UNISOKU 2018 NEWSLETTER

会社概要

商号	株式会社ユニソク
代表取締役社長	宮武　優
設立	昭和 49 年 11 月
所在地	大阪府枚方市春日野 2 丁目 4 番 3 号
資本金	5000 万
事業	走査型プローブ顕微鏡、高速分光 「研究開発分野」にて事業
取引銀行	京都銀行・三菱 UFJ 銀行・商工総合中央金庫
社員数	46 名

COMPANY PROFILE

TRADE NAME	UNISOKU CO., LTD
CEO	Yutaka Miyatake
FOUNDATION	NOV. 1974
LOCATION	2-4-3 Kasugano, Hirakata, Osaka, Japan
CAPITAL	50,000,000 JPY
BUSINESS	Manufacturing and sales of our own UHV LT SPM and kinetic spectroscopy system, research and development
BANKS	Bank of Kyoto, MUFG Bank, Ltd. , The Shoko Chukin Bank
EMPLOYEES	46

沿　革

昭和 49 年 11 月 (`74)	株式会社ユニオン測器を設立。旋光計、光散乱測定装置の販売を開始。資本金 2,500,000 円
昭和 56 年 10 月 (`81)	商号を株式会社ユニソクと変更。ストップトフロー・レーザー分光システムを販売開始
昭和 60 年 10 月 (`85)	増資・・・資本金 5,000,000 円
昭和 61 年　4 月 (`86)	大気中で使用する走査型トンネル顕微鏡を完成、販売開始
平成 元年　8 月 (`89)	超高真空 STM 装置を製品化、販売開始
平成　2 年 10 月 (`90)	増資・・・資本金 10,000,000 円
平成　3 年 10 月 (`91)	極低温超高真空 STM を製品化、販売開始
平 成 9 年 10 月 (`97)	増資・・・資本金 25,000,000 円
平成 10 年　7 月 (`98)	事業拡大のため本社を移設
平成 11 年　8 月 (`99)	2 K 強磁場環境極低温超高真空 STM 装置を製品化、販売開始（NEDO プロジェクトにて開発）
平成 14 年 10 月 (`02)	400mk 強磁場環境極低温 STM 装置を製品化、販売開始（NEDO プロジェクトにて開発）
平成 18 年　2 月 (`06)	2006 年ナノテク大賞　自社技術による走査型プローブ顕微鏡
平成 18 年 12 月 (`06)	枚方市より「ものづくり事業者表彰式」の優秀賞を受賞
平成 19 年　3 月 (`07)	JST 先端計測機器開発による 4 プローブ SPM 装置を製品化、販売開始
平成 19 年　4 月 (`07)	大阪府より「新技術開発功労者」で表彰　極低温走査型プローブ顕微鏡
平成 22 年　9 月 (`10)	株式会社ユニソクは株式会社東京インスツルメンツのグループ会社になる
平成 23 年　9 月 (`11)	Unisoku-TII Instruments 有限公司を北京に現地法人設立
平成 23 年 10 月 (`11)	増資・・・資本金 50,000,000 円
平成 24 年　6 月 (`12)	生産能力拡大のため第一工場完成
平成 24 年 12 月 (`12)	希釈冷凍方式 40mK 極低温強磁場 STM システムを製品化、販売開始
平成 26 年　3 月 (`14)	経済産業省「グローバルニッチトップ企業 100 選（電気電子部門）」に選定
平成 28 年　7 月 (`16)	第二工場完成で生産能力 2.5 倍、作業環境を改善
平成 28 年　9 月 (`16)	光化学協会技術賞受賞
平成 29 年　9 月 (`17)	JST 先端計測機器開発による高速過渡吸収分光装置 picoTAS の製品化
平成 29 年 12 月 (`17)	超低ヘリウムロス クライオスタットを自社開発、300 時間ヘリウム温度保持　新型低温 STM 装置　USM1200LL 発売開始

History

Nov.1974	Estabishment of Union Sokiki Co.,Ltd. Started the sales of Polarimeters and Light Scattering Spectrometers.
Oct. 1981	Changed the trade name to UNISOKU. Started the sales of Stopped Flow and Laser Photolysis Systems.
Oct. 1985	Increased capital to 5,000,000 JPY.
Apr. 1986	Completed and started the sales of Scanning Tunneling Microscopes for use in the atmosphere.
Aug.1989	Productized and started the sales of Ultra High Vacuum STM System.
Oct. 1990	Increased capital to 10,000,000 JPY.
Oct. 1991	Productized and started the sales of Ultra Low Temperature Ultra High Vacuum STM System.
Oct. 1997	Increased capital to 25,000,000 JPY.
Oct. 1998	Relocation of the head office ce due to business expansion.
Aug.1999	Productized and started the sales of 2K High Magnetic Field Ultra Low Temperature Ultra High Vacuum STM System.
Oct. 2002	Productized and started the sales of 400mK High Magnetic Field Ultra Low Temperature High Vacuum STM System.
Feb. 2006	Received Nanotech 2006 “Evaluation and Measurement Award” for Scanning Probe Microscopes with UNISOKU’ s own Technologies.
Dec. 2006	Received the Excellence Award in “Manufacturing Business Award Ceremony” from Hirakata City.
Mar. 2007	Productized and started the sales of 4 Probe SPM System by JST Development of Systems and Technology for Advanced Measurement and Analysis
Apr. 2007	Awarded as “Person of merit for new technology development” from Osaka Prefecture for Ultra Low Temperature SPM.
Sep. 2010	UNISOKU becomes a group company of Tokyo Instruments Inc.
Sep. 2011	Estabishment of UNISOKU-TII Instruments Co., Ltd. in Beijing, China, as an overseas affi liate.
Oct. 2011	Increased capital to 50,000,000 JPY.
Jun. 2012	Completion of the fi rst factory due to business expansion.
Dec.2012	Productized and started the sales of Ultra Low Temperature High Magnetic Field STM System with Dilution Refrigerator.
Mar.2014	Chosen as a “GLOBAL NICHE TOP 100” company from the Ministry of Economy, Trade and Industry of Japan
Jul. 2016	Completion of the second factory expanded 2.5 time in productivity, improving working environment
Sep. 2016	Received the Japanese Photochemistry Association Award for Technical Development
Sep.2017	Productized and launched the sales of Transient Absorption Spectrophotometer, picoTAS, by JST SENTAN
Dec.2017	Developed Supper Low Helium Loss Cryostat, Started the sales of USM1200LL New STM System, which has 300 h holding time.

Message from CEO

経営理念

お客様の探究心に応える計測を提供し、
お客様の成果を通じて、科学技術の発展に貢献する

ユニソクは、お客様の” 観たい”、” 知りたい”、” 突きとめたい” という探究心に応える計測機器を提供することを通じて、お客様による科学上の発見や創造に寄与していきたいと考えています。ユニソクの装置をお使いいただくお客様の成果を通し、科学技術の発展と、便利で豊かな社会の実現に貢献することを目指します。
ユニソクは、お客様の希求する計測を実現する装置を提供するため、自らの技術と知恵を結集し、徹底的に工夫をし、あくなき挑戦を続けます。そして、お客様の研究構想の実現を確かなものとするため、安心してお使いいただけるよう品質を高め、納期を守ることはもちろん、お客様に寄り添ったアフターサービスで成果が出るようサポートします。

Management Philosophy

We contribute to the development of science and technology through our customers researches by offering them our measuring systems that respond to their inquisitive spirit

UNISOKU aims to contribute not only to the development of science and technology but also to convenient and affluent society, by responding to our customers’ inquisitive spirit with desire to ‘Observe’,‘Know’ and ‘Solve’ through our measuring system.
UNISOKU will keep on challenging ourselves to offer instruments that our customers really need by being radically creative and combining our technology and wisdom. We always strive to improve the quality of our devices so that customers can use them in relief. We reasonably meet the delivery due date. We offer considerate after-sales supports so that our customers can get results.

経営方針

お客様・取引先・社員の満足と幸福の追求

ユニソクは自社の事業分野である、科学計測機器の開発・製造・販売に関係する業界全体の発展と繁栄を希求します。お客様には弊社の製品やサービスを通じて、取引先には技術連携や商務を通じて、社員には自身の仕事に対する顧客や取引先からの評価を通じて、満足と幸福を感じ、ともに発展出来る経営を目指します。

現場第一・前向きに挑戦

新製品や改善のヒントはお客様の研究の現場にあると考えます。納品後の装置の稼働状況や、ご使用方法の把握を心がけ、お客様への訪問や連絡を積極的に行います。そして、現場を見て課題を知り、お客様のご要望を真摯に受け止め、問題解決や夢の実現に向け、果敢に挑戦します。

取組み

成長を目指す積極投資

過去 6 年間で、2 棟の新工場建設と、社員数 2 割増加を実現し、生産環境の改善を行いました。引き続き、雇用を促進し、生産力と顧客サポート力を増強するとともに、市場からのニーズが高まっている新製品開発への投資を積極的に行います。

生産性の向上

製品の品質向上を図る事で信頼性を高め、共通化できる部分はモジュール化を推進し、生産性の向上に努めています。また作業手順書、検査書による作業工程の均質化と、不具合報告書による課題の共有と改善に取り組み、より多くのお客様に満足してご使用いただける製品製造を心がけます。今後は、製造現場の生産性だけでなく、お客様の成果のスピード UP を目指す上で、お客様との連携を密にとり、製品に共通した課題の早期発見、製品の使いやすさに向けた改善に邁進してまいります。

グローバル連携

販売・製品開発・サポートでシナジーと利便性を生み出すため、親会社の東京インスツルメンツ社とドイツ・SPECS 社で作る SPECS-TII グループに参画しています。また、自社ではまかなえない他メーカーの卓越した技術と組み合わせ、優れた製品を提供するため、海外を含めたメーカーとの OEM 提携の関係を積極的に受け入れています。

役員紹介／ *Executive introduction*

代表取締役社長　宮武　優
President and CEO　Yutaka Miyatake

取締役　中川 達央
Director　Tatsuo Nakagawa

取締役　水野 博之
Director　Hiroyuki Mizuno

Management Policy

‘Pursuing satisfaction and happiness of our customers, business partners and employees’

UNISOKU aspires after the development and prosperity of our business and the whole industry that relates to development, production, and sales of scientific instruments. We pursue business that each of them feels satisfaction and happiness, and that brings prosperity, through our products and services for our customers, through technical collaboration and commercial affairs for our business partners, and through evaluation from customers and partners for our employees.

‘Hands-on approach’, ‘Positive challenge’

Hints for new products and improvements are at site of customers’ research. We proactively visit and contact them after installation to see how the system is working, and how it is used. By knowing the issues on-site, we take them seriously, then we challenge boldly to find solution and how we can meet customers’ needs.

Endeavor

‘Vigorous investment for future growth’

In past 6 years, we improved production environment by completing 2 new factories and increasing employees by 20%. Besides buildup of productivity and customer support with promotion of employment, we vigorously invest in developing new products of which market needs has been growing.

‘Upgrading productivity’

To improve productivity, we promote modularization where possible, and upgrade the quality of products. For further customer satisfaction, we standardize assembling process through assembling manuals and inspection notes and share defect reports / issues. Hereafter, we will work on not only productivity in factory but also close communication with our users, which leads us to promote early detection of common problems among our products, improves user-friendliness and speeds their results consequently.

‘Global partnership’

We have joined SPECS-TII group which consists of our parent company Tokyo Instruments Inc. and SPECS GmbH in Germany to increase synergy and convenience by sales, product development and customer support. Also, to offer even better products, we actively accept OEM supply-demand relationship by technical collaboration with other manufactures including foreign companies.

2017 Highlights

Jan.


のぞけば原子の世界

Published in Asahi Newspaper in the article
UNISOKU appeared in "Latent power of Kansai area." as a globally active, small and medium company in Kansai.

Mar.

Prototype of Ultra-low Helium Loss Cryostat completed. Achieved 0.5 l/day Helium consumption rate, and 20 days holding time by an originally developed cryostat.

Apr.

Low Temperature UHV TERS system (USM1400 TERS) won "Award for Excellence" in the 29th new technologies and products award for small and medium enterprises.

May.

Establishment of SPECS-TII GmbH
Tokyo Instruments Inc., UNISOKU's parent company, and SPECS GmbH in Germany have established a joint holding company, SPECS-TII GmbH in Switzerland to enforce international business.

Jun.

Dealing of UNISOKU products started in North America by SPECS-TII, Inc.
Dr. Thomas Schulmeyer, CEO of SPECS-TII, Inc. visited UNISOKU.

Jul.

A German student, Mr. Felix Kuester joined UNISOKU for internship for 8 months from July and contributed to improve AFM techniques.

Jul.

The Mayor of Hirakata city visited UNISOKU, and observed our head office / factories as a growing company in Hirakata.

Jul.

Presented RIPT method at International Conference
Director Nakagawa made an oral and a poster presentation about originally developed RIPT method at ICP2017 (Strasbourg, France).

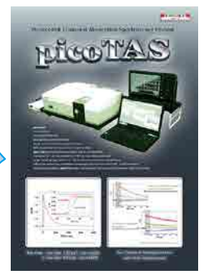
Sep.

Gave an awarded speech about the RIPT method at Annual Meeting on Photochemistry, awarded as 'The Japanese Photochemistry Association Award for Technical Development 2016'.

Nov.

Introduced UNISOKU products in AVS2017 (Tampa, US).

Sep.



picoTAS on sale.
Innovative picosecond transient absorption spectrophotometer using the RIPT method has been productized and officially on sale.

Dec.

The new model of USM1200 using originally developed Low Helium Loss Cryostat was completed and firstly delivered.

Highlights 2017

Lunch Break

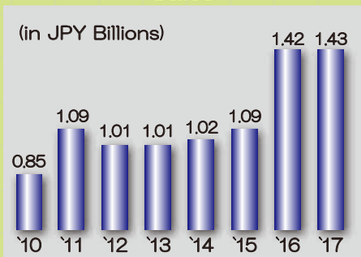
Fun time!!

新入社員紹介 NewFace!

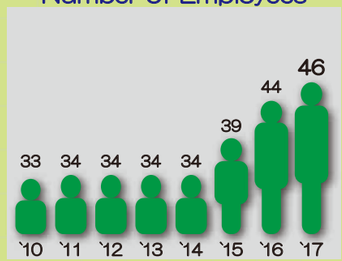
Four new members joined UNISOKU in 2017. Two of them are technical staff. They work for SPM division and experienced foreign business trip already. The other two work at the office, as a secretary and accountant with their career backgrounds.

Campany information

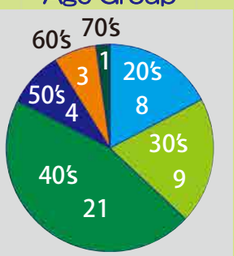
Sales



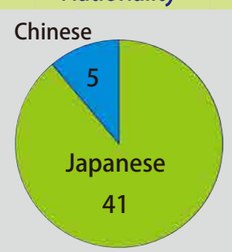
Number of Employees



Age Group



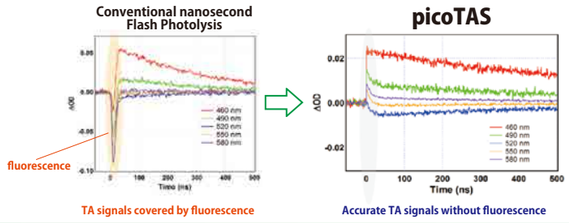
Nationality



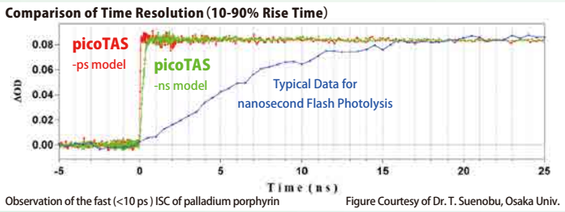
New Products and New information

picoTAS

picoTAS is an innovative transient absorption spectrophotometer based on originally developed RIPT method, of which first report[*1] was highlighted in Science and Nature Photonics.



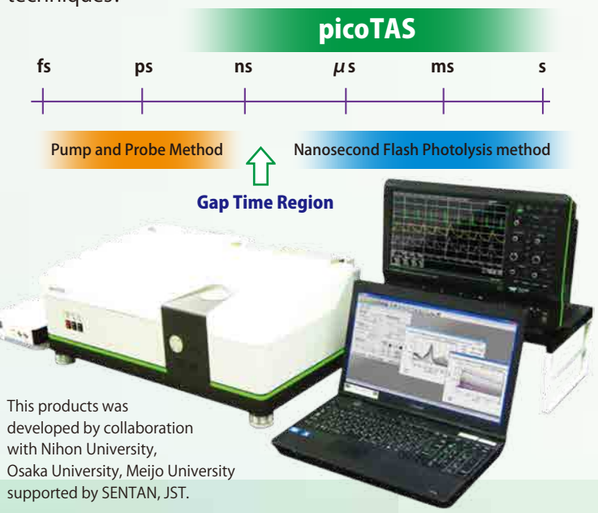
TA signals covered by fluorescence　　Accurate TA signals without fluorescence



Observation of the fast (<10 ps) ISC of palladium porphyrin　　Figure Courtesy of Dr. T. Suenobu, Osaka Univ.

*[1] *Optics Lett. 41, 1498 (2016)*
Highlighted in Science 352, 669 (2016), and Nature Photonics 10, 285 (2016)
応用物理 *86, 775 (2017)*
分光研究 *66, 207 (2017)*

What is the difference between **picoTAS** and conventional techniques?



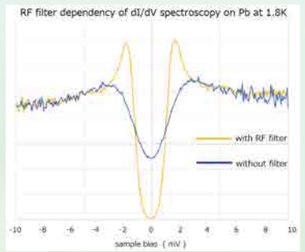
This products was developed by collaboration with Nihon University, Osaka University, Meijo University supported by SENTAN, JST.

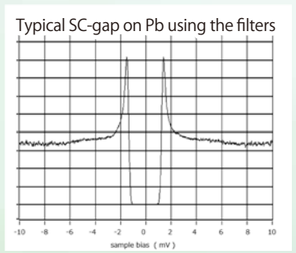
SPM Products

Updated information of new RF filter for USM1300

A: RF filter on piezo and bias line

These are very effective to get 2K below on electron temperature.　＊We deliver these filters as standard equipment.

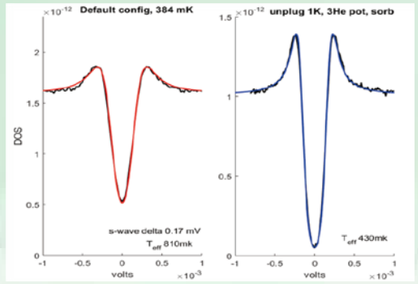




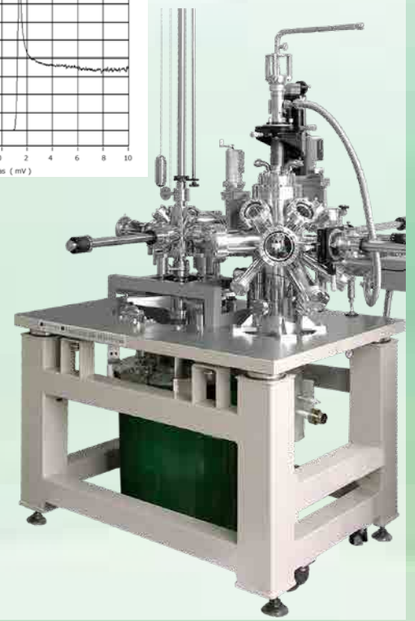
B: RF filters on temperature sensors.

Recently. UNISOKU found that RF noize which come through unreachable cable to STM, would affect on electron temperature.

RF filters for the temperature sensor on Cryostat



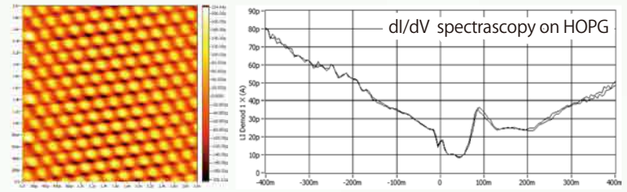
* This data was provided by Dr. Alan Fang in Stanford university, Prof. Aron Kapitulnik.

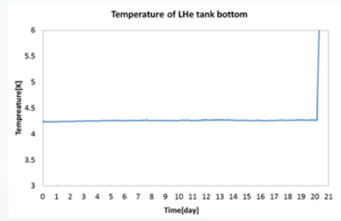


Innovative upgrade of the cryostat on USM1200 series

- 330h holding time with 10litters Liquid Helium.
  - Lower running cost than Cryocooler
- 170h holding time with 14litters Liquid N2
  - 1week continuous STM measurement.
- Quiet and stable enviroment for STM
  - Temperature stability is < 50mk/week
  - No mechanical viblation from Cryostat
- Variable temperature function by mechanical heat switch.
  - 5K~50K. Less counter heating because of the isolation by the heat switch.

STM performance is properly stable because of high temperature stability and quiet cryostat





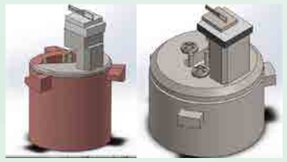
Temperature stability and long holding time in prototype cryostat

Progress of UNISOKU AFM using q-Plus sensor technology

UNISOKU made a license contract with prof. Giessibl in 2015 on q-Plus AFM sensor technology. UNISOKU has worked to improve AFM using q-plus technology. Recently, we can offer the demonstration of atomic resolution in the site acceptance test, and we realized atomic imaging in high magnetic field and 400mK as well.

(improving of sensing)

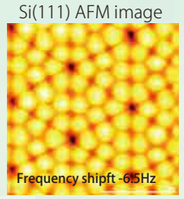
- Increase of Q-facter by well designed structure.
- loss crosstalk current measurement by the individual wireing of Tif.
- low noise signal wiring



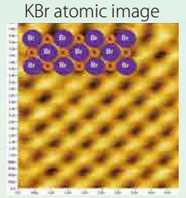
(AFM operation in High Magnetic field within 1K)

- Multi electrodes probe holder
- Actual proven in 8T and 400mK

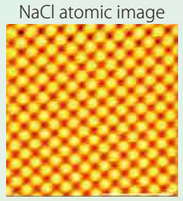
Si(111) AFM image



KBr atomic image



NaCl atomic image



Information of the updated SPM accessories

EBT-100 Tip heating power supply

- Remote dial box for filament control
- Protection is enriched than previous model

APS-100 DC power supply

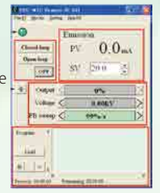
- Remote dial box for control the power
- USB interface for PC connection

EBM-100 sample EB heating power supply

- Remote dial box for filament control
- Protection is enriched than previous model
- Limit setting of the emission current to avoid overheat
- Analog external control mode.
  (*Possible to perform temperature feedback control by combination with SPC-MTC.)

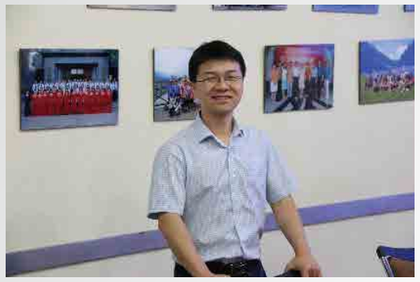
SPC-MTC Heater power control unit

- Two output channel to control external heater power supply
- Two input channels for monitor the reference signals
- Closed feedback loop mode
- USB interface for PC connection and the easy control software
- Programmable temperature setting



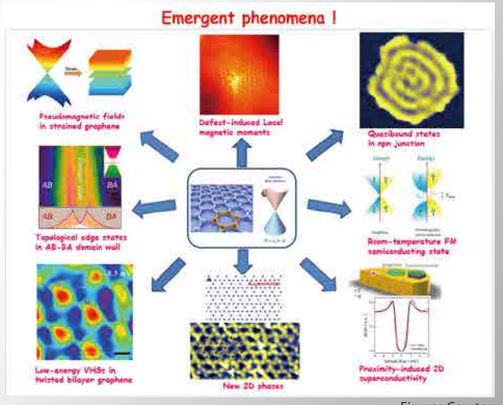
UNISOKU User's Page

Introduction of Laboratory :
Prof. Lin He Beijing Normal University



General introduction to our group

I began to establish my lab in Beijing Normal University since 2009. In the past few years, my group has focused on realizing emergent phenomena in graphene. By using symmetry breaking of lattice, high magnetic fields, and electronic field to tune the electronic properties of graphene, my group realized many new and novel quantum states.



Introduction of study utilizing UNISOKU system

Many interesting emergent phenomena, as shown in the right picture, have been realized in my group and studied carefully by using STM. For example, we demonstrated that atomic defect can induce local magnetic moments in graphene, we realized room-temperature ferromagnetic semiconducting state in graphene, and direct imaged topological edges states in AB-BA domain wall of graphene bilayer.

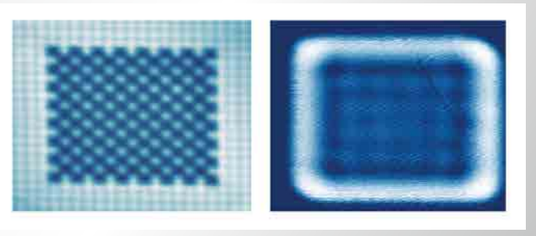
Figures Courtesy of Prof. Lin He

Introduction of Laboratory :
Prof. Sander Otte, Delft Univ. of Technology

In a recent paper we have studied arrays built from individual atomic vacancies on a chlorine-terminated Cu(100) surface. It is one of the most extended systematic studies of atomically crafted artificial materials to date. In particular, we found that by adjusting the density of vacancies, the effective mass of the resulting quasiparticle bands can be tuned.

In our group we try to improve atom manipulation techniques and use this technology to build and study extended atomic structures. We look for emergent behavior such as band formation, phase transitions or other collective phenomena that arise when a structure is scaled from a few to many atoms.

A particular class of systems that has our interest are spin chains composed of individual magnetic atoms. In these structures, we can observe and study the dispersion of collective spin excitations such as magnons.



Left: STM image (~8 nm wide) of a checkerboard lattice crafted from individual Cl vacancies in a Cl/Cu (100) surface layer. Right: corresponding dz/dV spectroscopy map measured at 2.97 volts, showing standing quasiparticle modes.

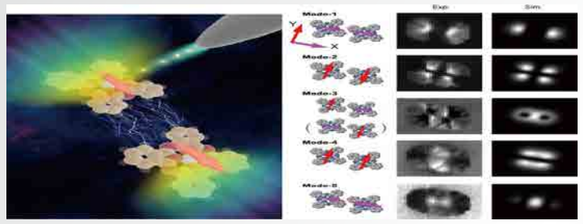
J. Girovsky et al., SciPost Physics 2, 020 (2017)

Figures Courtesy of Prof. Sander Otte

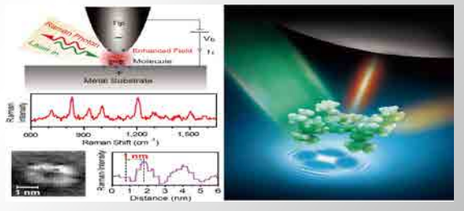
Introduction of Laboratory :
Prof. Zhenchao Dong in University of Science and Technology of China

Research of Interests:

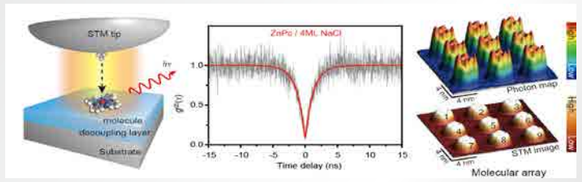
- Single-molecule optoelectronics by STM
- Electrically driven single-molecule single-photon sources
- Single-molecule Raman scattering
- Single-molecule plasmonics/Nano-photonics
- Nanocale chemical identification of bio-molecules on surfaces
- Plasmon-exciton coupling and energy transfer at the nanoscale



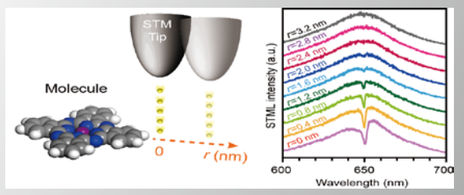
Visualizing coherent intermolecular dipole-dipole interaction in real space (Nature 531, 623 (2016))



Sub-nanometer resolved TERS imaging over single molecule (Nature 498, 82 (2013))



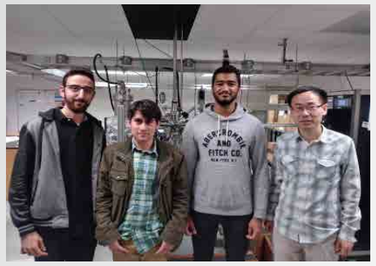
Electrically driven single-photon emission from single molecule and molecular array (Nat. commun., 8, 580 (2017))



Sub-nanometer control of the coherent interaction between a single molecule and a plasmonic nanocavity (Nat. commun., 8, 15225 (2017))

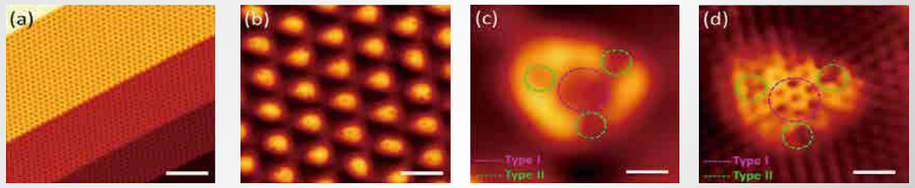
Figures Courtesy of Prof. Zhenchao Dong

Introduction of Laboratory :
Prof. Li Gao, California State University Northridge



(left to right): Harutiun Chinkezian, Carlos Chichiri , Himanshu Phirke, Li Gao

The research in our group focuses on probing the structural, electronic, magnetic, and chemical properties of low-dimensional materials at the single atom or molecule level by using scanning tunneling microscopy and spectroscopy (STM/STS).
Our research aims to gain new atomic-scale insights into the synthesis and properties of emerging materials for electronics and energy applications.
More specifically, we are currently interested in the following topics: (1) magnetic and spin-related phenomena in low-dimensional materials; (2) preparation and characterization of two-dimensional materials; and (3) chemical reactions of adsorbates on surfaces.
Our lab was established in 2012. The primary instrument in our lab is a Unisoku ultrahigh vacuum (UHV) low temperature STM system (USM1500S) in the basement of Eucalyptus Hall at CSU Northridge.
An UHV X-ray photoelectron spectroscopy (XPS) system will also be installed in the lab in 2018.
Our team is composed of the Principal Investigator Dr. Li Gao, graduates, undergraduates, and visiting scholars.



By using our USM1500S system, we recently investigated the synthesis of nitrogen (N) doped graphene on Ru(0001) from the N-containing sole precursor azafullerene ($C_{59}NH$). High quality N-doped single layer graphene has been obtained.
We found for the first time that the concentration of N-related defects on the N-graphene/Ru surface is tunable by adjusting the dosage of sole precursor and the number of growth cycles.
STM and XPS measurements indicate that there are two primary types of N-related defects and pyridinic N is the predominant bonding configuration of N atom in the obtained graphene layer.
Our findings indicate that the synthesis from heteroatom-containing sole precursors is a very promising approach for the preparation of heteroatom-doped graphene materials with controlled doping properties.
Related results have recently been published on Nano Letters 17, 2887 (2017).
This research is a collaboration with Prof. Simon Garrett's group at CSU Northridge, Prof. Liangbing Gan's group at Peking University, and Prof. Hong-Jun Gao's group at Chinese Academy of Sciences.

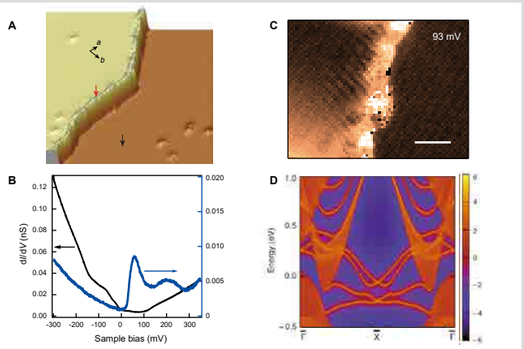
Figure: STM images of synthesized N-doped graphene on Ru(0001).
Scanning parameters: (a) 3 V, 5 pA; (b) 500 mV, 50 pA; (c) 1 V, 50 pA; (d) 10 mV, 5 nA. Images (c) and (d) are of the same region.
Scale bars: (a) 20 nm; (b) 3 nm; (c) 0.6 nm; (d) 0.6 nm.

Figures Courtesy of Prof. Li Gao

Smoothly travelling electrons on a rough step edge of WTe_2

Citation: Nature Communications 8, 659 (2017)
Product : USM-1300

Prof. Ying-Shuang Fu, Huazhong University of Science and Technology, and co-researchers reported the experimental evidence of the topological states at the step edge of WTe_2. Topological states emerge at the boundary of solids that are guaranteed to exist by the nontrivial topology of the bulk bands. As protected by time-reversal symmetry, the topological states can conduct electrons without dissipation even in the presence of nonmagnetic disorders. Recently, theory predicts a topological edge state on single layer transition metal dichalcogenides with 1T' structure, which is tantalizing for constructing practical topological devices. By investigating a cleaved WTe_2 surface (Fig. A), they observed a one-dimensional electronic state residing at the step edge of WTe_2 (Fig. B), which exhibits remarkable robustness against edge imperfections (Fig. C). First principles calculations rigorously verify the edge state has a topological origin, and its topological nature is unaffected by the presence of the substrate (Fig. D). The study supports the existence of topological edge states in 1T'-WTe_2, which may envision in-depth study of its topological physics and device applications.

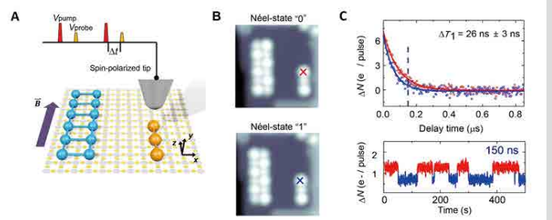


Figures Courtesy of Prof. Ying-Shuang Fu

Indirect atomic spin sensing

Citation: Science Advances (May 26, 2017) doi: 10.1126/sciadv.1603137
Product : USM-1300-3He 2T Vector Magnet

Prof. Sebastian Loth group have created an atomic spin sensor consisting of three Fe atoms nearby the nano-antiferromagnets and shown that it can detect the magnetic state switching via a surface-mediated interaction indirectly. The trimer sensor can detect it at up to a 3-nm distance with distance-dependence and achieves an energy resolution of 10 μeV, surpassing the thermal limit of conventional scanning probe spectroscopy. Both the sensor and the antiferromagnets are assembled at 0.5 K on a monolayer Cu_2N surface and the spin-polarized tips were prepared by picking up few Fe atoms to the apex of the PtIr tip.



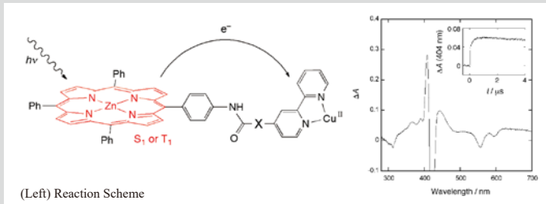
(A) The Fe trimer (orange) and a antiferromagnet (green) on a Cu_2N/Cu(100). The tip (gray) is polarized by an external magnetic field (purple). Pump-probe voltage pulses are sent to the tip and the spin relaxation time is measured.
(B) Spin-polarized STM images. 6.6 × 6.6 nm², 5mV, 50 pA.
(C) Pump-probe spectra and time traces. Pump:8 mV/80 ns, Probe:3 mV/100 ns. 0.25 T, 0.5 K.

Figures Courtesy of Prof. Shichao Yam and Prof. Sebastian Loth

Photoinduced Electron Transfer in Simple Dyads

Citation: Dalton Trans., 46, 12645 (2017)
Product Used : TSP-1000 (Nanosecond Laser Flash Photolysis)

K. Sakakibara et al., Prof. Inamo's group, synthesized new dyad systems based on a zinc(II) porphyrin complex and a 2,2′-bipyridine moiety linked by amide bridges having various bridging groups and the photochemical behavior was investigated using fluorescence spectroscopy and a nanosecond time-resolved absorption technique. The singlet excited state of the porphyrin complex was found to be partially quenched by Cu^{2+} in methanol, and a photoinduced electron transfer (PIET) from the excited state of the porphyrin moiety to the Cu(II)-bipyridine moiety was observed. The relatively long lifetime of the charge-separated (CS) state was ascribed to the slow electron-transfer reaction of the Cu(II)/Cu(I) couple bound to the bipyridine moiety. The lifetime of the CS state of dyads becomes longer with the increase of the distance between the porphyrin and bipyridine moieties, and these findings are discussed using an empirical formula for the relationship between the reactivity and molecular structure of dyads. With some compounds they synthesized, PIET from T1 of porphyrin was too fast to be observed using conventional nanosecond transient absorption techniques, so they have recently performed sub-nanosecond transient absorption experiments based on a RIPT method developed by Unisoku, and are preparing a new manuscript.



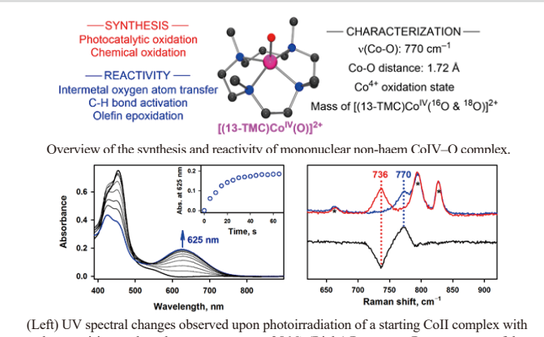
(Left) Reaction Scheme
(Right) Transient absorption spectrum observed at 1 μs after a laser irradiation for the methanol solution of [Zn(TPP-NHCO-CH_2-bpy)] (2) in the presence of Cu^{2+} (red line)

Figures Courtesy of Prof. M. Inamo

Synthesis and Characterization of a Non-Haem Co^{IV}–O Complex Succeeded

Citation: Nature Communications, 8, 14839 (2017)
Product Used : Cryostat USP-203

Synthesis and characterization of high-valent terminal metal-oxo complexes of late transition metals, such as Co, Ni and Cu, have remained a long-standing challenge. B Wang et al. in Prof. Wonwoo Nam's Group in Ewha Womans University, Korea, successfully synthesized photocatalytically a mononuclear non-haem $[(13\text{-TMC})Co^{IV}(O)]^{2+}$ in the presence of a photosensitizer, a sacrificial electron acceptor and water as an oxygen source. By international collaborating, they characterized the intermediate by various spectroscopic techniques. In particular, the resonance Raman experiments of the intermediate, performed by the late Prof. Takeshi Ogura in Hyogo University, Japan., reveals a diatomic Co-O vibration band at 770 cm^{-1}, which provides the conclusive evidence for the presence of a terminal Co-O bond, In reactivity studies, in which Unisoku's Cryostat for spectrophotometers, USP-203, played a crucial role, the intermediate was shown to be a competent oxidant in an intermetal oxygen atom transfer, C-H bond activation and olefin epoxidation reactions. These results strongly support the intermediacy of Co^{IV}- O species in oxidation of organic substrates as well as in the catalytic oxidation of water that evolves molecular oxygen.



Overview of the synthesis and reactivity of mononuclear non-haem CoIV–O complex.

(Left) UV spectral changes observed upon photoirradiation of a starting CoII complex with a photosentisizer and an electron acceptor at -25 °C. (Right) Resonance Raman spectra of the intermediate-^{16}O (blue) and -^{18}O (red). Black line shows the difference between the two spectra.

Figures Courtesy of Dr. B. Wang and Prof. Wonwoo Num

Thank you for using UNISOKU products!

Observation of electronic behavior in quasicrystals by scanning tunneling microscopy

Citation: Nature Communications 8, 15961 (2017)
Product Used : USM-1500

The ways electronic states change in quasicrystals, which possess long-range order but lack periodicity, remains unsolved. Prof. Gomes' group assembled a synthetic quasicrystal on the surface of Cu(III) that is composed of 460 carbon monoxide (CO) molecules and investigated the electronic states of this quasicrystal with scanning tunneling microscopy. This quasicrystal is tiled by an arrangement of only two kinds of rhombi, which is known as the Penrose tiling. A CO molecule, dark spots in the STM image (Fig.1), was placed in the center of each rhombus to form electronic sites at the vertices. The Penrose tiling formed eight structurally different sites, and conductance spectra at vertices of those sites showed different electronic states (Fig.2) even though this quasicrystal was made from only CO molecules. This approach of quasicrystal assembling and STM measurement could help solve other puzzles in the understanding of quasicrystals.

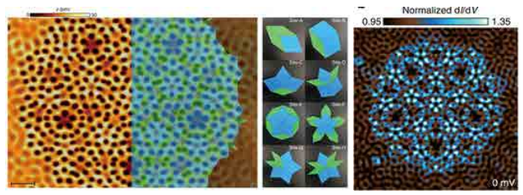


Fig.1 STM topograph of assembled quasicrystal on Cu(III). The overlay on the right side is the Penrose tiling composed of rhombi with side length 1.6 nm and vertices angles 72°/108° (blue) and 36°/144° (green).
Fig.2 Normalized differential conductance map at bias voltage V = 0 mV.

Figures Courtesy of Dr. K. Gones . University of Nortre Dane.

Nanoscale Dehydrogenation Observed by Ultra high vacuum - Low temperature Tip-Enhanced Raman Spectroscopy

Citation: J. Phys. Chem. C 2017, 121, 18162−18168.
Product Used : USM-1400-TERS

Prof. Yuji Kuwahara, Osaka University, and co-workers measured TERS spectra of self-assembled monolayer (SAM) of 2,13-bis(aldehyde)-[7]thiaheterohelicene (TH-aldehyde) molecules on the Au substrate at 79 K and found the evidence that the dehydrogenation of the molecule occurred at the TERS tip top. In TERS spectra of the SAM, a new peak which cannot be observed in far-field Raman spectra appeared at around 2000 cm^{-1} as shown in Fig.1. From DFT calculations, the Raman peak is assigned to the peak of carbon-carbon triple bond that is generated by dehydrogenation of the side benzene ring of TH-aldehyde molecular located at the closest position to the tip as shown in Fig.2. These results suggest that the dehydrogenation of TH-aldehyde occurred by the Ag tip which acts as both local heat source and catalyst.

Fig 1.

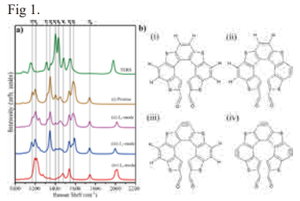


Fig 2.

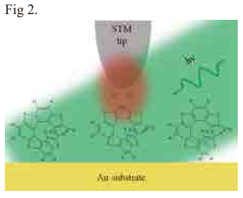


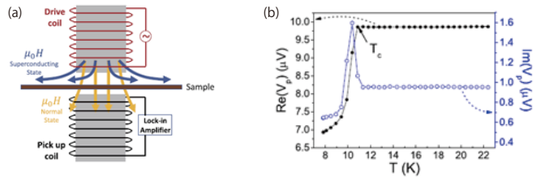
Fig 1. Experimental TERS spectrum of TH-aldehyde, SERS spectrum of TH-aldehyde powder, and calculated Raman spectra of various pristine compounds shown as (i) ~ (iv).
Fig 2. Illustration of the image of dehydrogenation of a molecule on a TERS tip

Figures Courtesy of Prof. Yuji Kuwahara

Measurement of the diamagnetic property using two-coil probe

Citation: Review of Scientific Instruments 88, 073902 (2017).
Product Used : USM-1300-4P

Prof. Canhua Liu and Prof. Jin-Feng Jia's research group at Shanghai Jiao Tong University developed a two-coil mutual inductance probe for diamagnetism measurement of a superconductor. The two-coil probe can be installed on a unique piezo scanning tube with four electrodes, which was invented by the same research group in cooperation with Unisoku. Fig. (a) is a schematic illustration of a transmission-type probe. Performance of the probe was demonstrated by measuring a NbN thin film grown on a Nb-doped $SrTiO_3$(III) substrate. As shown in Fig. (b), they observed a significant change in the output voltage from the pickup coil at 11 K, which indicates the superconducting transition of the NbN thin film. Remarkable feature of the developed system is the capability of in situ exchange of a two-coil probe, an STM tip and a 4-point probe, which enables the in situ measurements of surface morphology, electronic structure, transport property and diamagnetic response of a sample film to be performed within a single chamber, and thus largely raises the reliability of data analysis.



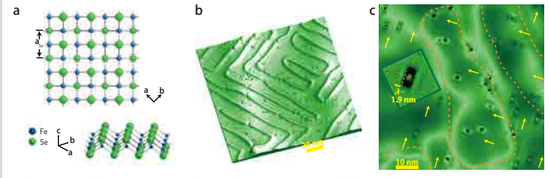
Mutual inductance measurement by the transmission-type two-coil probe. (a) Schematic illustration of the transmission-type probe. (b) Temperature dependence of the output voltage from the pickup coil measured on a NbN thin film.

Figures Courtesy of Prof. Canhua Liu

Stripes, a new ground state of nematicity in FeSe films.

Citation: Nature Physics 10.1038/NPHYS4186 (2017).
Product Used : USM-1300

In 2012, the discovery of interfacial superconductivity with Tc exceeding the record Tc = 55 K of bulk iron-based superconductors in 1UC-FeSe/ $SrTiO_3$(001) generated a new frontier in high-temperature superconductivity. FeSe/STO system attracted many scientists working on it not only due to the enhancement of superconductivity, but also because of its novel Fermi surface topology, extreme two-dimensionality, and the possibility of phonon-enhanced electron pairing. For FeSe films thicker than 1 UC, however, the electronic structure is markedly different, with a drastically suppressed superconductivity and strong nematicity appearing. The physics driving this extraordinary dichotomy of superconducting behavior is far from clear.To solve the puzzles in multilayers FeSe films on STO, Prof. Wei Li at Tsinghua University uses a low-temperature scanning tunneling microscopy bought from Unisoku to study the charge order in FeSe. He finds a stripe-type charge ordering instability that develops beneath the nematic state. The charge ordering is visible and pinned in the vicinity of impurities. And as it emerges in the strong limit of nematicity, it suggests that a magnetic fluctuation with a rather small wavevector may be competing with the ordinary collinear antiferromagnetic ordering in multilayer films. The existence of stripes in iron-based superconductors, which resemble the stripe order in cuprates, not only suggests that electronic anisotropy and correlation are playing an important role, but also provides a platform for probing the complex interactions between nematicity, charge ordering, magnetism and superconductivity in high-temperature superconductors.



MBE film and C_2 domains of FeSe. (a) Crystal structure of FeSe. (b) STM topographic image of a FeSe film (150nm × 150 nm, bias voltageV= − 50 mV, tunnelling current It =100 pA). The maze-like patterns are C_2 domain walls between two neighbouring nematic domains perpendicular to each other. (c) Stripes induced by impurities (70 nm × 70 nm, 60 mV, 10 pA).

Figures Courtesy of Prof. Li Wei in Tsinghua Univ.

SPM User's Published Paper List in 2017

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"Topological states in engineered atomic lattices",
Drost, R. and Liljeroth, P., et al. Nature Physics 13, 668-671 (2017)

"Building Complex Kondo Impurities by Manipulating Entangled Spin Chains",
Deung-Jang Choi, and Sebastian Loth, et al. Nano Lett. 2017, 17, 6203−6209"

"Dynamical Negative Differential Resistance in Antiferromagnetically Coupled Few-Atom Spin Chains",
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"Imaging quasiperiodic electronic states in a synthetic Penrose tiling"
Collins L. C.,Gomes K. K., et al. Nature Communications 8, 15961 (2017)

"Surface Landau levels and spin states in bismuth (111) ultrathin films",
Hongjian Du, Bing Wang & J.G. Hou, et al. Nature Communications 7:10814 (2016)

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Chengding Gu, Wei Chen, et al. ACS Nano 2017, 11, 4943−4949

"Phosphorus Nanostripe Arrays on Cu(110): A Case Study to Understand the Substrate Effect on the Phosphorus thin Film Growth",
Jia Lin Zhang, and Wei Chen, et al. Adv. Mater. Interfaces 1601167 (2017)

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Fang Cheng, and Kian Ping Loh, et al. Nano Lett. 17, 1116−1120 (2017)

"Observation of topological states residing at step edges of WTe_2",
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"Ultrathin β-tellurium layers grown on highly oriented pyrolytic graphite by molecular-beam epitaxy",
Jinglei Chen, Maohai Xie, et al. Nanoscale 2017, 9, 15945

"One-dimensional phosphorus chain and two-dimensional blue phosphorene grown on Au(111) by molecular-beam epitaxy",
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"Development of in situ two-coil mutual inductance technique in a multifunctional scanning tunneling microscope" ,
Ming-Chao Duan, Canhua Liu and Jin-Feng Jia, et al. Review of Scientific Instruments 88, 073902 (2017)

"Stripes developed at the strong limit of nematicity in FeSe film",
Z.-X.Shen and Qi-KunXue, et al. Nature Physics VOL13 957-961 (2017)

"Inter-atomic Spin Coupling in Manganese Clusters Registered on Graphene" ,
J. D. Ren, H. M. Guo, and H. J. Gao, et al. Phy. Rev. Lett. 119, 176806 (2017)

"Epitaxial Growth and Air-Stability of Monolayer Antimonene on $PdTe_2$."
X. Wu, Y. Shao, H. J. Gao, et al. Adv. Mater. 29, 1605407 (2017)

"Evidence for Ultralow-Energy Vibrations in Large Organic Molecules."
H. Chen, H.-J. Gao, Nano Lett. 17, 4929-4933 (2017)

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Qiwei Chen, Kai Wu, et al. Angew. Chem., Int. Ed. 56,5026–5030 (2017)

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"On-Surface Synthesis and Characterization of Honeycombene Oligophenylene Macrocycles",
Min Chen, Jian Shang, Yongfeng Wang, Kai Wu, and J. Michael Gottfried, et al. ACS Nano 11, 134−143 (2017)

"Steering Surface Reaction at Specific Sites with Self-Assembly Strategy"
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"On-surface synthesis approach to preparing one-dimensional organometallic and poly-p-phenylene chains",
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"On the shuttling mechanism of a chlorine atom in a chloroaluminum phthalocyanine based molecular switch",
Huanjun Song, Kai Wu, et al. Phys. Chem. Chem. Phys., 2017, 19, 22401

"Construction of Sierpiński Triangles up to the Fifth Order",
Chao Li, Yongfeng Wang, et al. Journal of American Chemical Society 139 (39), pp 13749–13753 (2017)

"Near-free-standing epitaxial graphene on rough SiC substrate by flash annealing at high temperature",
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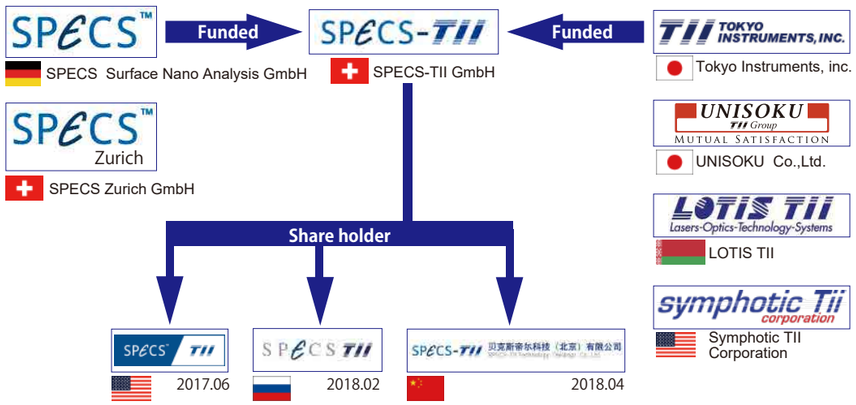
About the foundation of SPECS-TII GmbH



Tokyo Instruments, Inc., parent company of UNISOKU, and SPECS GmbH, in Germany, have established a joint holding company, SPECS-TII. GmbH, in Switzerland. In North America, SPECS-TII GmbH established SPECS -TII. Inc., Former SPECS Inc., which was owned by SPECS as American corporation. In China, SPECS and TII united each company which they owned in China and established SPECS-TII Technology (Beijing) Co., Ltd. In Russia, a new company SPECS TII RUS is now going to be established. SPECS and TII group is fortifying cooperation by using each other's strength to the full, complementing in sales network, customer support and product lineup.

Representatives of UNISOKU Products

Area	SPM Products	Optical Products
Japan	UNISOKU CO., LTD. www.unisoku.com info@unisoku.co.jp	
Korea	INA KOREA www.inakr.com	람다레이(주) lambdaray www.lambdaray.co.kr lambdaray@naver.com
China	SPECS-TII 贝克斯帝尔科技（北京）有限公司 SPECS-TII Technology (Beijing) Co., Ltd.	
Taiwan	shumotek 科榮股份有限公司 SCIENTEX CORPORATION	
North America	SPECS-TII Inc. www.specs.com usa@specs.com	Worldwide Exchange LLC (CoolSpeK) www.wwe-us.com info@wwe-us.com
Europe, Israel	Nanoscore GmbH www.nanoscore.de t.berghaus@nanoscore.de	SPECS GmbH www.specs.com sales@specs.com
Russia	TOKYO BOEKI GROUP Tokyo Boeki http://tokyo-boeki.ru/ main@tokyo-boeki.ru	SPECS TII RUS
Other Countries	UNISOKU CO., LTD. www.unisoku.com info@unisoku.co.jp	

Memories of the former CEO Suruga

2010

Sep. Mr. Suruga is inaugurated as the president of UNISOKU.
UNISOKU joins TII group.
Active business management by stable capital.
Dec. 5S activities (workplace organization method) start.
Improvement of working environment, productivity, and mind

2011

Jun. Commercialization of the world’s first 40 mK high magnetic field STM along with Cryogenic Ltd, U.K.

2012

Jun. Completion of our first factory
Inspection for every single system before shipment is upgraded.
Development of new 400 mK-SPM system with technical collaboration with Janis Research.

2013

Sep. Company trip to Malaysia for 40th anniversary of UNISOKU
Nov. “Development of UHV-LT TERS imaging system” is adapted as A-STEP by JST (Japan Science and Technology Agency)
Dec. 40th anniversary gift to our customers in Japan

2014

Feb. Nanoscore in Germany becomes our general agent in Europe.
Mar. Chosen as one of “Global Niche Top 100” companies from Ministry of Economy, Trade and Industry in Japan.
Jun. 40th anniversary gift to our customers in China.

2015

Oct. Renewed our logo. “Mutual Satisfaction” is added.
Nov. JT-STM business is transferred from SPECS.

2016

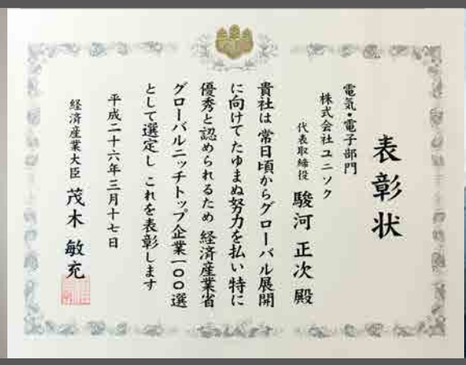
May. Published in electronical version of Nikkei Newspaper as hidden “technique” in Japan, world No.1 share.
Jun. Expansion of UNISOKU’s exportation is published in Nikkei Newspaper.
Provided year-end bonus to every employee.
Jul. Completion of our second factory. Improved productivity even more with broad space.
Sep. President Suruga, CEO of TII, is awarded the special prize of “The 14th Courageous Management Awards.”

2017

Jan. Published in Asahi Newspaper in the article “Latent power of Kansai area.”
Mar. Prototype of picoTAS is completed.
TII group and SPECS establish a joint venture “SPECS-TII GmbH” in Switzerland.
Apr. Awarded the excellence prize of “The 29th new technologies and products award for small and medium enterprises”.
Jun. Provided year-end bonus to every employee.

Sep. 2013 UNISOKU 40th Anniversary company trip in Malaysia.


Sep. 2010
Mr. Suruga was formally inaugurated as President.
Right : UNISOKU founder, former President Nagamura


表彰状

電気・電子部門
株式会社ユニソク
代表取締役 駿河 正次 殿

貴社は常日頃からグローバル展開に向けてたゆまぬ努力を払い特に優秀と認められるため 経済産業省 グローバルニッチトップ企業100選 として選定し これを表彰します

平成二十六年三月十七日

経済産業大臣 茂木 敏充

Mar. 2014
UNISOKU was chosen as one of "Global Niche Top companies 100" by Ministry of Economy, Trade and Industry.


Jul. 2016
The 2nd factory has been completed

人に好かれる人は『謙虚』 運のいい人・運を呼ぶ人

The person beloved is "modesty", has good fortune, and carries the luck.

Shoji Suruga

去る 2017 年　10 月 21 日
当時、弊社代表取締役　駿河 正次 氏が永眠いたしました。
ここにあらためて故人への生前のご厚誼に深く御礼申し上げます。

In October 21st 2017,
President Shoji Suruga passed away.
We deeply appreciate your care and support during his lifetime.

日本刀

Japanese swords

日本刀について

日本刀は刀身、拵（こしらえ／日本刀の外装部分）ともに日本の伝統技術の粋を極め、現代では美術品として高く評価されています。
西洋剣は刃がまっすぐで両刃、刀身は厚くて突くことや叩き切ることを重視しています。
対して日本刀は湾曲して片刃、刀身は薄くて柔軟性があり切れ味を重視しています。

日本刀の刀身は「折れず曲がらずよく切れる」ことを追求するため、硬軟２種類の鉄を組み合わせ打ち延ばして成形された後に硬度を高めるための焼入れが行われます。この時に日本刀独特の反りと刃文が生まれます。

正宗、村正、宗近などは刀そのものではなく刀工の名前にあたり、今でいうブランドやメーカー名といったところでしょうか。
形状の美しさや切れ味の良さだけではなく、日本刀に秘められた由緒や逸話の神秘性が日本刀の美術品としての人気の理由にあるようです。

堺観光（刃物、古墳、千利休）について

ユニソクから約 40 キロの距離にある堺市には堺打刃物といわれる伝統工芸があり、そのルーツは５世紀の古墳造営の時期にまで遡ります。鍛造と研ぎの技術に優れ、平安時代中期から後期（901-1180）には刀、戦国時代（1543-1590）には鉄砲、天正年間（1573-1592）には煙草包丁の産地としても知られてきました。江戸時代中期の元禄時代（1668-1704）には出刃包丁などの包丁が鍛冶職人によって開発され、現在の和包丁の種類がほぼ出揃いました。堺打刃物はプロの評価も高く、愛用する料理人も多いようです。また、堺市には日本最大の前方後円墳（仁徳天皇陵古墳）に代表される古墳群があるほか、茶道の開祖である千利休縁の茶室や屋敷跡などが観光名所として知られています。

Japanese swords

Japanese swords including its knife and outward design are valued as modern art for reaching the very top of Japanese traditional technique. Western swords are featured by its straight knife, thick double edge and sword blade, which is purposed push or chop. On the other hand, Japanese swords are featured by curve and thin and flexible single edge, which is to stress sharpness.

Japanese swords pursue not to crack nor to bend but to be sharp. Therefore, hard and soft, two kinds of irons are forged together, then to increase hardness, those are quenched in fire. At this time, Japanese sword originals, curvature and pattern of sword were born.

Masamune, Muramasa, Munechika are not the name of Japanese swords themselves but rather the name of craftsman, like brands or makers nowadays. Not only beauty of shape or sharpness but those are popular for having hidden histories, side stories or mythology.

Sight-seeing at Sakai-city (Knives, ancient tomb and Sennorikyu)

Sakai-city is located on approximately 40km away from UNISOKU. There is traditional industrial art, called Sakaiuchihamono, and its roots stretch back to era of antient tomb period, 5th century. It has excellent technology for forging and sharpening, which is known for sword between middle of Heian era to the end of Heian (901-1180), gun for the warring states of period (1543-1590) and birth place of knife for chopping tobacco leaves during Tenshō era (Momoyama period) (1573-1592). In Genroku Era within the middle of Edo era (1668-1704), Debabocho (thick knife for cutting fish or meat) was developed by black smiths, and there have been almost all the variety of Japanese knives since then. Sakaiuchihamono is valued well by professionals, and many chefs love them. Also, in Sakai city, there is the biggest Japanese ancient imperial graves (Nintoku-tenno-ryo Kofun) and tea-ceremony room or former residence place in connection to the founder of tea ceremony, Sennorikyu.

写真はイメージです。

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