from Tsukuba, Japan to the world

NIMS NOW International

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SPECIAL FEATURES

International Cooperation II -Joint Research with MOU Institutes-

NIMS / Charles University

Growth Control and Characterization of Epitaxial Ultra-thin Alumina Film as Model Catalyst Support

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Nanomaterials Laboratory (NML)

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Nanoparticles of noble metals on an alumina are known to display a variety of catalytic reactions and are used in diverse applications ranging from catalysts for the chemical industry, for example, in methanol production and ammonia synthesis, to catalysts for environmental purification, in oxidation of nitrogen monoxide and carbon monoxide. As part of research aimed at achieving higher performance and reduced costs with these catalysts, experiments were carried out by vapor deposition of nanoparticles of noble metals on a highly controlled, extremely thin alumina film to create what is termed a model catalyst. The principle of this method is shown in **Fig. 1**.

Conventionally, crystalline thin films with two domains and a thickness of 0.5 nm grown on NiAl (110) (with Al-O forming a 2nd layer part) have been used as support for model catalysts. Although the film is an insulator, it loses its insulating property when metal nanoparticles are applied to the film surface by vapor deposition, and the electron state differs from that of actual catalysts. In addition to these drawbacks, the thermal stability of metal nanoparticles on such 2-domain thin films is also known to be low. Therefore, as a model simulating actual catalysts, an epitaxial alumina film which is as thin as possible while maintaining an uncharged state but retains its properties as an insulator after vapor deposition of metal nanoparticles has been required.

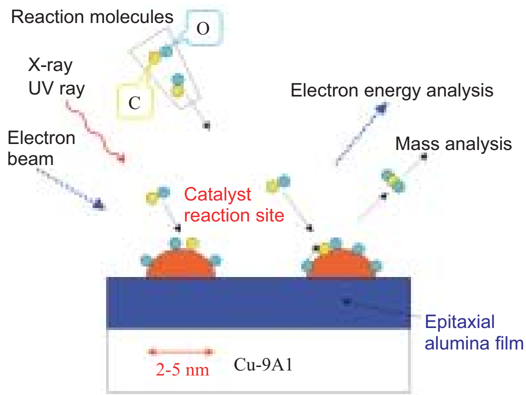

Fig 1: Schematic diagram of research on model catalyst.

We conducted research on control of the growth of epitaxial alumina films, and as a result, succeeded in growing epitaxial alumina films which are flat at the atomic level, with thicknesses of 0.5-4 nm, by oxidizing aluminum-added alloys/intermetallic compounds under an ultra-high vacuum using optimized temperature/oxygen partial pressure and other conditions. **Fig. 2** shows a low energy electron beam diffraction pattern of the surface where an alumina film was grown by oxidizing the (111) plane of a Cu alloy single crystal containing 9 at.% Al under an ultra-high vacuum at 990 K. The fact that the alumina film has grown epitaxially with respect to the CuAl alloy and the lattice constant of the alumina film can be understood from this pattern. < Continued on p.2

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NIMS NEWS

MOU with Materials Technology Institute (IfW), Darmstadt University of Technology, Germany

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Synthesis of Oxide Nanoparticles by Thermal Plasma Processing

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Plasma Processing Group
Advanced Materials Laboratory (AML)

Dong-Wha Park
Dept. of Chemical Engineering
Inha University

The NIMS Advanced Materials Laboratory concluded a memorandum of understanding (MOU) with Inha University in Incheon, Korea in October 2003. The two institutions are now jointly conducting "Research on Advanced Materials Processing through Controlling Chemical Reaction Fields."

Inha University was founded in 1954 as a private engineering college on account of the national desire for the extension of scientific/technical education at that time. The name, "INHA", comes from a combination of "In" in Incheon and "Ha" in Hawaii, since the university was opened in Incheon with a fund provided by a Korean emigrant to Hawaii. Today, Inha is a university with nine departments and is managed by a foundation affiliated with Korean Air.

The object of the present cooperation is the thermal plasma synthesis of oxide nanoparticles, which is conducted by the Plasma Processing Group of the AML at NIMS and Prof. Park of the Department of Chemical Engineering, Inha University. Works on application to light-emitting materials and photocatalysts have been carried out with the cooperation of the Electroceramics Group and Functional Glass Group, both of the AML.

Thermal plasma, which is generated at near-atmospheric pressures, reaches high temperatures exceeding 10,000 K. On leaving the high temperature region (electric power supply region), the plasma stream cools rapidly, at a rate of 10^{5-7} K/s. The crystal nuclei which form from the gas phase during cooling do not grow into large particles and can be collected as nano-size particles. Representative methods of generating thermal plasma are the radio-frequency (RF) induction method and DC arc method. Nanoparticle synthesis was performed by the RF method in the Plasma Processing Group and by the DC arc method at Inha University. In synthesizing nanoparticles, control of the particle size, composition control, and phase formation are all important. In this international cooperation, we have attempted to control the chemical reaction fields of nanoparticle synthesis utilizing the characteristics of the two different thermal plasma generating methods.

In order to obtain the photocatalytic activity of titanium oxide under the irradiation of the visible light, doping with transition metals has been tried. Inha University is studying application of iron oxide- or silicon oxide-doped titanium oxide as a photocatalyst by synthesis using a plasma oxidation reaction of gase phase precursors.

On the other hand, NIMS is synthesizing nanoparticles by supplying mist or micron-size solid powders in a high temperature thermal plasma. High concentration doping of nitrogen, iron oxides, etc. in titanium oxide nanoparticles has been achieved by a thermal plasma oxidation reaction of liquid and solid precursors. **Figure** shows high-crystallinity TiO_2 particles which were synthesized from titanium nitride (TiN) powder material. High photocatalytic activity can be expected as a result of nitrogen doping. Other goals at NIMS include synthesis of nanoparticles of rare earth element-doped TiO_2, which can be a new light-emitting material, and synthesis of nanoparticles of complex oxides whose compositions are difficult to control. Dr. Seung-Min Oh, who received his Ph.D. from Inha University, has also participated in this research at NIMS as a post-doctorate researcher. (**Figure** was taken during the period.) The second joint meeting was held at Inha University on November 2.

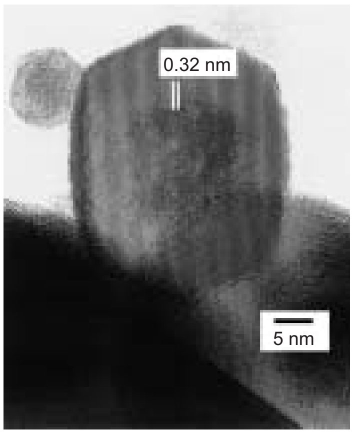

Fig: Titanium oxide nanoparticle with rutile structure synthesized by a thermal plasma oxidation reaction of titanium nitride (TiN) powder.

For further information, please visit: http://www.nims.go.jp/plasma/eng
http://www2.inha.ac.kr/~tppl/index_e.htm

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Growth Control and Characterization of Epitaxial Ultra-thin Alumina Film as Model Catalyst Support

Because our alumina film is slightly thicker than conventional films and is an insulator even after vapor deposition of metal nanoparticles, and furthermore, has no domains, nanoparticles are thermally stable. This film therefore has considerable promise as a model catalyst support. We are now carrying out research on controlled growth of this thin film, and synchrotron radiation evaluation and vapor deposition of nanoparticles of catalyst metals in joint work with the laboratory headed by Prof. Matolin of Charles University (Czech Republic), which is engaged in catalyst research.

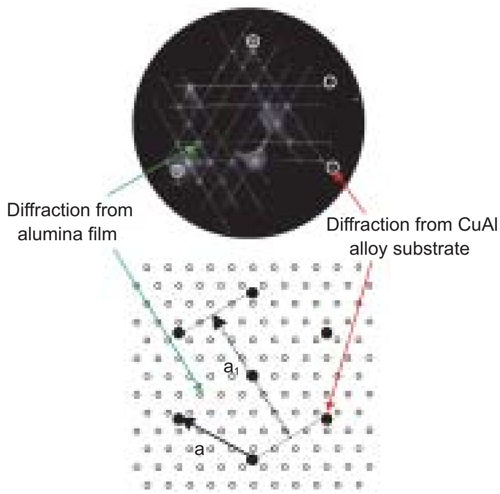

Fig. 2: Low energy electron beam diffraction pattern of alumina film formed by epitaxial growth process on Cu-Al alloy and its model.

For further information, please visit: http://www.nims.go.jp/nanoassembly/index-e.htm
http://physics.mff.cuni.cz/kevf/

Internal Structure and Biomimetic Properties of Fish Scales

Toshiyuki Ikoma, Yasushi Suetsugu
Regeneration Materials Group
Biomaterials Center (BMC)

Stephen Mann
School of Chemistry
University of Bristol

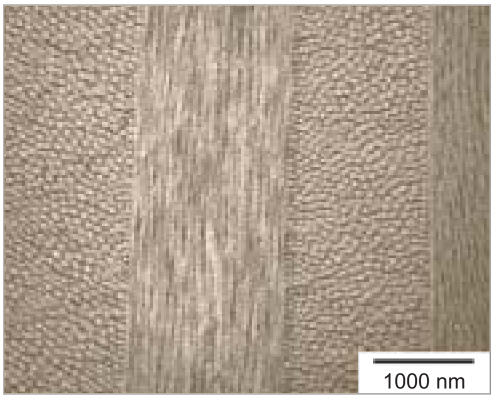

Fig. 1: Internal structure of sea bream scale observed by TEM.

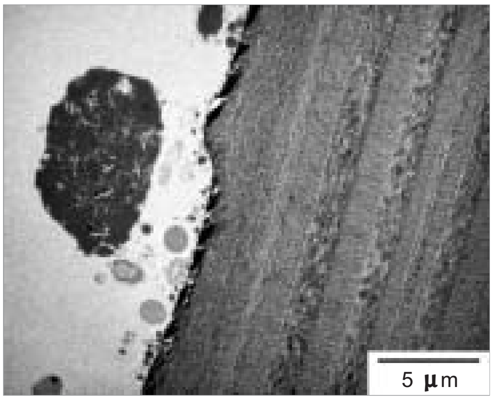

Fig. 2: Collagen fiber structure in sea bream scale; collagen fibers take random order at the outermost layer (the left side of the figure), and ordered structure inside.

Fish scales consist of calcium phosphate (hydroxyapatite) and protein (type I collagen). Scales not only protect the fish from external enemies but also reduce water resistance. In the course of evolution, it is thought that the scale formation process also developed into the mechanism responsible for formation of teeth and bone. Thus, elucidation of the internal structure of scales and their biomimetic properties may lead to the development of new biomaterials. Concretely, reproduction of ordered structures similar to scales in the test tube would open the way to application as substitute materials for the cornea, spinal tissue, and other body tissue.

Sea bream scales were used in this work. First, the calcium phosphate component was removed, and the scale structure was observed with a transmission electron microscope (TEM), as shown in **Fig. 1**. The observed structure was layered (thickness: 1-2 µm) and consisted of alternating layers of the round cross-section of collagen fibers (thickness: 70-80 nm) and an arrangement in the fiber direction with a 65 nm striped periodic structure. (**Fig. 2**) In other words, the structure consisted of layers of collagen fiber arrayed in one direction, with each layer rotated 90°. Fish scales have high strength due to this layered structure, and being free of light scattering, also have high transparency. This ordered structure is extremely similar to the internal structure of the corneal stroma of the human eye. It is therefore thought that an ordered structure like that in **Fig. 1** can be obtained by elucidating the formation mechanism of fish scales and reproducing that mechanism in the test tube.

When unmodified fish scales are baked at 1200℃, the structure shown in **Fig. 3** is obtained. High temperature baking eliminates the collagen and leaves only hydroxyapatite and a trace amount of tricalcium phosphate. The fact that tricalcium phosphate remains shows that the calcium content of the hydroxyapatite contained in the scale is inherently deficient, while the unique gap structure of the calcium phosphate indicates that collagen is arrayed with calcium phosphate in fish scales. This complex structure is expected to find application as a porous inorganic material in the fields of separation/catalysis/medicine.

The research outlined above was carried out jointly with Prof. Mann of the School of Chemistry, University of Bristol. We are currently engaged in basic research for the development of new biomaterials based on clarification of the biomineralization process in living organisms (calcification phenomenon in which hard substances form in living organisms) as an international joint research project.

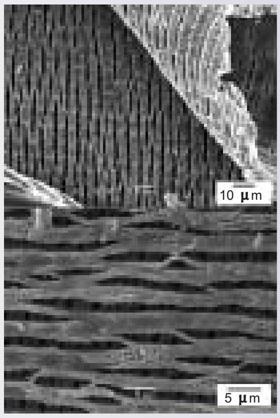

Fig. 3: Internal structure of sea bream scale after baking at 1200 ℃.

For further information, please visit: http://www.nims.go.jp/bmc/index_e.html
http://www.chm.bris.ac.uk/

The 1st ICYS Evaluation Committee Meeting

The 1st Evaluation Committee Meeting of NIMS' International Center for Young Scientists (ICYS) was held in Tokyo on September 7. Prof. Ikoma (board member of Hitachi Metals) as chairperson, six Japanese and international committee members deliberated the management and research activities of ICYS.

Beginning with the report on the policy and activity by Prof. Bando, Director-General of ICYS, the discussion was lively conducted. Research Fellows also participated and made comments about their research activities and the research environment, and exchanged opinions with the members. The meeting was successfully finished with many informative opinions and suggestions as conclusion, which was followed by President Kishi's closing remarks on future prospects of ICYS and NIMS.

NIMS / Materials Testing Institute (MPA), University of Stuttgart

Aiming at Improved Evaluation of High Temperature Strength of Heat Resistant Steels and Alloys

Koichi Yagi
Director-General
Materials Information Technology Station (MITS)

Karl Maile
Deputy-Director, Materials Testing Institute (MPA)
University of Stuttgart

In March of this year, NIMS held the MITS 2004 International Conference. One day of this conference was taken up with the NIMS-MPA Workshop. This is the fourth workshop based on a research cooperation agreement with the Materials Testing Institute, University of Stuttgart.

MPA's predecessor institution was established in 1878 as the Mechanical and Materials Testing and Research Institute of the Wurttemberg kingdom, and subsequently incorporated education/academic research and industrial/practical scientific research in its activities, resulting in its present form. In October of this year, MPA had ceremonies commemorating its 120th anniversary as a mechanical/materials engineering-related research institute and invited NIMS' President Kishi to attend them.

Since the period of its creation, MPA has been involved principally in research on energy-related equipment/parts for power plants, etc. and has large-scale equipment and facilities capable of testing actual power plant components (pipes and plates, actual scale models). As basic research, the institute also performs strength tests of metal materials and ceramics which make up structure parts.

Mechanical structures such as power plants are used under high and low temperature conditions, and their structural materials are also exposed to corrosive environmental conditions and are used under fluctuating loads and multi-axial loading. Therefore, quantitative investigation of the effects of temperature, corrosion, and load changes on material strength is important. On the other hand, because a combination of these factors acts on structural parts such as piping, it is also necessary to elucidate their compound effects. NIMS is particularly strong in the first area, material engineering, while MPA is strong in the second area, mechanics. The two institutes thus have areas of common expertise as well as mutually complementary strengths.

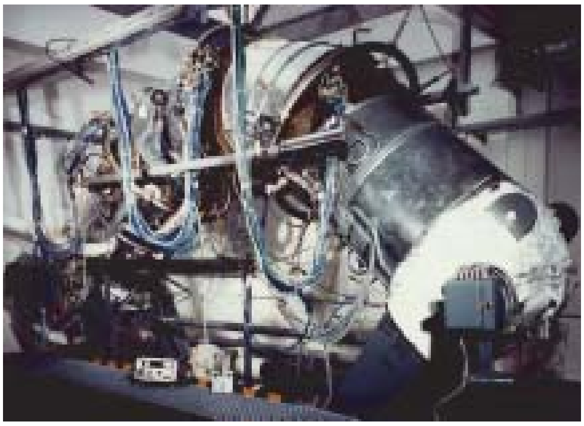

Fig: Bending creep test of actual piping at MPA. (Figure provided by Prof. Maile.)

In November 1998, on the occasion of a visit to NIMS by Director E. Roos of MPA, MPA and NIMS' predecessor institute discussed research cooperation, leading to the conclusion of a memorandum of understanding in April 1999. Based on this MOU, the two sides have held workshops and created a circle of research cooperation through exchanges of information. The 1st NIMS-MPA Workshop was held in Stuttgart in March 2000.

Among the themes of these meetings, the 1st Workshop focused on materials development/component reliability and materials information, while the 2nd and subsequent workshops took up the long-term strength of high-Cr steels for power plant use, which is a subject of considerable topicality, resulting in workshops which were of value not only to the two institutes, but also to related persons. At MITS 2004, a risk-based engineering workshop was also held with the cooperation of those concerned at the MPA. NIMS hopes to promote closer cooperation through this relationship.

For further information, please visit: http://www.nims.go.jp/mits/english/E_index.htm
http://www.mpa.uni-stuttgart.de/mpa_en_home.htm

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MOU with Materials Technology Institute (IfW), Darmstadt University of Technology, Germany

On September 14, the NIMS Materials Technology Information Station (MITS) and Steel Research Center concluded a memorandum of understanding (MOU) with the Materials Technology Institute (IfW) of Darmstadt University of Technology in Germany. As the aims of this agreement, the two sides intend to exchange information and human resources and conduct joint research in testing and research fields related to the life and strength evaluation of structural materials.

IfW is among Europe's representative research institutes, particularly as a high temperature material strength testing laboratory, for example, having conducted long-term creep tests since before World War II, and has numerous research achievements as a materials research institute and extensive data on subjects including creep, creep fatigue, crack propagation behavior, and multi-axial behavior. It is also actively participating in international standardization activities for material test methods and evaluation procedures necessary for this type of material strength research.

In the present stage, NIMS and IfW will promote research cooperation through information exchanges and mutual visits and plan to hold a workshop on long-term strength evaluation at Darmstadt in the fall of 2005.

For further information, please visit: http://www.nims.go.jp/mits/english/E_index.htm
http://www.nims.go.jp/stx-21/eg/index-e.html
http://www.hrz.tu-darmstadt.de/forschung/bericht/160008.en.tud

Success in Test Production of Ultra Fine Grained Steel Plate with 35 mm Thickness from Scrap Steel

—Development of New Process Features Use of Numerical Simulation—

Tadanobu Inoue
Metallurgical Processing Group
Steel Research Center (SRC)

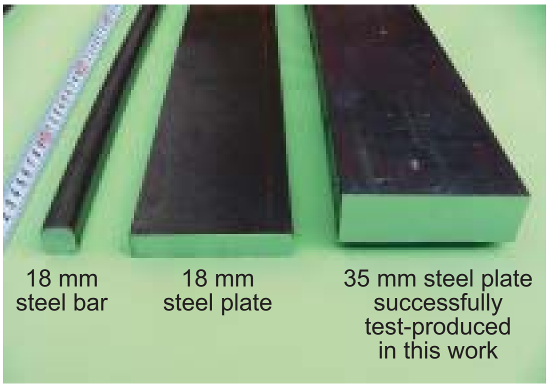


Fig. 1: Appearance of test-produced large-scale UFG plate.

The Steel Research Center succeeded for the first time in manufacturing a steel plate with an ultra fine grained structure having a grain diameter of less than 1 μm (1 μm = 1/1000 mm), or approximately 1/10 of the conventional size, using commercial manufacturing equipment. The plate, as shown in **Fig. 1**, was 35 mm in thickness and approximately 90 kg in weight, and displayed more than double the conventional yield strength. Numerical simulation technology was actively applied in developing the manufacturing process.

Steel is an aggregate of numerous small crystal grains and shows increased strength as the size of these grains decreases. The grain size of steels in general use is 10 μm or more. Steels with grains of 1 μm or less, which is 1/10 of the conventional size, are termed ultra fine grained (UFG) steels. Although ultra fine grain sizes have been achieved in small samples, it was difficult to realize a UFG structure in the material as a whole. In particular, it was considered extremely difficult to produce large-scale UFG samples with existing production capacity. However, in shipbuilding, civil engineering, construction, and other fields, large-scale, high strength steel plates having thicknesses of 25 mm or more with excellent recyclability and resource saving suited to the recycling society of the future had been desired.

To date, the NIMS Steel Research Center has elucidated the principle of ultra grain refinement in basic experiments using very small test pieces and attempted to expand this basic principle to test production of large-scale materials. First, several concepts were studied by numerical simulation, and a manufacturing process capable of creating a UFG plate from the viewpoints of the load on the equipment, prediction of the microstructure, and the shape of the plate was proposed. However, a large-scale press and detailed processing technology were necessary in order to verify the new process proposal. Therefore, Muroran Plant of Japan Steel Works, Ltd. was commissioned to perform the test production work. Using a large-scale press (**Fig. 2**) which is part of that company's commercial production equipment, a 35 mm thick UFG plate was successfully test-produced by realizing the new process with high accuracy.

The material used in test production of this plate was a continuous casting slab (produced by Oji Steel Co., Ltd.) made from scrap steel. Recycling of scrap steel is considered to be important for creating the recycling society of the future and reducing environmental loads not only in Japan, but globally as well. Using the proposed UFG manufacturing process, the possibility of manufacturing UFG steel from scrap steel was demonstrated with commercial production equipment owned by a private-sector company.

Among future goals, the Metallurgical Processing Group plans to create larger-scale UFG plates with the aim of realizing use for UFG steels in a variety of fields.

Fig. 2: Large-scale press at Japan Steel Works, Ltd. used in test production of UFG plate.

NIMS Signs MOU with Mexican National Research Institute

On September 30, the Advanced Materials Laboratory (AML) signed a Memorandum of Understanding (MOU) with Mexico's Institute for Scientific and Technological Research of San Luis Potosi (IPICyT) covering technical co-operation in the creation/evaluation and modeling of nanostructural materials. The aim of this cooperation is to conduct wide-ranging joint research on the fundamentals and applications of nanoscale materials by combining the IPICyT's high research potential in the creation of nanomaterials such as carbon nanotubes and theoretical calculation capabilities, and the AML's high research potential in the synthesis of new nanotubes, such as BN nanotubes and others developed to date and TEM structural analysis technology.

For further information, please visit: http://www.nims.go.jp/amlaml/english/
http://www.ipicyt.edu.mx/ingeipicyt/

Front, left to right; Dr. Watanabe (Director General, AML), Dr. López (Director, ADMAT, IPICyT) and Dr. Terrones (Chair, ADMAT, IPICyT).
Center back; Prof. Bando (Director-General, ICYS / Director, AML) and Dr. Terrones (ICYS Fellow, brother of Dr. Terrones of IPICyT).

Strengthening NIMS' Functions as Japan's Core Institute in Material Research

Prof. Teruo Kishi
President

NIMS is the only Independent Administrative Institution in Japan specializing in materials research. Thus, while carrying out our own research activities, NIMS must also play the role of a core institute which provides basic support for materials research activities in Japan as a whole and supports international research activities in the field.

Since its establishment, NIMS has introduced a number of measures necessary for fulfilling its functions as a core institute. At present, with approximately 1 and 1/2 years remaining in the First Five-Year Program, NIMS believes that it is necessary to link these function-strengthening efforts developmentally to the Second Five-Year Program in a more effective form.

Therefore, based on domestic and international conditions in the field of materials research, NIMS intends to strengthen its functions in the three areas of **Internationalization and Dissemination of Information**, **Intellectual Infrastructure**, and **Cooperation with Industry and Academia**.

1. Strengthening of Internationalization and Dissemination of Information

– Strengthening of Internationalization –

NIMS will construct a framework for international cooperation with multiple institutes engaged in materials research based on present international tie-ups, which mainly take the form of bilateral cooperation with one foreign institute.

Taking advantage of its experience with the activities of the International Center for Young Scientists (ICYS), NIMS will endeavor to further improve/create a working/living environment conducive to internationalization and will positively receive international researchers.

– Strengthening of Dissemination of Information –

As an information/analysis journal which accurately grasps and analyzes general trends in government and other policies, research activities, etc. in materials research in Japan and internationally, NIMS will begin publication of *Materials Science Outlook*.

On the other hand, NIMS, together with other related institutes, will also endeavor to improve and expand the academic journal *Science and Technology of Advanced Materials (STAM)* to make it an international journal which communicates with a global readership.

2. Strengthening of Intellectual Infrastructure

– Strengthening of International Standardization Activities –

To encourage wider use of new materials worldwide, NIMS intends to realize international standardization of its research results to the greatest extent possible.For this purpose, NIMS will create an internal Committee of Certification for Reference Materials and Standards, under which NIMS will standardize and certify research results and actively promote standardization of those results through international committees, etc.

– Strengthening of Intellectual Property –

NIMS will construct a system for effectively/efficiently utilizing NIMS' research results by establishing a basic policy on the management/use of intellectual property and conducting reviews/ improvements of the patent control/maintenance system.

3. Strengthening of Cooperation with Industry and Academia

– Construction of Materials Research Platforms –

To encourage practical application of NIMS' research results, NIMS will improve the environment to enable more active participation by industry researchers in NIMS' internal research activities, for example, by providing private rooms which secure confidentiality and common spaces which enable free discussion of research with NIMS researchers.

To promote research for practical applications with industry under the Second Five-Year Program, NIMS will identify research topics where practical application can be expected within the period of the First Five-Year Program and make the necessary preparations.

– Strengthening of Cooperation with University –

NIMS will actively promote joint research on research topics leading to the creation of new fields with large potential for development through tie-ups with universities. At the same time, NIMS will also conduct survey/analysis activities in connection with materials research together with universities in Japan and other countries to support the above-mentioned objective of "Strengthening of Dissemination of Information."

Dr. Bednorz, Nobel Laureate in 1987, Visits NIMS

Nobel Prize winner Dr. J. Georg Bednorz of the IBM Zurich Research Laboratories visited NIMS on October 1. In 1987, Dr. Bednorz won the Nobel Prize in Physics at the young age of 37 for his discovery of oxide high-temperature superconductors. During his visit, Dr. Bednorz gave a lecture on resistive memory materials using doped perovskite oxides and their electrical properties, which is among his recent areas of research. As part of his busy schedule, the Nobel Laureate also visited related groups, held discussions on research on new material development, inspected NIMS laboratories, and had informal discussions with ICYS Fellows.

NIMS Succeeds in Synthesizing Water-Soluble Silica-Based Material

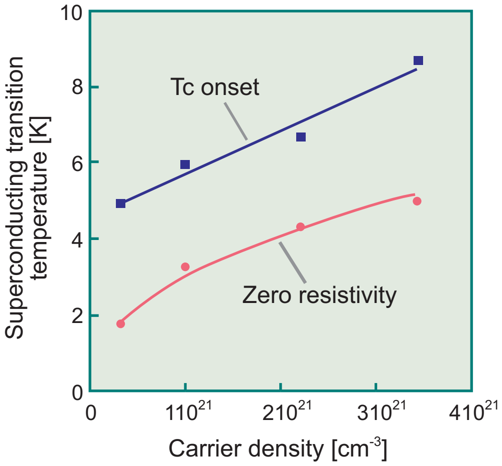
- Synthesis of Nanometer-order Rodlike Silica-Based Material -

A water-soluble silica-based material was successfully synthesized by polymerization (sol-gel method) of an alkoxysilane material with a functional substituent, which is converted to an ionic substituent during the polymerization. The work was carried out by a team in the Opto-Single Crystal Group of the Advanced Materials Laboratory (AML) led by Yoshiro Kaneko and Nobuo Iyi. The new material has a rodlike structure with about 1 nm in diameter and the ionic substituent on its surface. Therefore, this rodlike silica-based material separates in the water. Consequently, this material shows the water-solubility. It can be expected that numerous applications, e.g., utilizing as an inorganic species for inorganic-organic hybrid materials and a thickener (viscosity improver) for cosmetics and inks, etc. using the properties of this material such as water solubility, ionic property, transparency, and improvement of viscosity.

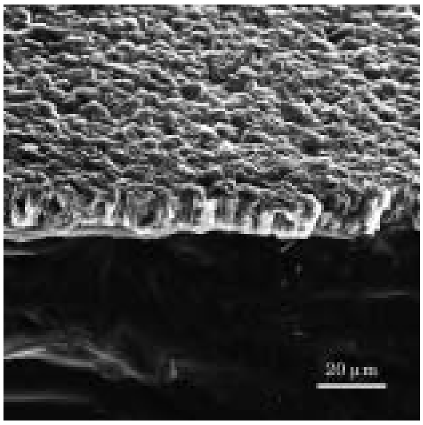
For further information, please visit: http://www.nims.go.jp/osc/index_eng.html

Discovery of Superconductivity in Diamond Thin Film Grown by Chemical Vapor Deposition

Superconductivity was observed for the first time in diamonds grown by chemical vapor deposition in joint research by a team in the Nano Quantum Electronics Group, Nanomaterials Laboratory (NML) led by Yoshihiko Takano and a group under Prof. Hiroshi Kawarada of the Waseda University, School of Science and Engineering. This phenomenon occurred when a large quantity of boron was added to the diamond. The material was synthesized by adding an extremely high concentration (2 %) of B relative to the C content, and showed superconductivity at an absolute temperature of 8.7 K. By adding the new function of superconductivity to diamond thin films, this discovery is expected to lead to practical application of new devices which generate extremely little heat and are environment- friendly.



Carrier density dependence of the superconducting transition temperature Tc. Tc onset and zero resistivity rise steadily with the increase of carrier density.



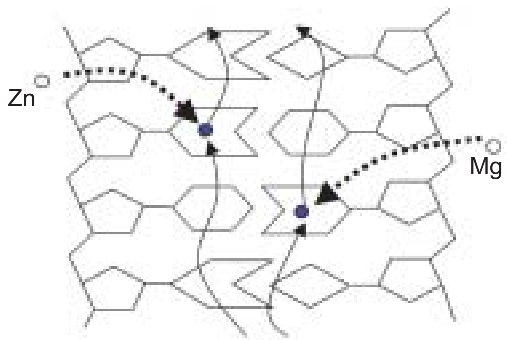
Scanning electron microscopy (SEM) image of the CVD diamond thin film deposited on the Si substrate.

For further information, please visit:
http://www.nims.go.jp/nanomat_lab/ResGroup/Quantele/qanele.html

Discovery of Mechanism Controlling Electrical Resistance in DNA

- Opening the Way to Next-Generation DNA Semiconductors -

The theory of electrical conduction and mechanism controlling electrical resistance in DNA were discovered by a group under Hiori Kino and Takahisa Ohno, Deputy Director of the Computational Materials Science Center (CMSC), working jointly with Prof. Hidetoshi Fukuyama of Tohoku University and a group under Dr. Kiyoyuki Terakura, Research Coordinator of Japan's National Institute of Advanced Industrial Science and Technology (AIST). Although it is known that DNA is normally an insulator in biological environments, this research discovered that DNA becomes a semiconductor when it is bonded with designated species of metal ions and the water molecules surrounding these metal ions are removed. This finding is expected to result in dramatic progress in the development of control technologies for electrical conductivity in DNA, and opens the way to use of DNA in semiconductor wires and the development of next-generation electronic devices which utilize nano-size properties such as self-organization.



A hole, which carries the electric current by applying a voltage, moves from metal ions to base molecules of DNA, when the metal ions are not surrounded by water molecules. The hole, which is not capable of moving freely when it is on the metal ions (a whilte circle), is mobile on the base molecules of DNA (a blue circle).

Suba in Tsukuba

Raghavan Subasri (India)
Research Fellow (Feb. 2003 - Feb. 2005)
Corrosion Group
Materials Information Technology Station (MITS)

[With colleagues, right]

My name is Raghavan Subasri and I hail from India. I joined this Institute during Feb. 2003 as a NIMS Post Doc in the Corrosion Group headed by Dr Tadashi Shinohara. The research work that I am involved in focuses on a novel application of TiO_2-based coatings namely for cathodic protection of metals and/or steels (for details, see cover of Vol.2 No.7 issue).

This is my maiden visit to Japan and my life in Tsukuba has been very pleasant all these days. After living here, I feel that the name Tsukuba could have stemmed as an acronym for a Tranquil Serene Unpolluted Kingdom and an Undeniably Blessed Area. During my initial days after arrival, I felt a bit inconvenient because of the limited transportation facilities available here. But slowly, I realized that it was only because of this that I could move around on my bicycle and discover the beauty of Tsukuba. I have now come to a conclusion that one lifetime is insufficient to explore cum enjoy the whole of Tsukuba and become one with its greenery. NIMS is undoubtedly the best Institution around the globe to carry out quality research. The freedom given to the researchers with regard to use of an equipment at anytime is highly encouraging and leaves the researchers as the rate determining step to achieve a specific research target.

On the whole, I think it is a privilege to do science and live in Tsukuba. How can I not like to live in a place that includes my name, i.e. suba is within Tsukuba !!!!

A Total Experience - Not Only Research

I am from the University Bayreuth in Germany. During my sabbatical I worked together with Dr. Yoko Yamabe-Mitarai in the High Temperature Materials 21 Project of Director Dr. Hiroshi Harada.

When I arrived in Tsukuba on a sunny day in October I knew just ***konnichiwa*** and ***sayonara***. However I was eager to do not only science but to get to know the Japanese people, their culture and their country. Now, just a couple of days before my departure, I can conclude that it was a wonderful and successful year. I could be part of a fantastic group. Thanks to countless fruitful discussions with my colleagues and the world-class facilities of NIMS I could succeed in my research with several publications. I am convinced that the deep personal relationships I could develop at NIMS will stimulate future international cooperation. Besides research work I will always remember the trips to Tsuru no yu in Nyuto onsen with my working group or to Hakuba with the ski club of NIMS or the touring with the motorcycle club of NIMS.

Rainer Völkl (University Bayreuth, Germany)
JSPS Fellow (Oct. 2003 - Oct. 2004)
High Temperature Materials Group
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[With colleagues in Akita, front, second from the left]

I hope I can give sometime, somehow, something back for all the things you did for me. Thus do not hesitate to contact me if you are near Bayreuth in Germany the next time (Rainer.Voelkl@uni-bayreuth.de).

Yamaboshi (Cornus Kousa)
November 5

It's been a beautiful and warm autumn this year in Tsukuba. Yamaboshi leaves have started to change the color to red.

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