in 2D or 3D color map
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Sputtering by Pressure Gradient System

『PGS model』

Innovative sputter deposition technology that can solve the conventional problems and improve the performance which is one of the most popular vacuum film forming means.



【Feature】

Comparison items	Normal Sputtering	Pressure Gradient Sputtering
Pressure Gradient	No	Yes
Substrate Pressure	$\approx 5 \sim 0.5 \text{ Pa}$	$\leq 10 \sim 2 \text{ Pa}$
Target Pressure	$\approx 5 \sim 0.5 \text{ Pa}$	$\approx 0.4 \text{ Pa}$
Mean Free path	short	Long ※technical data①
Distance between Substrate and Target	50mm	$\geq 150 \sim 200 \text{ mm}$
Plasma density	Low	High
Deposition rate	Slow	Fast ※technical data② (More than twice the normal sputtering)
Substrate Plasma Damage	High	Less ※technical data⑧
Film Formation Quality		Improved crystallinity ※technical data③

【Reference data】

Result and Discussion

① In-situ pressure measurement

(A) Normal sputtering

CP	CC	ST	TG	TG/ST
0.5 Pa	0.4 Pa	0.8 Pa	0.8 Pa	1.0

(B) Pressure gradient sputtering

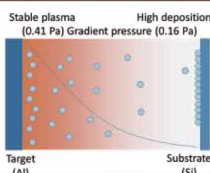
CP	CC	ST	TG	TG/ST
$3.7 \times 10^{-2} \text{ Pa}$	0.1 Pa	0.16 Pa	0.41 Pa	2.6

Using the differential pumping system, TG / ST was increased.

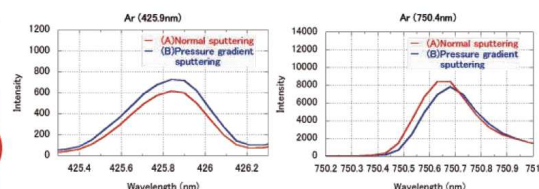
② Thickness (or deposition rate)

	Thickness (nm)	Deposition rate (nm/min)
(A)	36.2	1.8
(B)	75.2	3.8

Using the differential pumping system, deposition rate **doubled**.



③ In-situ optical emission spectroscopy



	Intensity (integrated)		
	425.9 (nm)	750.4 (nm)	425.9 nm / 750.4 nm
(A)	5387	55604	0.097
(B)	6679	50117	0.133

Thank you, we appreciate your support



15th year of consecutive awards

2018 15th Cho Monodzukuri Grand Award for Parts Electric / Electronic Parts Award

Diaphragm Valves for Next Gen Semiconductor Process



Cho Monodzukuri Grand Award for Parts - Awards History

2017	14th	2016	13th	2015	12th	2014	11th	2013	10th	2012	9th	2011	8th
Machine Parts Award	Machine Parts Award	Machine Parts Award	Incentive Award	Incentive Award	Electric and Electronic Parts Award	Machine Parts Award	Incentive Award	Machine Parts Award	Machine Parts Award	Machine Parts Award	Machine Parts Award	Incentive Award	Incentive Award
High Performance Metal Gasket Fitting for Ultra High-Pressure Hydrogen Gas	Ultracompact IGS (Integrated Gas System)	Fujikin Advance Liquid Vaporize System	Electrically controlled ultra-fast response valves with electric double-layer capacitor (EECV ₂)	Flow Ratio Controller (FRC)	Stick IGS	High-performance sanitary soft diaphragm valves							
2010	7th	2009	6th	2008	5th	2007	4th	2006	3rd	2005	2nd	2004	1st
Machine Parts Award	Machinery Component Award	Parts Related to the Environment Award	Incentive Award	Incentive Award	Machine Parts Award	Incentive Award	Machine Parts Award	Incentive Award	Machine Parts Award	Parts Award	Parts Award	Parts Award	Parts Award
FCS ₂ -P 250°C high-temperature-compatible pressure-controlled gas flow volume controller	Gas-operated high endurance direct diaphragm valves	Control valves and shutoff valves for automobile fuel cell high-pressure hydrogen filler	Pressure-controlled flow volume controller	Electronic Valves SR100E	Electric compact direct diaphragm valves	Ultra-compact metal gasket fittings							

Awards History

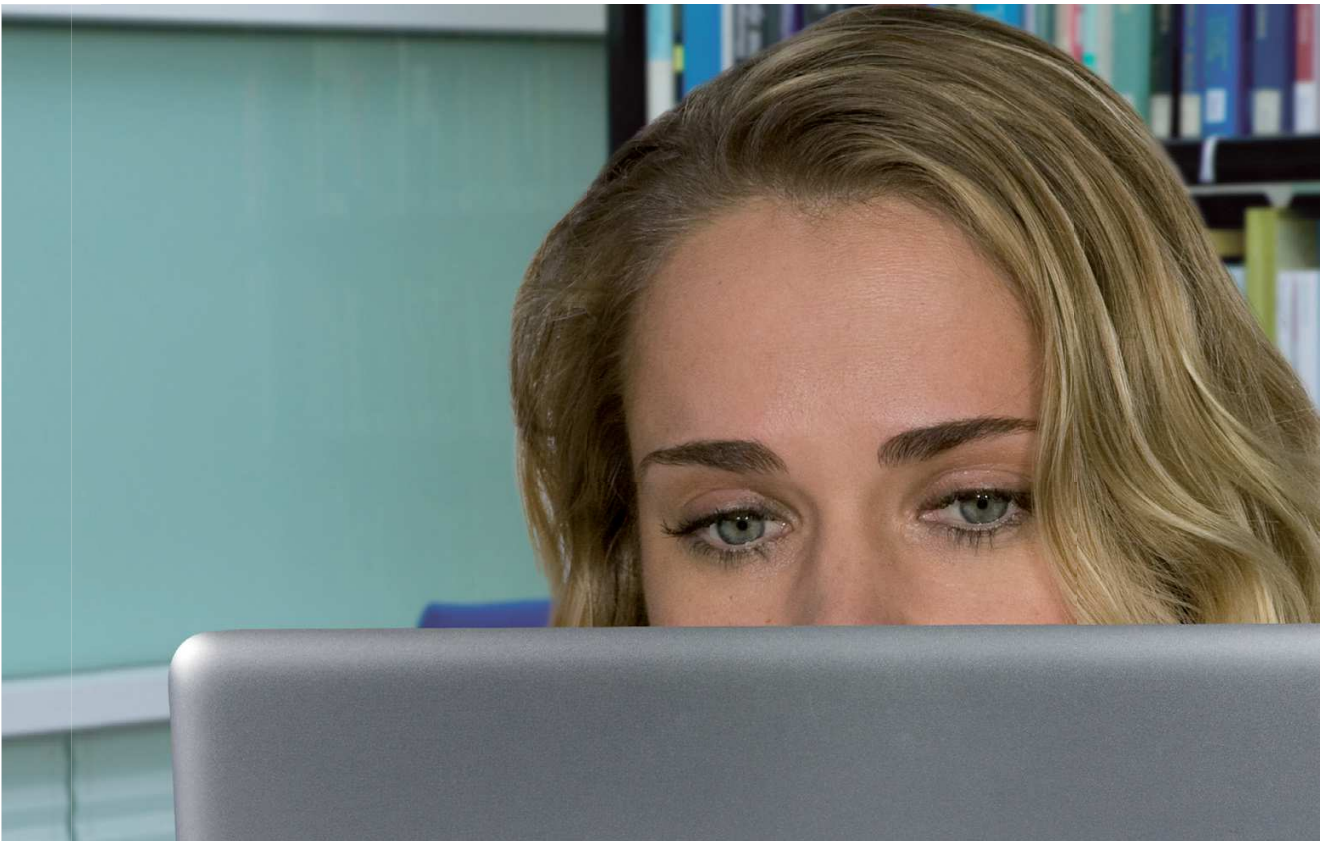
<p>2016</p> <p>The Order of the Rising Sun, Gold and Silver Rays</p>	<p>2017</p> <p>The 7th Monodzukuri Nippon Grand Awards Ministry of Economy, Trade and Industry</p> <p>Awarded to 7 developers</p> <p>Fujikin Advanced Liquid Vaporizing System</p> <p>FALVS</p>	<p>2017</p> <p>43rd Invention Award: Nikkan Kogyo Shimbun Award</p> <p>Direct touch metal diaphragm valves</p>	<p>2017</p> <p>ASelected as a "Regional future leading companies"</p> <p>地域未来牽引企業</p>	<p>2016</p> <p>Awarded the 32nd Sokeizai Industry Technology Awards, Small and Medium Enterprise Agency Director's Award</p> <p>LPS Valves</p>	<p>2014</p> <p>Selected by the Ministry of Economy, Trade and Industry as a "Global Niche Top Company".</p>
<p>2001</p> <p>Medal with Yellow Ribbon</p>	<p>2011</p> <p>Awarded the Nikkan Kogyo Shimbun 6th Monodzukuri Associated Grand Awards Special Award</p>	<p>2005</p> <p>The 1st Monodzukuri Nippon Grand Awards Excellence Prize</p> <p>Awarded to 9 developers</p> <p>the stable integrated ultra-pure gas supply system for semiconductor manufacturing</p> <p>IGS</p>	<p>1990</p> <p>3rd Small and Medium Enterprise Excellent New Technology / New Product Award: Incentive Award</p> <p>attitude control satellite propellant supply device</p>	<p>1984</p> <p>Awarded the USA Vaaler Award</p> <p>1983</p> <p>Chemical Plant Show Excellence Award</p>	<p>1982</p> <p>Awarded the Nikkan Kogyo Shimbun Judai New Product Award</p> <p>fine ceramic valves</p> <p>COSMIX</p>



Intenat "Beyond the Flow" of Things.

Only **Electronic Valves** can make "Flow" with *Auto*.





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akiyuki.tokuno@springernature.com

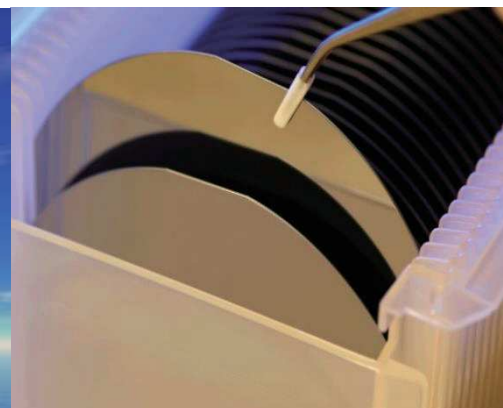
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Continuous Challenge for New Possibilities

PROFILE

MO Sangyo, global electronic materials trading company, deals mainly III-V family compound, Si, Ge, SiC, GaN and each type of single crystals together with Epitaxial (MOCVD, MBE, and Thermal CVD) to be used for R&D and mass production for Opto device, Micro wave device, and Power device. We also introduce a large range of foundry services by taking advantage of various knowledge.



PRODUCTS

◆GaAs, InP single crystal substrate

Size : 2, 3, 4, 6 inch

◆GaSb, InSb, InAs, GaP single crystal substrate

Size : 2, 3 inch

◆SiC (4H) single crystal substrate

Size : 2, 3, 4 inch

◆Ge single crystal substrate

Size : 2, 3, 4, 6 inch

◆GaN single crystal substrate

Size : 2, 3, 4 inch

◆Al₂O₃ single crystal substrate (Sapphire)

Size : 2, 3, 4, 5, 6, 8 inch

◆Si single crystal substrate

Size : 2, 3, 4, 5, 6, 8 inch

◆Epitaxial growth (MOCVD, MBE)

Size : 2, 3, 4, 6 inch

Manufacturers

- ▲ AXT ... GaAs, InP, Ge, VGF Wafer
- ▲ JX Crystal ... GaSb, InAs, InSb, LEC, VGF Wafer

- ▲ Monocrystal ... Sapphire
- ▲ EST ... MBE Epitaxial
- ▲ Epitaxial/FVL ... MOCVD Epitaxial

*Inquiries on matters other than the above are also welcome. Please feel free to contact us.

マスクレス露光装置 Maskless Exposure System



「フォトリソを、もっと身近に！」

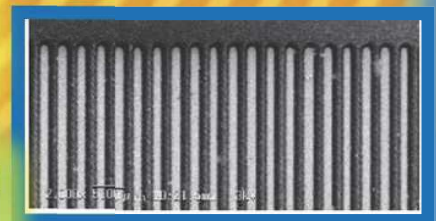
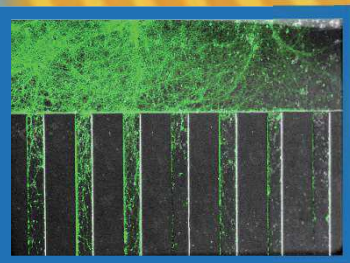
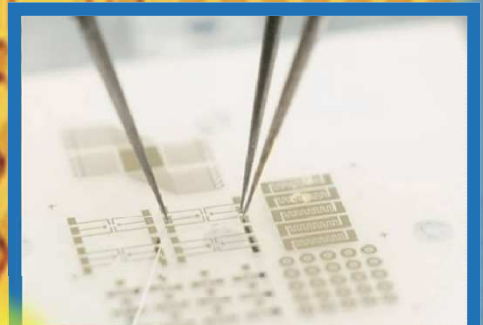
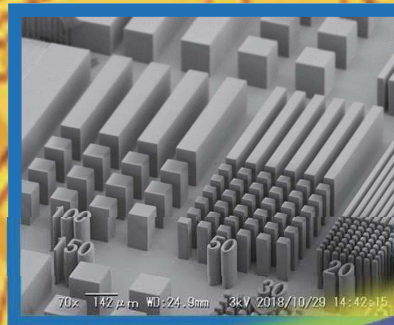
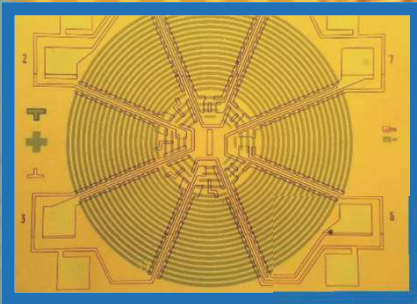
あらゆる分野で利用されるMEMS技術の代表格であるフォトリソグラフィを、卓上で、手軽に、思いのままに行えるのがマスクレス露光装置“PALET(パレット)”です。設置場所を選ばない装置サイズ、マスクレス露光装置の常識を破る価格設定、思いついたパターンをその場で形にできるシンプルな操作性は、トライ&エラーが必要不可欠な研究・試作用途に最適です。

「Be familiar to Photolithography！」

Photolithography is one of the representative technique in MEMS, and Maskless direct-exposure system “PALET” supports easy & simple desktop photolithography, and enable your idea to be solid innovative devices with minimum efforts.

Compact product size, reasonable price and simple operation supporting to shape patterns of your intuitive ideas instantly is the most ideal choice for a research and development purpose which requires try and error to build up prototype or research based devices.

- ◎サンプル作成可能 Sample creation is possible
- ◎デモ可能 Demonstration possible



- ・機能の絞り込みによる低価格化を実現
- ・露光エリア：□25mm (or □100mm)
- ・最小露光線幅：3μm
- ・手動ステージモデルと電動ステージモデルを用意

- ・Achieving low price by careful parts selection
- ・Exposure area : □25mm (or □100mm)
- ・Minimum Exposure line width : 3μm
- ・Supporting either manual or motorized stage

NEOARK **ネオアーク株式会社**
NEOARK CORPORATION

URL <http://www.neoark.co.jp>
MAIL info@neoark.co.jp

・大阪支店 OSAKA OFFICE
(STAFF: 平野 HIRANO)
〒541-0056 大阪府中央区久太郎町2-3-8-201
TEL (06)6271-5123 FAX (06)6271-5110

・東京営業部 TOKYO OFFICE
(STAFF: 小宮 KOMIYA)
〒192-0021 東京都八王子市中野町2062-21
TEL (042)627-7432 FAX (042)627-7427



HiCubeClassic



HiPace , ATH



ASM340



PrismaPlus



ACP

Pfeiffer Vacuum product portfolio for Semicon Nano2019



Turbo pumping stations ~HiCubeClassic series~

- ▼ Compact, easy operation , various combination incorporating turbopumps and backing pumps.

Turbopumps ~ HiPace(M) series, ATH (M) series~ 【pumping speed (N₂): 10 ~2,800 L/s】

- ▼ Hybrid Bearing & Mag-lev model: Optimized reliability use proven bearing systems which are available in two different options.
- ▼ Suitable for all high and ultra high vacuum applications : Corrosive, High compression, and High gas throughput models.

Multi-stage roots dry pumps ~ACP series~

- ▼ Clean and dry vacuum: No particle contamination such as scroll pump. Oil -free, no lubricants inside the pumping module.
- ▼ Low cost ownership (Recommended Maintenance cycle : every 20,000~22,000 h)
- ▼ Low energy operation available by combination with HiPace.

Quadrupole mass spectrometers ~PrismaPlus~

- ▼ High speed measurement from 2 ms
- ▼ 4 ion source options provides the best solution.
- ▼ 8 decades dynamic range
- ▼ Up to 128 measurement channels at once

Helium leak detectors ~ASM340~

- ▼ Smallest detectable helium leak rate: 5×10^{-13} Pa·m³/s
- ▼ Easy operation, intuitive menu and large color touch screen
- ▼ Rapid response time due to high helium pumping speed : 2.5 L/s
- ▼ High backing pump capacity for versatile use: 15m³/h(RVP model)
- ▼ Unique capability to detect leaks starting at 100 hPa.

Hakuto Co., Ltd.



Head office
Kansai branch
Isehara service center
Shanghai branch

1-13, Shinjuku 1-Chome, Shinjuku-Ku, Tokyo 160-8910
Miyahara 4-1-6, Yodogawa-ku, Osaka-city, Osaka pref. 532-0003
Suzukawa 42 Isehara-city, Kanagawa pref. 259-1146
Room 303, Longemont Yes Tower, 399 Kaixuan Road, Shanghai, 200051, P.R CHINA

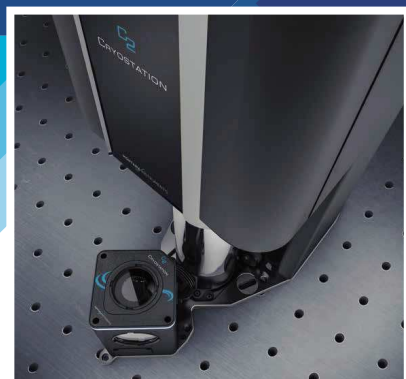
TEL 81-3-3225-8938
TEL 81-6-6350-8913
TEL 81-463-96-2005
TEL 86-21-6381-1212

Website: <http://www.hakuto-vacuum.jp/>

米国モンタナ・インスツルメンツ社製

超低振動無冷媒 (インバータ空冷コンプレッサー)

光学・クライオスタート!




CRYOSTATION

仕様

- 温度レンジ 3.2~350K
- サンプル振動 5nm以下
- ワーキングディスタンス 0.31mm (対物レンズオプション使用)
- 温度安定性 0.01K以下
- サンプルスペース 内径 53mm 高さ 40mm、高真空 (オプションで拡張可能)
- 光学窓&外部電気端子 5光学窓 (オプションで6光学窓可能) & 28端子 (オプションで拡張可能)
- 電源 単相AC200V 50/60Hz

特長

洗練されたフォルムならびに使い勝手をより向上

- 除振台のどの位置にも制限なく配置可能
- 干渉なしに対物レンズを容易に近接可能
- 拡張性をボリュームアップ

超低振動『5nm以下』、温度安定性『0.01K』を実現

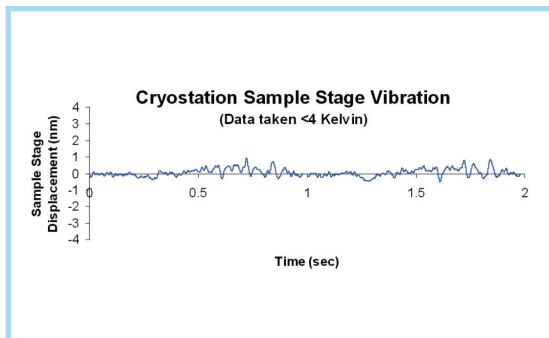
熱伝導が非常に優れた無酸素銅より、さらに15倍以上熱伝導が優れた材料を、Cold finger linkageとして使用、その形状や取付け方法を開発したこと、さらにインバータ制御コンプレッサーを採用したことにより実現

簡単取付と自動制御

- 5光学窓&28端子 (オプション) を活用した簡単取付
- ソフトウェアからすべてを自動制御可能

充実の標準装備と革新的なオプション (標準装備)

- 専用ノートパソコン&ソフトウェア
- 温度コントローラー
- ダイアフラムポンプ
- クライオポンプ
- GM冷凍機
- 空冷コンプレッサー (オプション)
- 対物レンズ
- 6光学窓
- 小型電磁石 (最大1T以上可)



より詳しい情報は <http://www.montanainstruments.com/>



Quantum Design Japan
日本カンタム・デザイン株式会社

〒171-0042 東京都豊島区高松1-11-16西池袋フジタビル
TEL. 03-5964-6620 FAX. 03-5964-6621 info@qdj.co.jp
<http://www.qd-japan.com/>

TCSPC (時間相関単一光子計数測定) をより自在に、より速く。



PICOQUANT

マルチチャンネル TCSPC 装置 *MultiHarp 150*

比類のない短いデッドタイムで最高のスループットを実現

- 4ch. または 8ch. 独立入力チャンネル
- デッドタイム : 650 ps (1ch. 当り)
- TCSPC 時間分解能 < 100 ps
- 時間タグ時間分解モード (TTTR モード)
- 持続データスループット (32bit) :
80 Mcps (タイムタグモード時), 180 Mcps (ヒストグラムモード時)



励起用ピコ秒レーザードライバ *Taiko PDL M1*

波長&パワー調整機能付き。リニア出力 (vs. 電流値)。

- バーストパターン、パルス&CW モードを設定可能
- 繰返し周波数 1 Hz to 100 MHz
- リアルタイム出力表示
- フル同期機能 (手動&PC)
- 外部トリガ入力



<https://www.japanlaser.co.jp/>

E-mail: jlc@japanlaser.co.jp

 **JLC** 株式会社日本レーザー

東京本社
大阪支店
名古屋支店

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大阪市東淀川区東中島1-20-12
名古屋市中区錦3-1-30

TEL 03-5285-0863(直)
TEL 06-6323-7286
TEL 052-205-9711

For high performance inspection, measurement and observation in power electronics applications

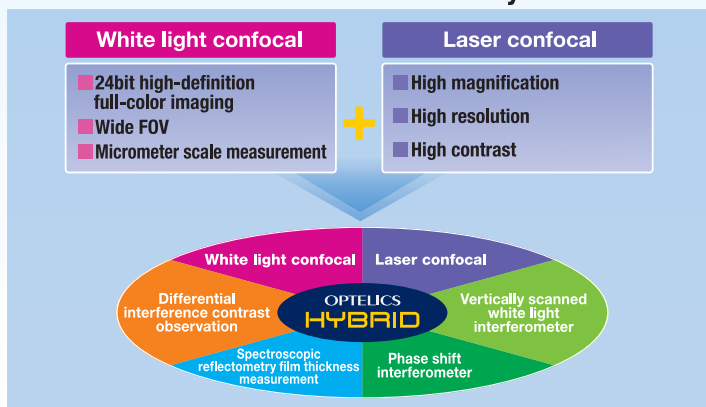
OPTELICS HYBRID



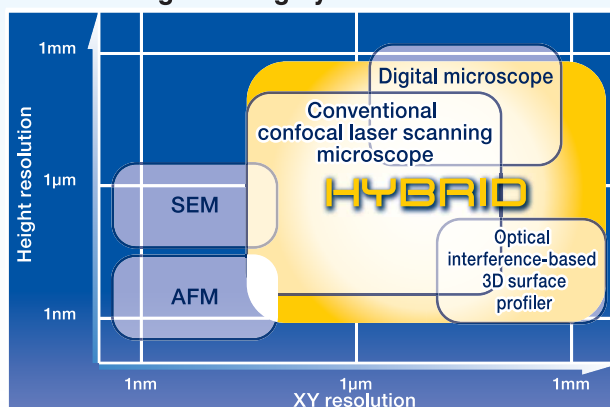
White light confocal + Laser confocal

World's First Hybrid Optical Microscope
Featuring dual optical systems to meet the needs of diverse applications

6 functions in one body



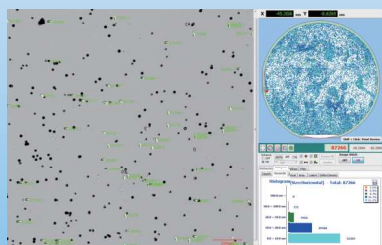
Wide coverage and highly accurate measurement



Key Features

- Non-destructive observation with up to nanoscale resolution and 3D measurement capability
- Optical interference measurement, differential interference contrast observation, and spectroscopic reflectometry film thickness measurement – all available on a single platform
- Industry-leading measurement speed and accuracy
- Highly accurate measurement in wide FOV
- 12 megapixels of confocal color image
- Auto-measurement software: Automated positioning and measurement of small patterns
- Auto-inspection software: High resolution defect review and classification

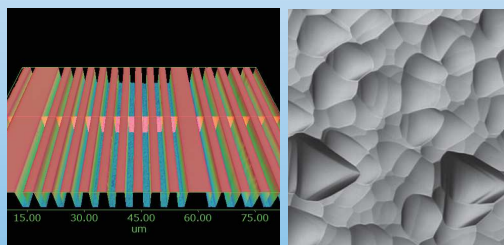
Defect Inspection



Defect inspection screen

Whole SiC wafer etch pit inspection, defect review and classification

Measurement & Observation

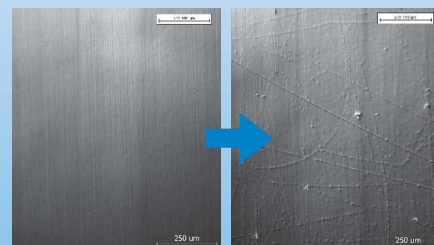


3D trench image

SiC wafer backside inspection

Measurement of trench width/height, roughness, and thin film thickness

High Temperature Observation



Anneal process, room temperature Anneal process, 1600°C

In-situ observation of changes in defects during high-temperature process

The inspection and analysis of defects is the first step of process improvement. Lasertec provides the best solution.

株式会社エピテックは

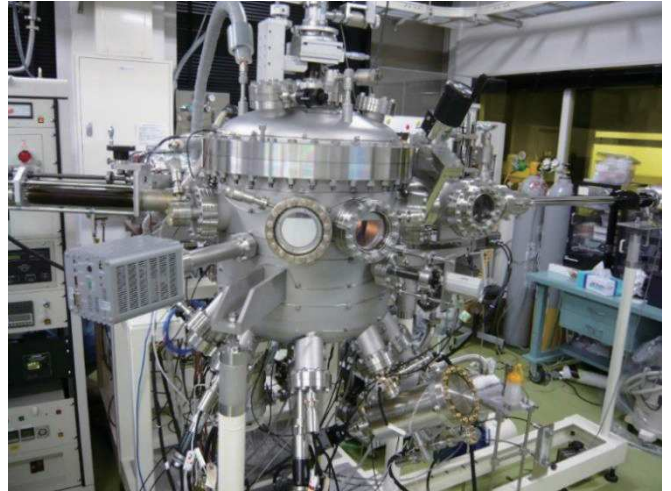
2003年創業以来、半導体等の先端分野で広く使われている真空装置を中心にシステム設計製造、真空部品・成膜部品の設計加工やメンテナンス、各種電源・制御装置、ソフトウェアに至るまで、お客様のご要望に限りなく近づくことをモットーとしています。

【MBE 装置 (3室構造)】

2インチ対応, Kセルポート×8 (ICF114)
排気系: TMP×2

部品設計加工もさせていただきます

Mo ヒーター, 基板ホルダ, リフレクタ等
Ta ヒーター, リフレクタ等
その他 石英ガラス SiC ヒーター
グラファイトカーボン



【ベルジャー蒸着装置】



既存の蒸着装置改造もさせていただきます

グローブボックス設計設置 (アクリル製・その他)
蒸発源の改良・増設
特殊シャッター設計・製作・取付
回転・直進・特殊 等
排気系の改造
液体窒素トラップ増設



蒸着源×6 各蒸発源専用のシャッター及び膜厚計設置可能

その他

加熱 CVD 装置 有機材料精製装置
多機能小型真空チャンバ



水冷機構付

液体窒素冷却機構付



Epi Tech Inc.

株式会社エピテック

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TEL: 075-383-4638 FAX: 075-393-4639

URL: <http://www.epitech.co.jp/>

SemiconNano2019 Program at a Glance

	9/24 (Tue)	9/25 (Wed)	9/26 (Thu)	9/27 (Fri)	
7:30	Registration				
7:45					
8:00					
8:15			Registration	Registration	Registration
8:30	Opening	Keynote Stefano Sanguinetti	Keynote Tomoki Machida	Keynote Paul Koenraad	
8:45	Pleanary Hiroshi Amano				
9:00		Invited Armando Rastelli	Invited J. Marcelo J. Lopes	Invited Tomoya Konishi	
9:15		Invited Jin Liu	Invited Henri Mariette	Invited Takuo Sasaki	
9:30	Photo & Coffee Break	Coffee Break	Coffee Break	Coffee Break	
9:45					
10:00	Invited Koichi Okamoto	Invited Victor J. Gomez	Invited Yoshitaka Okada	Invited Hideki Miyazaki	
10:15	Invited Mituru Funato	Alexei Bouravleuv	Shigeo Asahi	Invited	
10:30		Fumitaro Ishikawa	Ryo Tamaki	Richard Hogg	
10:45	Invited Kenji Shiraishi	Satoshi Hiura	Yukihiro Harada	Invited	
11:00		Masafumi Jo	Kenichi Yamashita	Naoya Miyashita	Takeo Kageyama
11:15	Lunch	Lunch	Excursion & Banquet	Lunch	
11:30					
11:45					
12:00					
12:15					
12:30					
12:45					
13:00					
13:15					
13:30	Invited Kazuhiro Ohkawa	Invited Minoru Fujii			Jun Tatebayashi
13:45	Invited Jen-Inn Chyi	Invited Frédéric Grillot			Osamu Kojima
14:00				Invited Mark Holmes	Invited Ilan Goldfarb
14:15	Invited Masahiro Uemukai	Kouichi Akahane		Invited Gavin Bell	
14:30			Invited Nobuhiko Ozaki	Invited Katsuhiko Tomioka	
14:45	Coffee Break	Toshiyuki Kaizu		Invited Holger Eisele	
15:00			Dolf Timmerman	Invited Gunther Springholz	
15:15	Invited Yasufumi Fujiwara	Poster with light meal	Excursion & Banquet	Closing	
15:30					
15:45					
16:00					
16:15					
16:30					
16:45					
17:00					
17:15					
17:30					
17:45					
18:00	Welcome Dinner				
18:15					
18:30					
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19:00					
19:15					
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