from Tsukuba, Japan to the world

NIMS NOW International

National Institute for Materials Science

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Special Features

Introduction of 20 New Projects and Recent Achievements - Advanced Electronic Materials Center -

Aiming at a Fusion of Nanomaterials and Nanoelectronics

Toyohiro Chikyow
Managing Director
Advanced Electronic Materials Center

Silicon semiconductor devices are used in all types of familiar information and electronic products, and have become the basis of today's advanced information society. However, those Si devices are now approaching a critical turning point with a lot of technical hurdles. To overcome the hurdles, research and development for future Si devices are progressing largely in the following three directions (**figure**).

(1) "More Moore" technologies

To date, Si devices have realized higher integration and higher speed based on micro fabrication techniques in accordance with Moore's law. It is assumed that this trend in integration will continue until 2025-2030. However, accompanying miniaturization, numerous material-related issues have become apparent. The most urgent challenge is the development of a metal gate for the gate stack, which is the basic structure of integrated circuits. Here, work function control by metal materials and interface control of the gate/gate insulating film is required. Development of next-generation gate insulating film which does not have an SiO_2 layer between the Si layers is also being accelerated. In order to develop these materials, precise measurement of the work function with nano scale resolution and interface tuning between metal gate and gate insulator have become indispensable.

Due to the constantly increasing speed of signal transfer, signal delay in multilayer wiring has also emerged as a problem, and the development of low dielectric materials to improve this delay has become important. Looking further into the future, the development of light waveguides for the optical wiring, light sources and photo detector for this requirement, have also become important.

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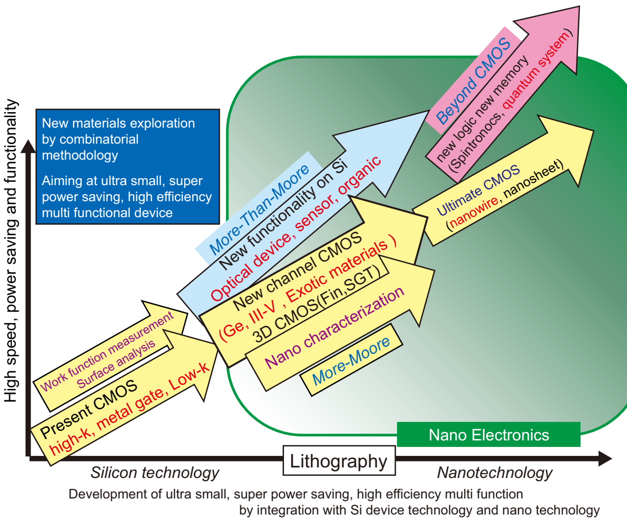

Fig. Roadmap of technology in next-generation semiconductor devices. The research shown in red letters is being promoted and related the measuring technologies shown in purple.

in this issue

NIMS News

Dr. Nakanishi Appointed Group Leader at Germany's Max Planck Institute

Prof. Möhwald (left) and Dr. Nakanishi at MPI.

< Continued on p.7

Realizing Advanced Functionalities in Si Devices

- Aiming at Diverse Materials Research for Si Integrated Circuits -

Toyohiro Chikyow, Shojiro Komatsu
Michiko Yoshitake, Motoharu Imai
Yutaka Wakayama, Seiichi Takami
Hideki Abe, Shinjiro Yagyu
Chisato Niikura, Takahiro Nagata
Naoto Umezawa, Yoshiyuki Yamashita
Advanced Device Materials Group
Advanced Electronic Materials Center

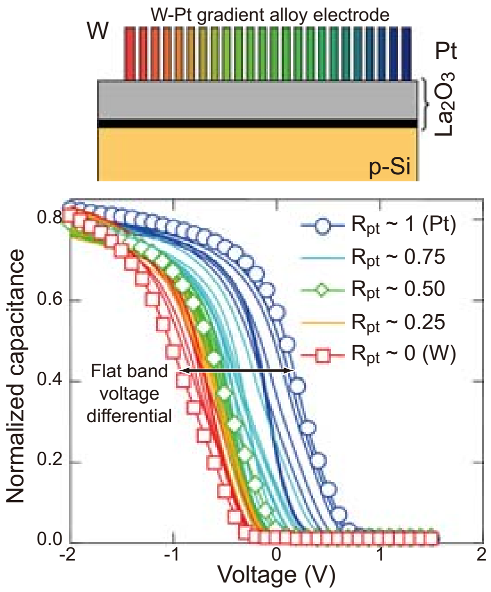

Fig. 1 Flat band voltage V_{fb} differential was successfully controlled in a range of 0.9 V by using a La_2O_3.

In the field of Si-based semiconductor devices, materials development is now being carried out for the generations after the hp (half pitch) 32 nm node generation, which has a gate width of 16 nm. For this, the development of metal gate materials and realization of a stable metal gate/gate oxide film interface is demanded. In metal gates, it is necessary to use materials having the optimum work function in the p-type substrate and n-type substrate by controlling the work function. The Advanced Device Materials Group has already succeeded in controlling the work function using a binary alloy of platinum and tungsten employing a combinatorial technique. Recently, however, a phenomenon called Fermi level pinning has been reported in metal gate/gate oxide films, and this has become a serious problem. This is a phenomenon in which changes in the work function, even if made, are not reflected in the threshold voltage, and the Fermi level is fixed, or "pinned," at a certain voltage. This means that operation of complementary MOSFET (CMOS) is impossible. In order to solve this problem, in cooperative research with Tokyo Institute of Technology, we have succeeded in avoiding Fermi level pinning by mixing La_2O_3 with the HfO_2, and furthermore, showed that work function dependency can be secured (**Fig. 1**). Here, changes in the flat band voltage Vfb depending on the work function differential were observed. For the future, we are working to realize a metal gate/gate oxide film interface which is more stable and has minimal performance variations.

Considering increases in signal transfer information in the devices of the future, it is assumed that the data communication rate (bit rate) in integrated circuits with Cu wiring will reach its limit within several years. Therefore, first, the development of an interlayer insulating film using a low dielectric and, beyond this, techniques corresponding to the optical wiring of the future, will be necessary. This group is also grappling with the development of low dielectric materials using nanoparticles, photo detectors using ZnO, and new light-emitting materials of BN and other substances. (**Fig. 2**)

In Si integrated circuits, the development of "More than Moore" technologies which add functionalities on Si and "Beyond CMOS" technologies which aim at new device operating principles for the future are also important. High expectations are placed on the application of polymer materials and organic materials, which are particularly rich in functions, to memory devices and others by integration with Si.

Si semiconductors are advancing in directions which will improve their functions and performance by making full use of diverse materials, rather than the fixed materials used to date. This group is engaged in research which responds to these needs of the times.

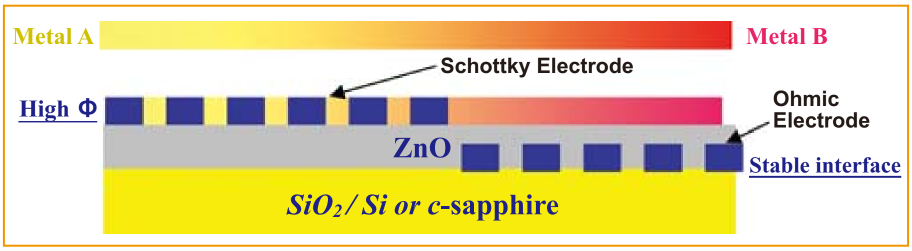

Fig. 2 Variable Schottky barrier UV photo detectors fabricated using ZnO.

Special Features

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Aiming at a Fusion of Nanomaterials and Nanoelectronics

(2) "More than Moore" technologies

Separately from the direction which aims at higher speed and higher functions by miniaturization, another research trend aimed at integrating oxides and compound semiconductors with Si devices. Organic materials with the unique functionalities will add to Si device in future. Also the creating new functionalities such as high frequency devices on Si or sensors on Si are showing rapid growth in this area.

(3) "Beyond CMOS" technologies

Ultra-high density integrated circuits using the current CMOS technology will hit a technical wall around 2025-2030. To realize high performance devices beyond this point, it will be necessary to propose the concept for a new logic device by 2010. Here, quantum information transfer, spin device, and other information transfer techniques, that do not rely on electrons and holes as the carrier, become necessary.

The Advanced Electronic Materials Center is energetically promoting the development of the fundamental but essential technologies demanded in these next-generation semiconductors industries with members in the Advanced Device Materials Group and Nano Device Characterization Group.

Characterization of Properties of Silicon-Based Functional Materials using Electron Beam Induced Current (EBIC) Method

Takashi Sekiguchi, Yoshiki Sakuma
Naoki Fukata, Yoshihiro Irokawa
Nano Device Characterization Group
Advanced Electronic Materials Center

Electron beam induced current (EBIC) is a versatile tool for characterizing various semiconductor materials and devices. Since EBIC images are formed by the electron and holes generated by an electron beam, we can visualize the electrically active defects and microstructures (recombination centers) as dark patterns. By using EBIC, we have been studied extended defects in Si materials such as dislocations and grain boundaries in multicrystalline Si for solar cells.

When a new material is going to be used in a device, defect characterization is indispensable for the realization of this devices. We recently have succeeded in observing misfit dislocations in strained Si thin films and detecting leakage sites of high-k dielectric films (high permittivity gate dielectric films).

Fig. 1a shows a cross-sectional transmission electron microscope (TEM) image of the dislocations in strained Si film grown on an SiGe substrate, while **Fig. 1b** and **Fig. 1c** show plan-view EBIC images taken at 4 kV and 25 kV, respectively. The straight black lines in the EBIC image at 4 kV is misfit dislocations at the strained Si/SiGe interface. At 25 kV, the fluctuation of dislocation density in the substrate region was observed as black and white stripes. By varying the acceleration voltage in this manner, we can separate the two different dislocations in depth. This is the first non-destructive observation of misfit dislocations in the subsurface region.

Fig. 2a shows the cross-sectional structure of a next-generation MOSFET using Hf-based oxide. **Fig. 2b** is the EBIC images of gate region in plane view. The white spot corresponds to the leakage site in the HfSiON insulating film. The high-k MOSFET study was carried out as a joint research with Selete (Semiconductor Leading Edge Technologies, Inc.) and High-k Net (Next-Generation Gate Insulating Film Research Network).

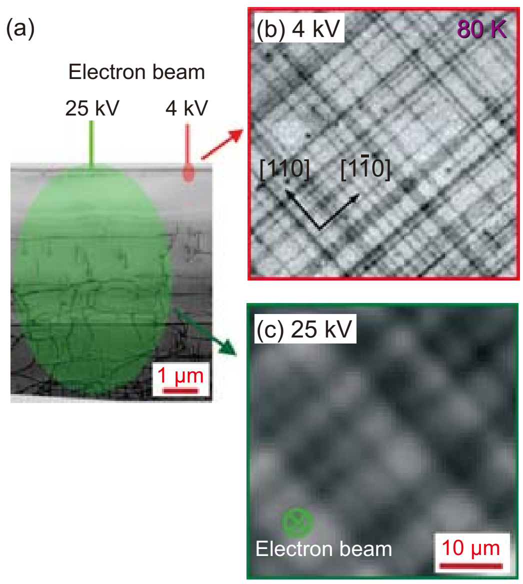


Fig. 1 (a) Cross-sectional transmission electron microscope (TEM) image and schematic diagram of electron spread; (b), (c) plan-view EBIC images (electron beam: 4 kV and 25 kV; 80 K).

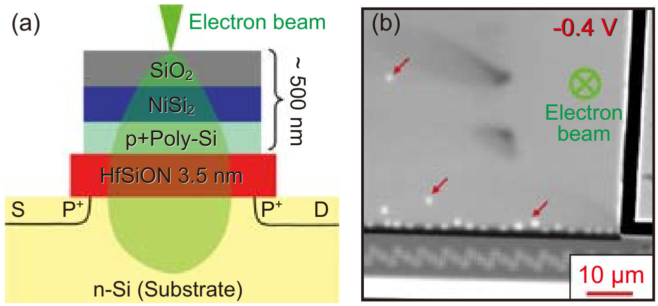


Fig. 2 (a) Schematic diagram of the cross section of a high-k MOSFET, (b) plan-view EBIC image. The white spot shown by the red arrow is the location of a leak. (Electron beam: 10 kV, 0.8 nA; gate voltage: -0.4 V, room temperature)

NIMS News

Coming Soon !

1st NIMS Conference on Recent Breakthroughs in Materials Science and Technology to be held

NIMS will hold a 1st NIMS Conference on Recent Breakthroughs in Materials Science and Technology July 11-13 at the EPOCHAL TSUKUBA located in Tsukuba, Ibaraki, Japan. Followed by the 1st NIMS Award Ceremony on July 12, there will be three sessions July 12-13; (I) Recent progress in spintronics and magnetic materials/ Breakthrough in information and communication technologies, (II) Spherical aberration correction in the electron microscope/Long-awaited breakthrough in atomic scale materials observation, and (III) Novel organic materials with high functionality/Challenges for making breakthroughs in nanotechnology.

Call for papers (Poster session) abstract submission deadline is June 15 and online registration deadline is June 30. Registration fee is free and everyone is welcome.

For more details: http://www.nims.go.jp/nimsconf07

Development of Intelligent Light Sources
- Based on Unique Nanostructures of Opto-Ceramics -
- High Efficiency Lasing of Desired Wavelengths -

Kenji Kitamura
Managing Director
Optronic Materials Center

Based on nanostructural control techniques for ceramic materials, the Optronic Materials Center is engaged in comprehensive research and development from the development of light emitting and optoelectric functions by wide bandgap design and development of wavelength selection/wavelength conversion functions by control of the wave motion of light using the nano 3-dimensional structures of dielectrics to the development of intelligent light sources for wide wavelength regions.

Using a materials science approach, the Center's goal is to develop novel light control techniques using the unique structures possessed by ceramics at the nanoscale, and to provide the light sources for various needs to society.

In order to fulfill this purpose, the Center is targeting the development of new functions of intelligent light sources, for which it has establishing three groups, (1) the Opto-Electronics Group, which aims at basic development of light-emitting and electronic functional devices using ceramic wide bandgap semiconductor materials, (2) the Frequency Conversion Group, which aims at the development of high efficient frequency conversion devices by spontaneous polarization tailoring in ferroelectric materials, and (3) the Wave Optics Group, whose goal is the manifestation of intelligent functions by controlling the wave motion property of light using the unique nanostructures of dielectrics.

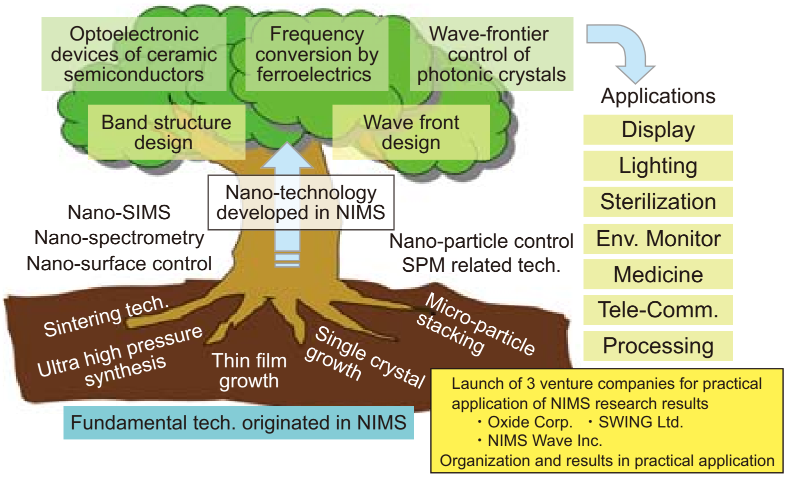


Fig. Flow of development in the Optronic Materials Center. Utilizing traditional NIMS synthesis techniques and advanced nano technologies developed in recent years, the Center's goal is to develop light sources which will open the way to a diverse range of new applications.

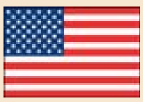
These groups actively utilize common nano process technologies and nano characterization techniques and promote exchanges of technology and knowledge, with researchers engaged in technical development of these technologies as a supporting group for this project, in order to efficiently advance the project as a whole. As part of this, in research on light-emitting functions utilizing the wide bandgap of ceramic based materials, results which are worthy of worldwide attention had been achieved using extreme environments such as ultra-high pressure and plasma under ultra-high temperature conditions, etc. On the other hand, NIMS is also promoting pioneering research at the world level in connection with the photonic crystal functions and wavelength conversion functions that originate in the unique structures of dielectrics and the nature of light as a wave phenomenon. Unlike existing materials, these materials are easily affected by external fields. Taking advantage of this property, the development of novel light source functions which enable variability or self-responsiveness can be expected.

Three venture companies have already been created as a result of development utilizing these NIMS original materials and device fabrication technologies. Thus, the importance of deepening ties with these companies and development which bridges the gap to practical application can be understood.

For more details: http://www.nims.go.jp/omc/top_eng.html

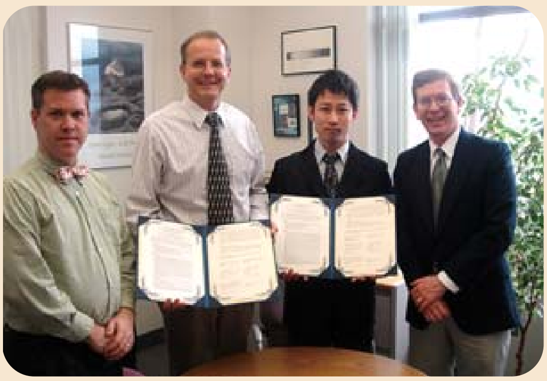
NIMS News

MOU with Brigham Young University, U.S.A.



(March 21, U.S.A.) -- The Nano Ceramics Center and the Organic Nanomaterials Center of NIMS signed a memorandum of understanding (MOU) on collaborative research in the field of surface chemistry with the Department of Chemistry and Biochemistry, Brigham Young University (BYU, Utah in U.S.A.) which was established in 1875.

The Centers have already started international collaboration with the BYU on the strategy "Chemical Functionalizations on Semiconductor Surfaces". Furthermore, BYU and the both centers plan to advance their collaborative researches by exchanging researchers and students, research information, joint researches, and other productive activities in the filed of surface chemistry.



From the left, Assist. Prof. Asplund, BYU, Prof. Farnsworth, Dept. Chairman, BYU, Dr. Shirahata, Senior Researcher, NIMS, and Assoc. Prof. Linford, BYU.

Making Wide Bandgap Materials Shine

Naoki Ohashi, Takashi Taniguchi
Yoshiki Wada, Isao Sakaguchi
Kenji Watanabe, Yutaka Adachi
Opto-Electronics Group
Optronic Materials Center

Optical devices and instruments, such as light-emitting diodes and flat-panel displays, are recently attracting much attention. These devices emit visible light for human eyes. However, visible light is not the only type of light. For example, many photocatalysts which decompose harmful substances absorb ultraviolet (UV) light and use its energy to decompose those substances. Of course, UV light itself also has a sterilizing effect. In other words, UV light sources and UV sensors are extremely important in our everyday lives.

Light emission is the property by which substances radiate the difference in energy when making the transition from an unstable high energy state (excited state) to a stable state (ground state) in the form of light. In order to obtain UV light, which has higher energy than visible light, the energy differential between the excited state and the ground state must be larger (>3.3 eV). The substances which Opto-Electronics Group handles are members of the group called wide bandgap materials, in which the energy differential between the excited state and ground state corresponds to the energy of UV light.

With the aim of developing novel opto-electronic materials, the Opto-Electronics Group is carrying out research in which we synthesize wide bandgap materials by a variety of methods, such as ultra-high pressure environments, etc., and utilize measurement techniques which make it possible to grasp phenomena that occur in extraordinarily short time spans of less than 1-trillionth of a second (although light can circle the globe 7 1/2 times in only 1 second, it travels only 1mm in this length of time), analytical techniques which can capture a single impurity atom among a million other atoms, and similar advanced techniques.

From this, we discovered that boron nitride (BN) functions as a UV lasers at room temperature, and zinc oxide displays high efficiency UV light emission. by controlling defect structures by doping.

While watching various social trends, including the realization of gallium nitride (GaN)-based blue light-emitting diodes and popularization of liquid crystal displays, and the resulting rapid rise in the price of rare earth metal elements, we are carrying out research and development with the aim of contributing to a more abundant human society through novel technology on opto-electronics.

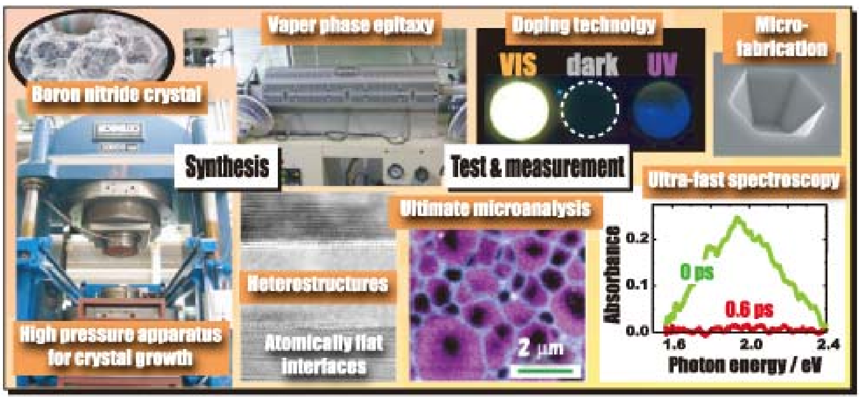


Fig. Outline of the Opto-Electronics Group.

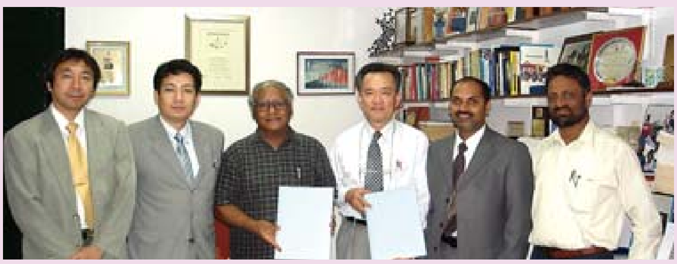
For more details: http://www.nims.go.jp/kouden/index_e.html

NIMS News

Cooperation Agreements with India's Anna University and JNCASR

(February 26-27, India) -- NIMS signed cooperation agreements with Anna University (February 26) and the Jawaharlal Nehru Centre for Advanced Scientific Research (JNCASR; February 27). The purpose of these cooperation agreements is to start the International Joint Graduate School Program to receive Ph.D. students of the two Indian institutions to NIMS, and to exchange key researchers.

At Anna University in Chennai; Prof. Viswanathan, Vice-Chancellor, Anna University (left), and Dr. Kitagawa, Vice-President, NIMS.



At the JNCASR in Bangalore; left to right: Dr. Nishimura, Managing Director, Fuel Cell Materials Center, Dr. Akiyama, Senior Researcher, International Affairs Office/Structural Materials Center, Prof. Rao, Dr. Kitagawa, Dr. A. Vinu, Senior Researcher, Fuel Cell Materials Center, and Dr. Jayachandra, Administrative Officer, JNCASR.

NIMS and Anna University have already concluded two MOUs; "Interdisciplinary area of materials science" (Optronic Materials Center) and "Design of novel nanoporous materials" (Fuel Cell Materials Center). Also, NIMS has been receiving post-docs from Anna University.

Last year, International Center for Young Scientists (ICYS) of NIMS and Chemistry and Physics of Materials Unit (CPMU) of JNCASR concluded an MOU for collaboration on the basics and fabrication of nanomaterials, and Prof. C.N.R. Rao, Honorary President of JNCASR, assumed the ICYS Executive Adviser.

These cooperation agreements will strengthen partnerships between NIMS and the two institutions in India.

Development of Light Frequency Conversion Materials and Devices

- The Quest for Easier-to-Use Laser Light Sources -

Kenji Kitamura, Shunji Takekawa
Masaru Nakamura, Kiyoshi Shimamura
Sunao Kurimura, E. G. Villora
Frequency Conversion Group
Optronic Materials Center

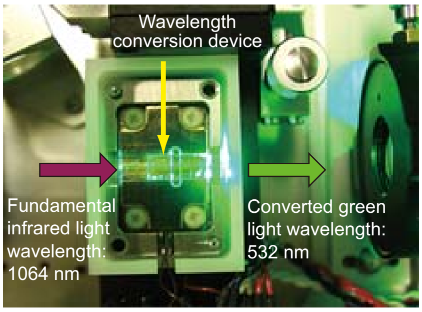


Fig. 1 Wavelength conversion device using stoichiometric lithium tantalate ($LiTaO_3$) single crystal which converts infrared light with a wavelength of 1064 nm to green light with a wavelength of 532 nm. Conversion efficiency of 70 % is achieved simply by one pass of the fundamental light (pulse).

Lasers include a variety of types, such as solid-state lasers, gas lasers, dye lasers, and semiconductor lasers. It might seem that general devices using the current generation of technology have reached a sufficient stage of development. However, the wavelengths of high output, compact lasers which are maintenance-free and laser with a single switch is extremely limited, and applications are limited because devices are still large in scale and require complicated maintenance. In particular, in the fields of optical fabrication/measurement, environment monitoring, security, and medical treatments, the development of high efficiency, compact light sources with the optimum frequency (wavelength) is strongly desired.

This has been partially achieved with semiconductor lasers and semiconductor laser-excitation solid-state lasers. If it is possible to complete a secondary laser light source by wavelength conversion using one of these devices as the fundamental light source, it will be possible to use the resulting device as a substitute for existing large-scale laser devices. This is analogous to the innovation which led from the vacuum tube to the transistor, and would result in wider use of laser light sources in familiar applications, while also opening the way to applications which had not been imagined in the past.

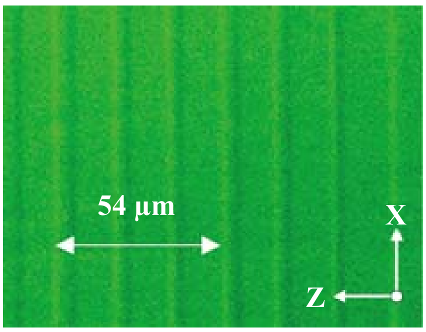


Fig. 2 266 nm UV light lasing device using periodical twin structure of quartz.

Using high quality lithium niobate ($LiNbO_3$) and lithium tantalate ($LiTaO_3$) with a controlled defect densities, which were developed mainly by NIMS, we formed a periodically poled structure in devices and used these as wavelength converters (**Fig. 1**). With wavelength conversion by this method, high efficiency lasing of arbitrary wavelengths is possible in a wide transparent wavelength region (350 nm-4500 nm) of single crystal materials. Although this type of laser light source had been large in scale until now, this realizes a compact light source and makes it possible to develop applications for laser light of wavelengths which could not be used until now. In addition, we are also engaged in the development of fabrication techniques for wavelength conversion devices based on the same principle using materials which have wide transparent wavelength regions (quartz, fluorides), and the development of easy-to-use laser light sources for a wider wavelength region (**Fig. 2**, **Fig. 3**).

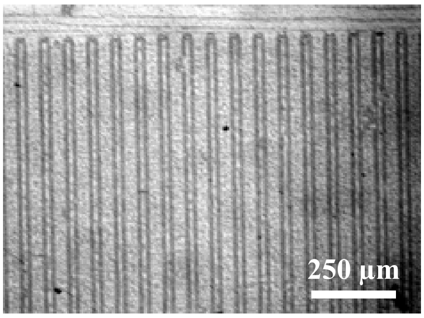
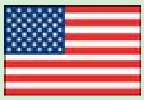


Fig. 3 Periodically poled structure formed in a ferroelectric fluoride ($BaMgF_4$).

For more details: http://www.nims.go.jp/fcg/index_eng.html

NIMS News

MOU with Iowa State University, U.S.A.



(February, 22, U.S.A.) -- The NIMS Composites and Coatings Center concluded an MOU on "Development of high temperature oxidation resistant coatings" with the Department of Materials Science and Engineering of Iowa State University (ISU). The two organizations will actively promote the exchange of researchers and collaborative researches with the R&D of coating materials which can enhance oxidation-resistance of substrate materials without deteriorating their mechanical properties as a main theme.

ISU is tied closely to the Ames Laboratory which has a Material Preparation Center. Moreover, the former Chair of the department, Prof. Mufit Akinc, assumed the position of NIMS International Advisor last year. These moves will boost wider range of research cooperation.

From left: Prof. Brian Gleeson, ISU, Dr. Murakami, Senior Researcher, Composites and Coatings Center, Prof. Mark J. Kushner, Dean, College of Engineering, ISU.

Nanostructural Materials for Control of Light Wave Motion - Domains, Nanoparticles, and Fibers -

Tsutomu Sawada, Shin-ichi Todoroki
Hiroshi Fudouzi
Wave Optics Group
Optronic Materials Center

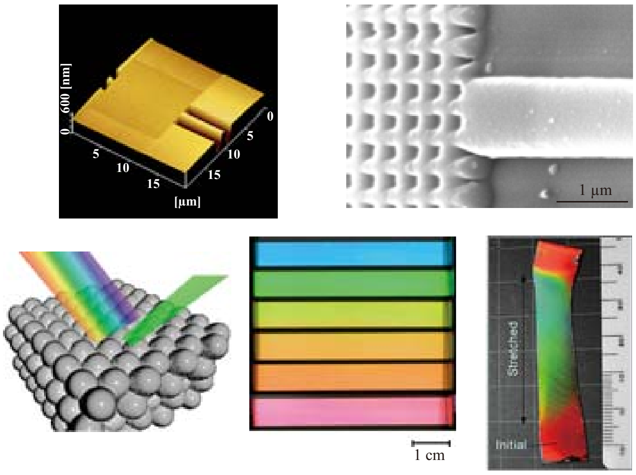


Fig. 1 Top: Periodic pattern formed in a ferroelectric single crystal (left) and enlargement of the pattern (right). Bottom: Schematic diagram of a monochrome reflecting particle array (left), monochrome reflection with an actual material (center), and change in the reflected color due to deformation. As deformation increases, the reflected color shifts to colors with shorter wavelengths (blue side).

Light has both the nature of a wave and the nature of particles. The Wave Optics Group is conducting research on materials which control light using mainly the wave motion property. The wave property of light appears most remarkably in cases where light is scattered and reflected by a structure of approximately the same size as the light wavelength. Accordingly, the object of our research is materials which have structures of this size.

Various structures with a size on the same order as the wavelength of light are conceivable. However, our focus is on the following three types of materials. One is materials which are fabricated by drawing a periodic pattern (domain pattern) on a single crystal of substances which are sensitive to external electric fields, namely, the ferroelectrics (**Fig. 1, top**). The second is materials in which fine particles with equal diameters are arranged periodically. In both cases, the period of the array is from several 10 nm to several microns. The wavelengths of visible light are in the region of several 100 nm. Today, however, electromagnetic waves in a wide wavelength region which includes wavelengths around the visible region are called "light" in the broad sense, and these types of light are used in information processing, fabrication, and other applications. The above-mentioned periodic structures have structures of precisely the same size as the wavelength of light, and therefore can be expected to display large effects in controlling the wave property of light. Where nanoparticle arrays are concerned, we have succeeded in developing homogeneous film materials with large areas. These reflect only light of a designated wavelength, corresponding to conditions, and the reflected wavelength can be changed intentionally (**Fig. 1, bottom**).

The third type of materials is optical fibers, including their modified structures. A defect in an optical fiber delivering strong light can cause a chain meltdown reaction called fiber fuse. This phenomenon has the potential to be utilized as a new fabrication method for void arrays in glass materials (**Fig. 2**).

By controlling light using materials like those described here, it is possible to realize novel optical propagation devices, optical detection-type sensors, laser devices, and other new devices.

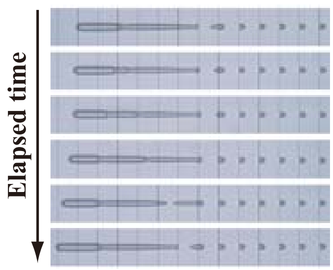


Fig. 2 Fiber fuse phenomenon: One void forms at approximately 20 µs. The vertical line is entered as a scale with an interval of 20 µm.

NIMS News

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Dr. Nakanishi Appointed Group Leader at Germany's Max Planck Institute

On February 28 in 2007, the NIMS Organic Nanomaterials Center (Managing Director: Dr. Izumi Ichinose) signed a joint research agreement with Germany's Max Planck Institute (MPI) of Colloids and Interfaces (Managing Director: Prof. Helmuth Möhwald). As part of the alliance, on April 1, Dr. Takashi Nakanishi, Senior Researcher at the Organic Nanomaterials Center, was appointed Group Leader of the MPI-NIMS International Joint Laboratory. While running this independent research group at the MPI in Germany, Dr. Nakanishi plans to undertake project research utilizing "NIMS Research Abroad Program". Dr. Nakanishi's posting to Germany is at the invitation of the MPI. In 2004, NIMS signed a memorandum of understanding (MOU) with the MPI of Colloids and Interfaces, aimed at promoting personnel exchange and joint research, and the MPI's Dr. Dirk G. Kurth currently serves as Group Leader of the Functional Modules Group at the Organic Nanomaterials Center.

The Max Planck Institute of Colloids and Interfaces (Potsdam) is world-renowned in the research of thin films and capsules derived from organic molecules and polymers. The MPI-NIMS International Joint Laboratory aims to build up supramolecular materials based on the fullerene self-assembly processes, to develop soft nanomaterials utilizing organic molecular properties, and to create new organic and inorganic hybrid materials. It plans to conduct joint research at the MPI in Potsdam as a stronghold, in collaboration with postdoctoral researchers and students from the University of Potsdam.

For more details: http://www.nims.go.jp/onc/index_e.html
http://www.mpikg.mpg.de/english/cont_issues/news/

Hello from NIMS

Impressions of the Japanese

Hello! My name is Andrey Grinevich. I was born in 1980 in a small town, Ivanovo, which is situated in the central part of Russia. I came here from Charles University in Prague, where I am currently in my 3rd year of my PhD studies.

In 2005, my supervisor told me that there was an opportunity to go to Japan for 1 year to the National Institute for Materials Science. I knew about NIMS from my friends and coworkers who had already visited it, and I thought that it was a very good chance for me to continue my work in Tsukuba, because NIMS provides extraordinary scientific possibilities with perfect equipment and research facilities. This was also a good possibility for me to meet new people, to get acquainted with Japanese traditions, and to have the experience of living surrounded by Japanese culture.

Now I'm working at NIMS in the Advanced Probe Microscopy Group under the supervision of Dr. Akiko Itakura (Nakamura). She is a very remarkable person.

Even though I have only been in Japan for a few months, I have already received a deep impression of the country. Practically everything is different from the European style of life. Especially, I want to point out the system of human relations common to Japanese society. Even though the Japanese are known around the world as a polite and responsible nation, I was honestly surprised to notice how caring they are for people around them. It is not a rare thing for a person to make every effort to show you the directions even though he/she has difficulty expressing themselves in English. It would be good if Russian people could learn from the Japanese in this sense.

Andrey Grinevich
(Charles University in Prague, Czech Republic)
International Joint Graduate School Program
(October 2006 - October 2007)
Advanced Probe Microscopy Group
Advanced Nano Characterization Center

[From right: Dr. Itakura, Ms. Richterova, and my wife in Kimono. Author (left) and Mr. Reiter (center).]

NIMS News

Appointment of New Adjunct Auditor

(April 1, NIMS) -- Dr. Kiyoshi Asakawa, Professor of the University of Tsukuba, TARA Center, was newly appointed as an Adjunct Auditor, succeeding Dr. Hisatsune Watanabe.

Dr. Kiyoshi Asakawa

Biography

Doctor of Engineering, University of Tokyo (1992). Graduated from the University of Tokyo, Applied Physics Department, in 1968. Joined the NEC Corporation as a Researcher of the Central Research Laboratories 1968 and built his career to Senor Research Scientist at the Opto-electronic Research Laboratory. Subsequently, served as a Guest Researcher at the University of California, Santa. Barbara (1987-1988) and as a Senior Group Leader at the Femtosecond Technology Research Association (FESTA) (1996 - 2004). Became the Professor of the TARA Center, University of Tsukuba in 2004.

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To subscribe, contact:
Ms. Naoko Ichihara
Public Relations Office, NIMS
1-2-1 Sengen, Tsukuba, Ibaraki
305-0047 JAPAN
Phone: +81-29-859-2026
Fax: +81-29-859-2017
inquiry@nims.go.jp