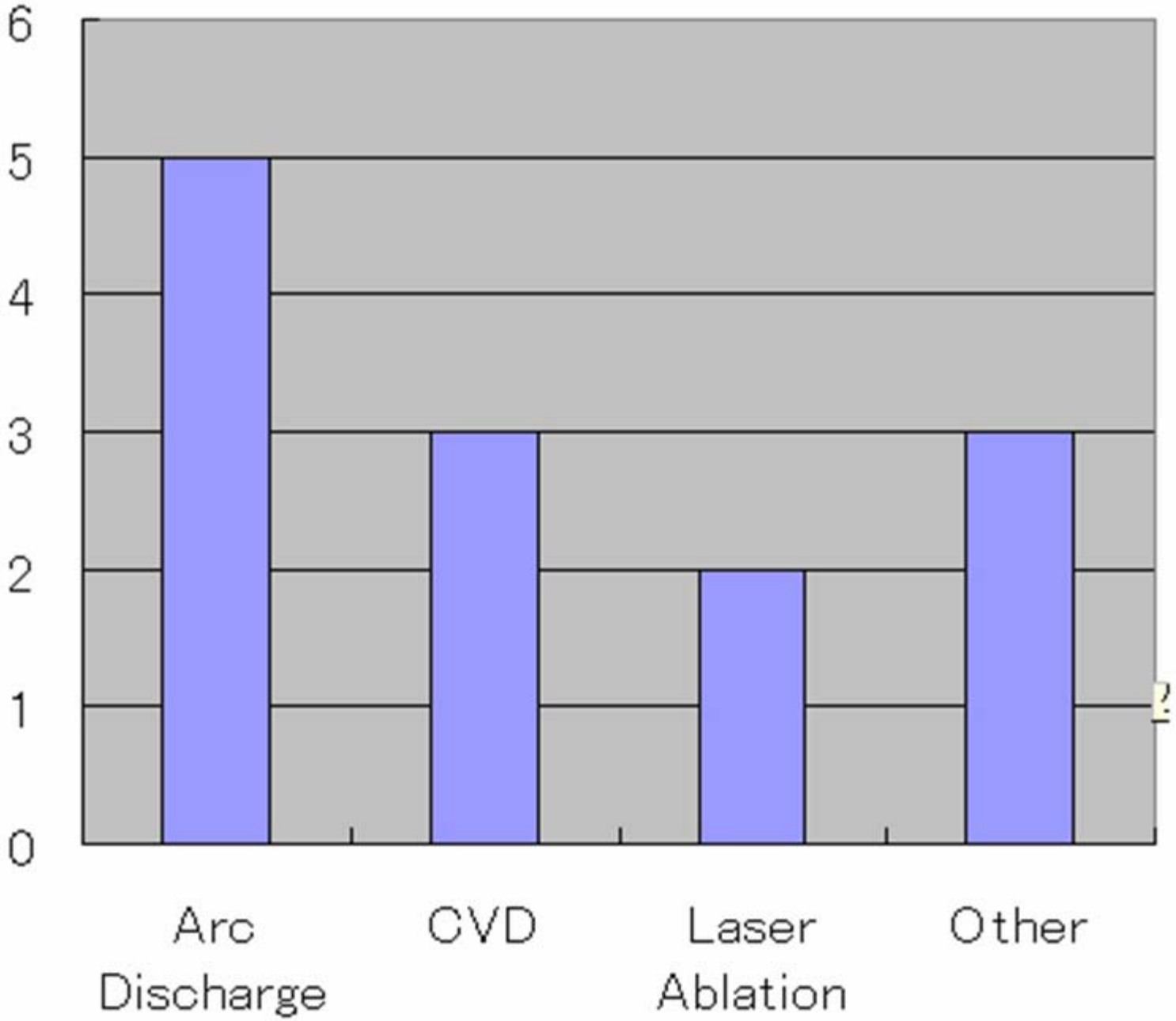
# Poster Session B

Non-CVD Synthesis of Nanotubes : 14 abstracts

&

Formation and Characterization of Unusual Nanostructures : 23 abstracts


6
5
4
3
2
1
0
Arc Discharge
CVD
Laser Ablation
Other

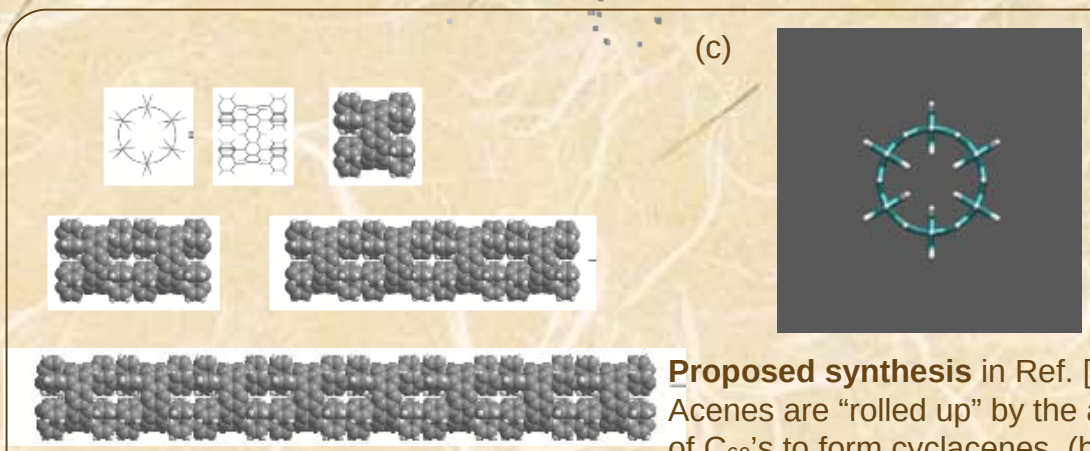
B001

# *Ab initio* calculation of cyclacene-based carbon nanotubular compounds

Shinya Okano[1], Glen P. Miller[2], David Tománek[1]
[1] Michigan State University, [2] University of New Hampshire

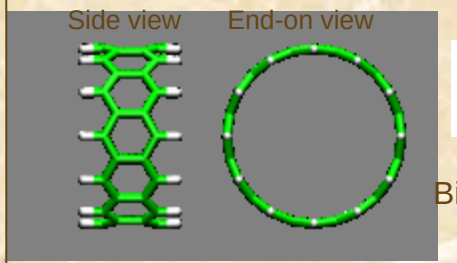
We investigate the structural and electronic properties of cyclacene-based carbon nanotubular compunds using the density functional theory. This is a theoretical counterpart of a proposed synthesis, which is aimed at selectively synthesizing single-walled nanotubular compounds with uniform dimension and chirality with a wet chemical approach [1].
Our results show that it is possible to modulate the band gap and dispersion of these compounds depending on the nature and orientation of molecular linkers that connect cyclacenes.

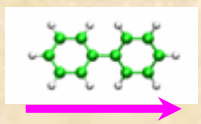
[1] Glen P. Miller, Shinya Okano, and David Tománek, *Toward uniform nanotubular compounds: Synthetic approach and ab initio calculations*, J. Chem. Phys. **124**, 121102 (2006).




**Proposed synthesis** in Ref. [1]: (a) Acenes are "rolled up" by the addition of $C_{60}$'s to form cyclacenes. (b) Cyclacenes are iteratively connected with molecular linkers. (c) Animation.

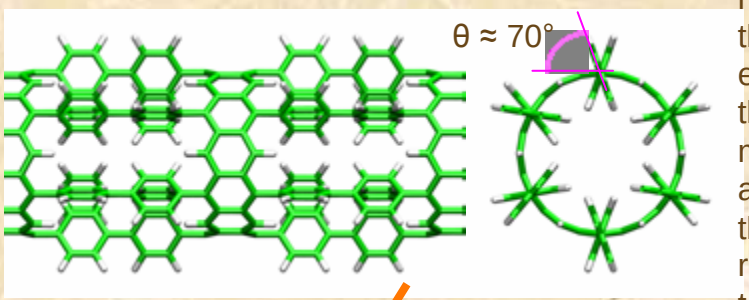
Cyclacene



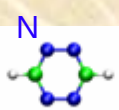



Biphenyl linker

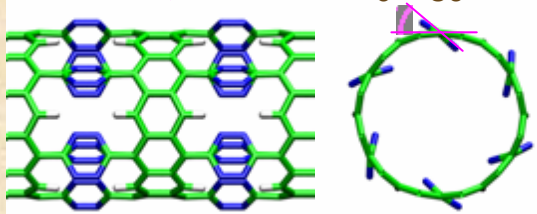
(12,0) biphenyl-linker tube




We use biphenyl and tetrazine as the molecular linkers that connect cyclacenes. In the case of biphenyl linker tubes, the electronic states near the $E_F$ are essentially the same as those of an isolated cyclacene molecule: the band dispersion is very small, and the fundamental gap is 0.55 eV. Changing the biphenyl linker to the tetrazine linker reduces the equilibrium linker angle from 70° to 36°, which improves π conjugation between the linkers and cyclacenes. This results in a larger band dispersion and a smaller gap of 0.07 eV for the tetrazine linker tube.



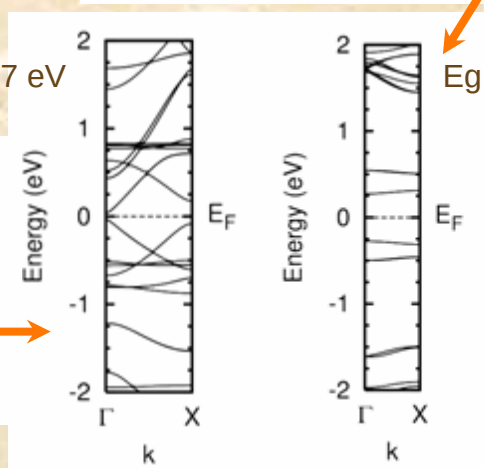

Tetrazine linker




(12,0) tetrazine-linker tube

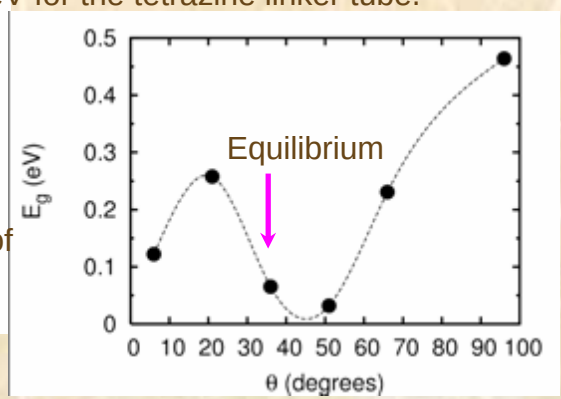
Eg = 0.07 eV

Eg = 0.55 eV




Band structures

The fundamental gap, $E_g$, of (12,0) tetrazine-linker tube as a function of the linker angle, θ.



B002

# Observation of Bamboo-liked Structure of Carbon Nanotubes Prepared via Pulsed Laser Ablation Technique

**Noorhana Yahya**

**The bamboo-liked carbon nanotubes were formed by laser ablation using a graphite target containing 10 weight percentage of NiCo catalysts. An Nd:YAG laser with 532 nm wavelength, 10.54 W was used to ablate the target to form the carbon nanotubes. The pressure inside the chamber was kept at 4 Torr and the bamboo-liked carbon nanotubes were formed on the substrate after 30 minutes of laser ablation. The TEM images showed that the diameter of the carbon nanotubes formed by NiCo catalyst were about 35 nm.**

B003

# Development of Fe-doped carbon electrode for mass-producing high-yield single-wall carbon nanotubes

Xinluo Zhao 1, T. Suzuki 1, T. Ikeda 1, S. Inoue 1, M. Ohkohchi 1, Y. Ando 1, Y. Takimoto 2

- Development of high-quality Fe-doped carbon electrode for mass-producing high-yield SWNTs.

- More than fourteen kinds of carbon materials have been used to prepare Fe-doped carbon electrode

- The best carbon electrode containing 1 at% Fe catalyst is capable of generating ~ 10 g/day of high-yield SWNTs in our laboratory.

- SWNTs with purity higher than 90 at%.

B004

# Continuous Synthesis Single-Walled Carbon Nanotubes from Carbon Black

Jian Bing Wu, Li Xia Ling, Wei Ren Bao, Yong Kang Lv

- High purity single-walled carbon nanotubes were synthesized continuously by injecting carbon black into electric arc.

- Best proportion of catalyst to carbon black (mass%) is 20~30%. The catalysis effect is Fe~Fe2O3>Fe3O4>FeS>FeCl2.

- The single-walled carbon nanotubes coarse purity can reach

- Probable growth mechanism from carbon black to carbon nanotubes was proposed in this paper.

B005

# Draw out Carbon Nanotube from Liquid Carbon

Shuang Zhang 1, Takeo Hoshi 2, Takeo Fujiwara 2

- Show the simulation results of elongated growth process of CNT by drawing out a well-formed nanotube from liquid carbon and discuss the mechanism and suitable synthesis conditions.

- The process is also simulated for creation of a Y junction from two isolated CNTs as first step to CNT network.

- promising one for catalyst-free mechanical design of interconnected CNT network and CNT cloning.

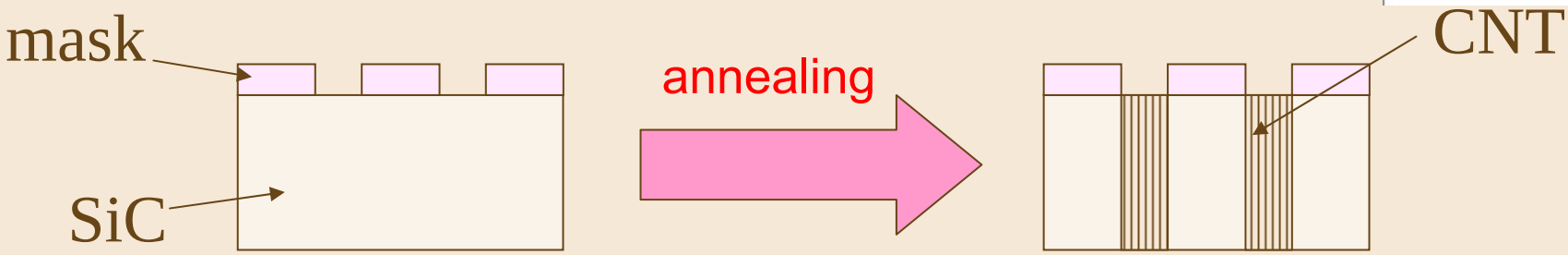
B006

# Fabrication of Carbon Nanotube Pattern on 6H-SiC(000-1) using Ti mask

Yoko Hozumi Dept. of Materials Science & Engineering, Meijo Univ.

CNT growth by surface decomposition of SiC is useful to fabricate CNT-based devices.

To fabricate CNT-based device, it is important to form selectively CNTs on SiC surface.




We used Ti as a mask for selective growth of CNT on SiC, since the melting point of Ti is higher than the decomposition temperature of SiC surface.

B006

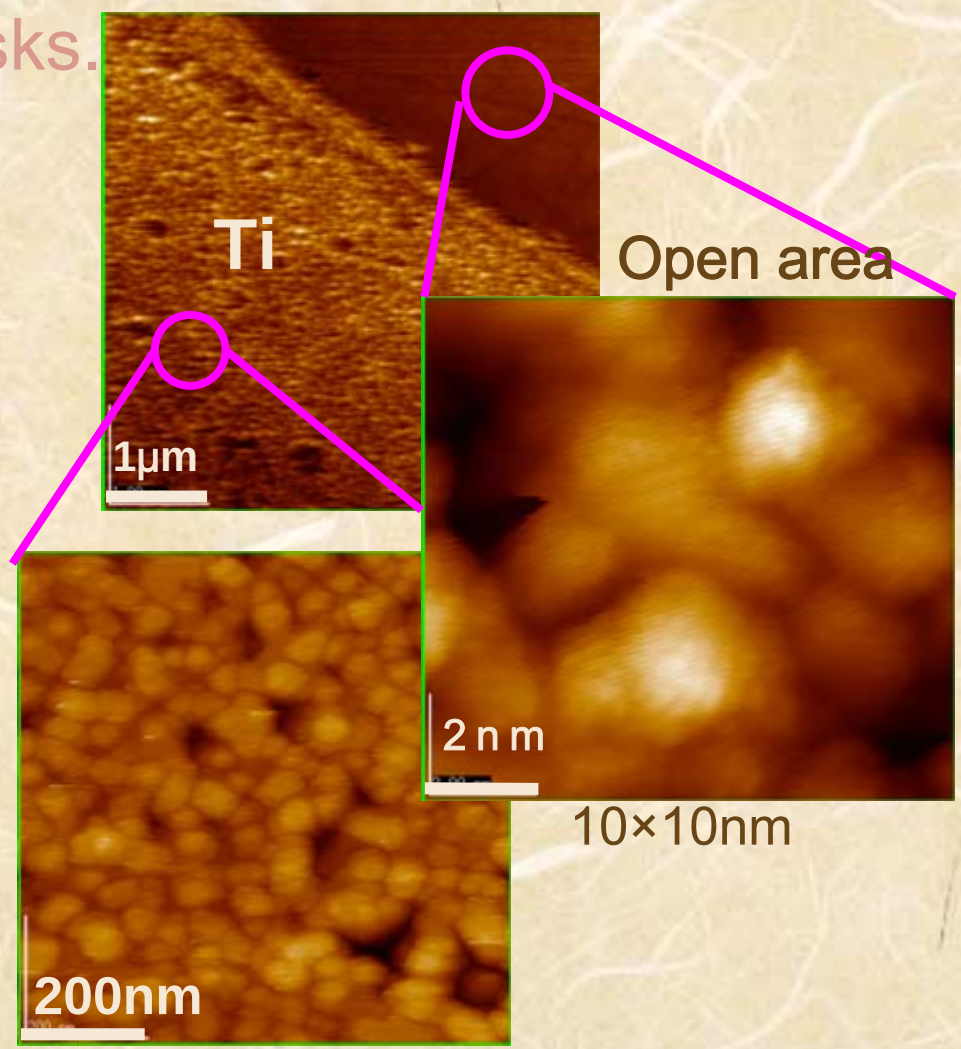
Annealing at 1270℃

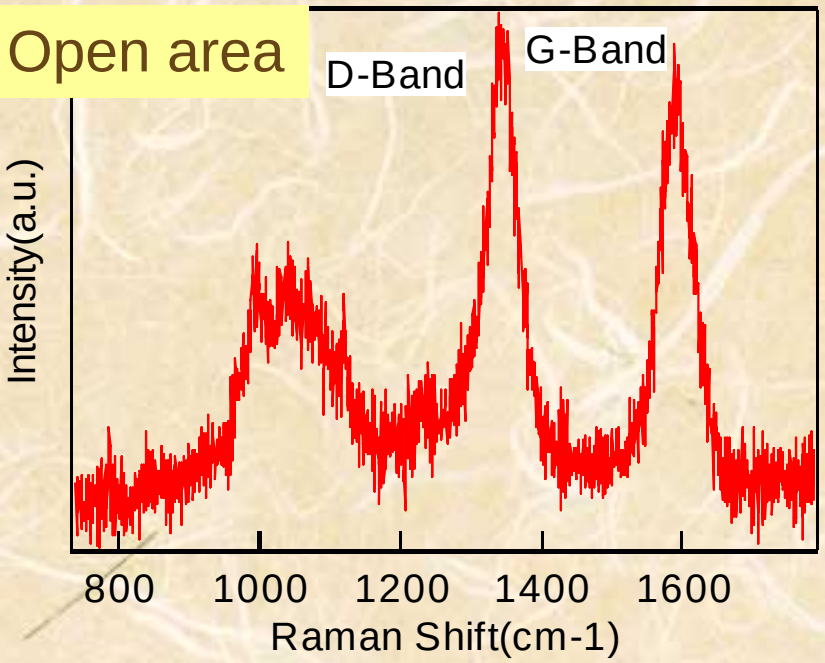
STM image

Annealing at 1700℃

Micro Raman spectroscopy

Carbon nanocaps are selectively grown at the open area between Ti masks.




**Strong G band peak was observed at open areas of Ti mask**

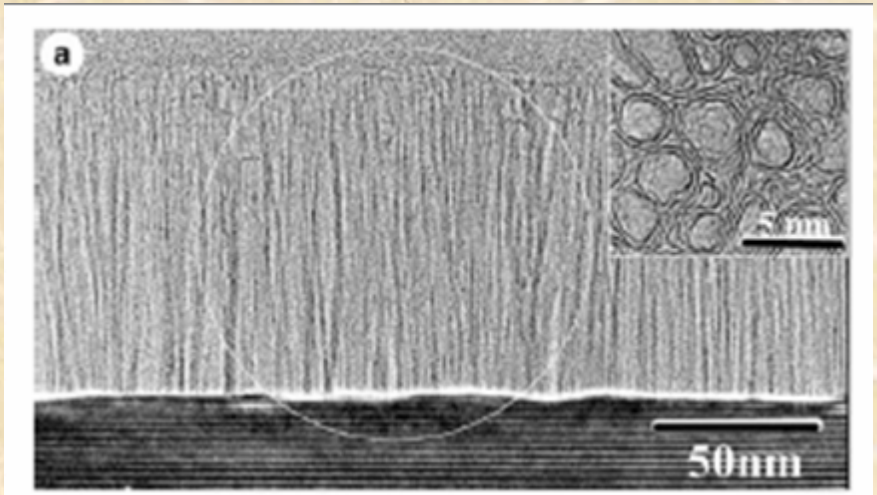
**CNT Growth**

B007

# XPS and STM studies of the effects of oxygen ambient on carbon nanotube growth into SiC by surface decomposition

Naomi Fujita Dept. of Materials Science & Engineering, Meijo Univ.

## CNTs produced by surface decomposition of SiC(000-1)




M. Kusunoki et al.,
Appl. Phys. Lett. 77 (2000) 531

**The effects of oxygen ambient on CNTs growth ?**

Sample annealed under various oxygen partial pressure

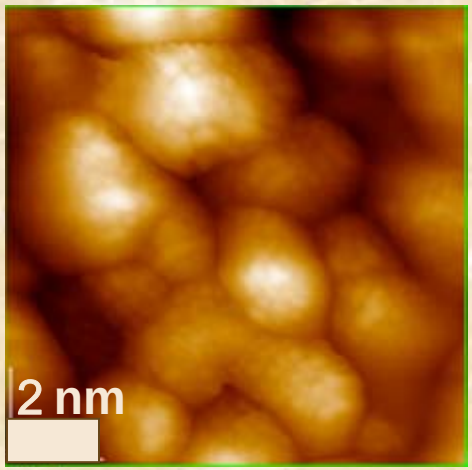
STM ➡ surface structure

XPS ➡ surface composition (chemical bonding) Thickness

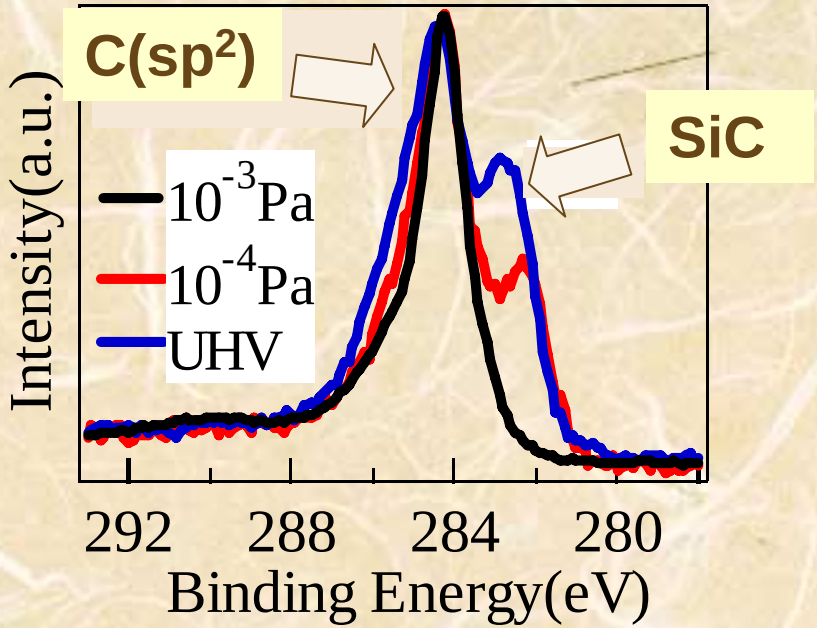
B007

# STM and XPS studies for the samples annealed at 1250℃ for 0.5h under various oxygen partial pressure

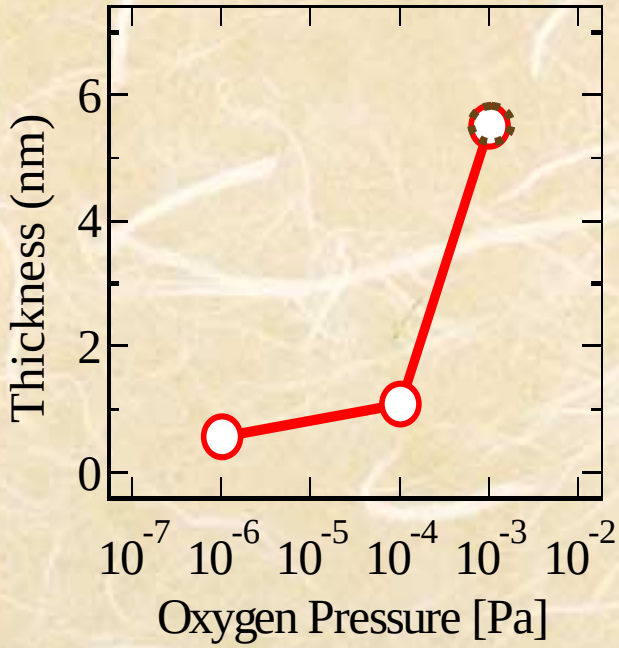
**CNT & Carbon nanocap**




C 1s XPS spectra




CNT thickness vs Oxygen pressure




***As the oxygen pressure increases, SiC peak decreases.***

**As oxygen pressure becomes higher, the growth rate increases.**

***Oxygen enhanced the decomposition of SiC surface !***

B008

# Synthesis of multiwall carbon nanotubes by pulsed laser irradiation of liquid

Jongbok Park 1, Sungho Jeong 1, Mun Seok Jeong 2, Do-Kyeong Ko 2, Jongmin Lee 2

- Method proposed for the synthesis of multiwall carbon nanotubes (MWCNTs) under room temperature and atmospheric pressure.

- MWCNTs are found in the solution with co-existing other forms of carbon nanostructures.

- Analyzed with Raman spectroscopy, scanning electron microscopy (SEM), and transmission electron microscopy (TEM) are presented.

B009

# Synthesis of SWCNTs by arc-discharge process using nonmagnetic catalysts

Miroslav Haluska 1, Martin Hulman 2, Viera Skakalova 1, Björn Hornbostel 1, Jiri Cech 1, Siegmar Roth 1

- Grow SWCNTs large enough to accommodate larger fullerenes using nonmagnetic metal catalysts.

- The growth was performed in water-cooled dc arc-discharge, used different catalysts such as Pt, Rh, Pd and their mixtures, as well as various buffer gases and additives.

- Raman and optical spectroscopy, TGA and TEM were used for characterization of the material produced at the various growth conditions.
- The type and the pressure of the buffer gas strongly affect the yield of SWCNT webs, but they have only a small influence on the diameter of SWCNTs..

B010

# Toward low temperature growth of carbon fibers by means of reactive sputtering

Xiaoxi LIU, Akimitsu Morisako

- Reactive sputtering has been proposed to growth carbon nanotubes.

- Nano-porous structures of anodized aluminum oxide films were used to prepare homogeneous diameter catalyst particles.

- Carbon nanotubes with diameter of about 40 nm were successfully prepared at temperature of 500 ℃.

- In conclusion, carbon nano-tubes have been successfully prepared by reactive sputtering process at temperatures as low as 500 oC.

B011

# A novel method for the ambient temperature substrate deposition of individual single-walled carbon nanotubes based on gas-phase charging

David Gonzalez 1, Albert G Nasibulin 1, Sergey D Shandakov 1, Hua Jiang 2, Paula Queipo 1, Taku Tsuneta 3, Esko I Kauppinen 4

- Discovered spontaneous gas-phase charging phenomenon of single-walled carbon nanotube (CNT) bundles.

- CNT bundles were both positively and negatively naturally charged, whereas individual nanotubes remained electrically neutral.

- The origin of this phenomenon was correlated to the bundling of the nanotubes.

- A novel method for the gas-phase separation of individual CNTs from bundles and their subsequent deposition on any solid substrate at ambient temperature was developed.

B012

# Characterization of Carbon Nanotubes Formed on Silicon Carbide Materials by Surface Decomposition

John J Boeckl 1, William C. Mitchel 1, Maher S. Amer 2

- Carbon nanotubes (CNT's) have been formed on the surface of silicon carbide (SiC) wafers during high temperature anneals

- No metal catalysts are required for this CNT growth method and the resulting CNT's are vertically aligned on the SiC substrate and have a high purity.

- Extend this growth technique to include CNT growth on 3C-SiC nano particles with diameters of 45nm and 38 μm. We also investigate CNT's formed on carbon foams and carbon fibers that have a chemical vapor deposited layer of 3C-SiC.

- development of sensors for aqueous and vapor phase chemical detection by these techniques.

B013

# Synthesis of carbon nanotubes with narrow diameter-distribution by spray pyrolysis of a natural precursor: Turpentine oil

**PRADIP GHOSH 1, Rakesh A. Afre 1, Prakash R Somani 2, M Umeno 2, T Jimbo 1, T Soga 1**

- **Synthesis of carbon nanotubes (CNTs) with narrow diameter distribution using a natural precursor**

- **Spray pyrolysis method here we used, is a very simple and inexpensive method for synthesis of this type of CNTs.**

- **characterized the structure of the grown nanotubes by SEM, TEM and Raman spectroscopy.**
- **Narrow diameter distribution confirmed**

B014

# Carbon nanowires prepared by arc plasma gun

Xinluo Zhao, Masaeki Endo, Akihiko Mizutani, Tomoko Suzuki, Sakae Inoue, Yoshinori Ando

- Show a new method for preparing CNWs by using an arc plasma gun.

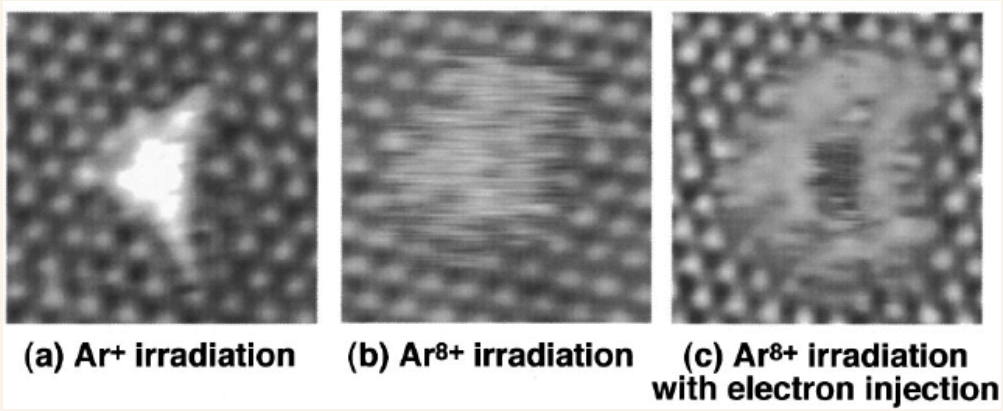
- Multiwalled carbon nanotubes (MWNTs) and CNWs (C-chain@MWNTs) were found on the surface of carbon rod inside the plasma flame.

- The characteristic Raman peaks of CNWs have been observed at approximately 1850 cm-1

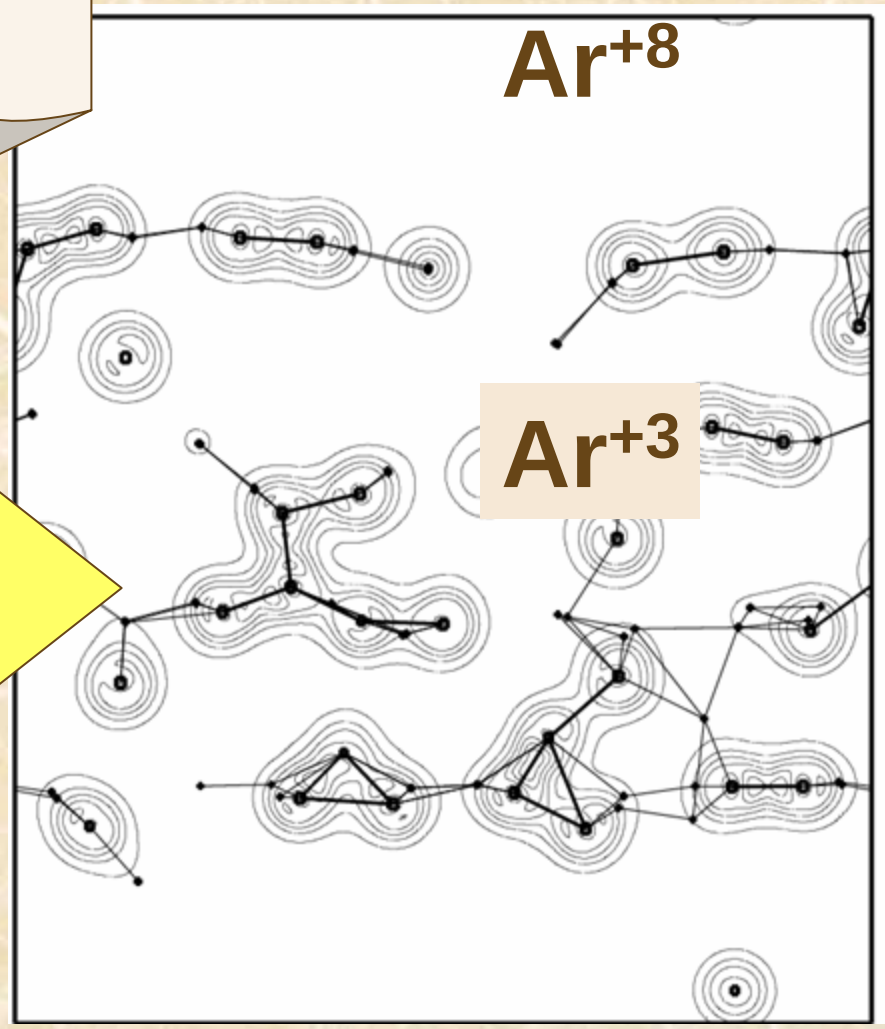
- It can be concluded that the formation of CNTs with very thin central holes (~ 0.7 nm in diameter) is the essential condition for CNW growth.

# B015 Y. Miyamoto

Nano-diamond formation by $Ar^{+8}$ irradiation?
(Experiment by T. Meguro, APL 79, p3866 (2001)




Electron-ion dynamics simulation of $Ar^{+8}$ collision shows ->
$sp^3$ and $sp^2$ structure!



B016

# Filling carbon nanotubes with silicon nanocrystals formed by pulsed-laser fragmentation of electrochemically etched Si micrograins.

Vladimir Svrcek, Takeshi Sasaki, Yoshiki Shimizu, Naoto Koshizaki

•Funcionalization of the carbon nanotubes (CNTS) is one hot issue nowadays research in this field.

•Report on cheap and effective way to fill carbon nanotubes through shock waves by pulsed-laser fragmentation of Si micrograins in silicon technology compatible spin on glass (SOG) solutions

• Fine blue luminescent Si-ncs with quantum confinement size can be formed. With increasing laser fluences the optical absorption and generated plasma heat together with strong shock waves provoke grains fragmentation

B017

# Band Structure Modification in Carbon Nanotubes Due to Crystal Encapsulation

LAIN-JONG LI 1, Tsung-Wu Lin 2, J Doig 3, I B Mortimer 3, J G Wiltshire 3, R A Taylor 3, J Sloan 2, M L. H. Green 2, R J Nicholas 3

- Modification of the band structure of single-walled carbon nanotubes (SWNTs) through encapsulation of the inorganic material manganese ditelluride ($MnTe_2$).

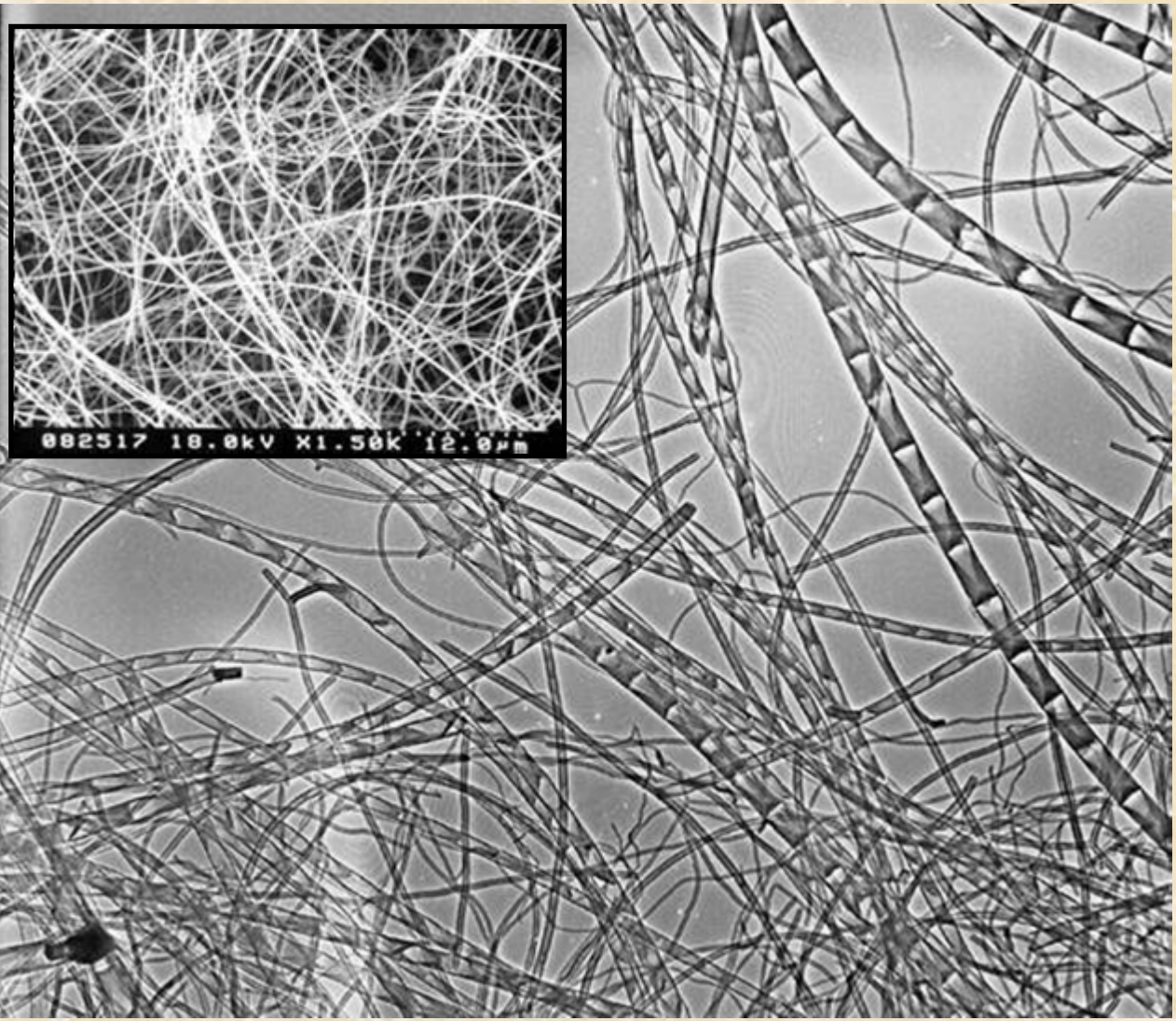
- The radial breathing mode frequencies are also found to increase due to the tube filling, consistent with idea that the interaction between the tubes and the $MnTe_2$ filling becomes stronger with increasing tube diameter.

- Crystal-filling enables a permanent, air-stable and large band gap modulation for carbon nanotubes.

B018

# Formation and Structural Changes of Carbon Nanofibers Having an Array of Conical Nano Cavities

Akira Koshio, Yuta Takemura and Fumio Kokai
*Department of Chemistry for Materials, Mie University*



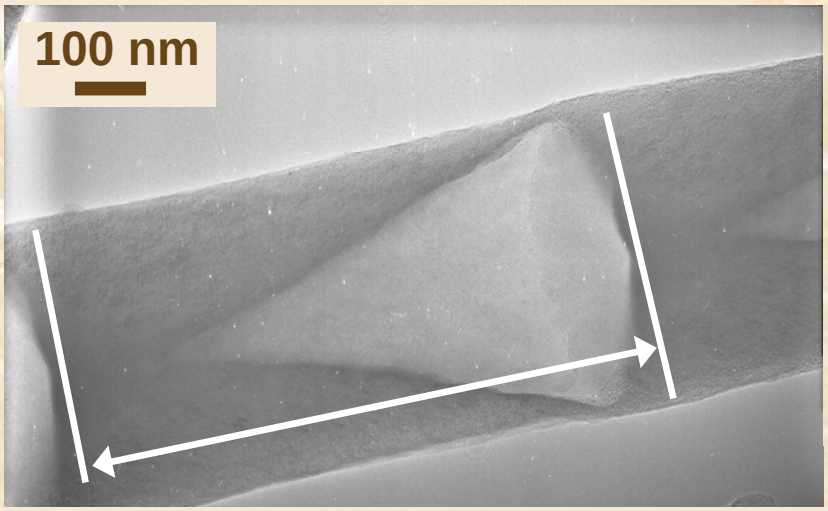

**Fe/ITO ($In_2O_3$ and $SnO_2$)**
**Alcohol CVD**

**Effective production of CNFs having an array of conical cavities**

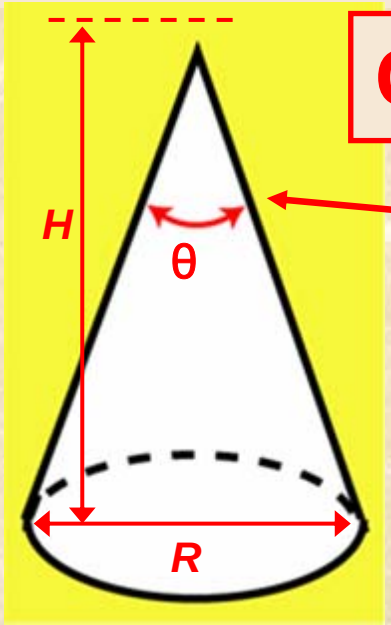
**Arrays of conical cavities formed in CNFs may make new carbon architectures possible.**

B018

# Structure of a conical cavity and snapping by mechanical force



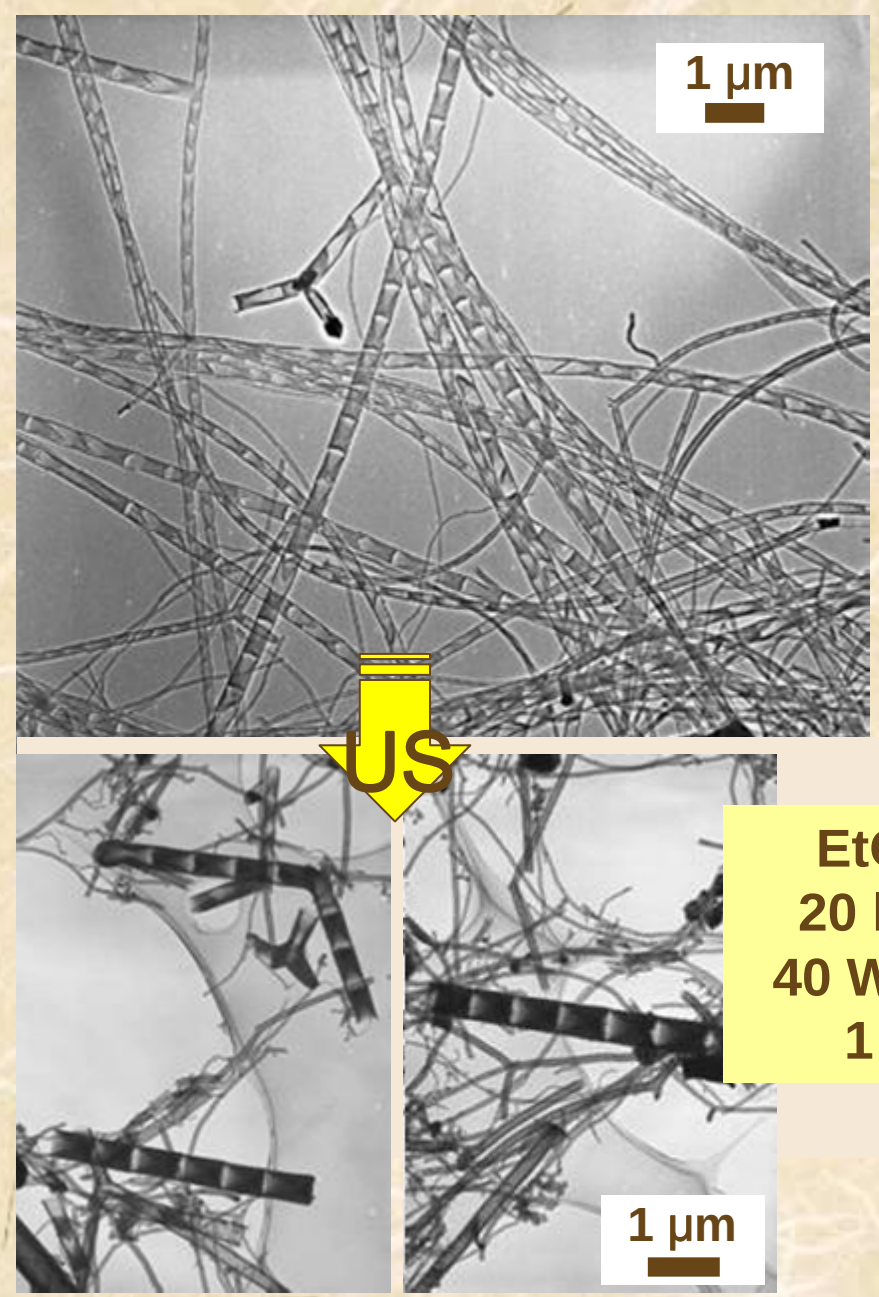

Length of a segment: 300 - 500 nm

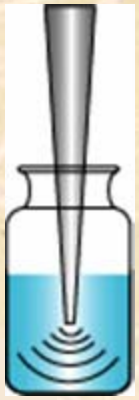



## Conical Cavity

Vertical angle θis constant: θ~40°

$$\frac{H}{R} = \frac{1}{2}\cot\left(\frac{40°}{2}\right) \approx 1.4$$



EtOH
20 kHz
40 W/cm²
1 h

Snapping in 1-10 segments

B019

# Growth of vertically aligned “carbon nanoflags” assembled by carbon nanofibers and nanowalls

Atsuto Okamoto 1, Kei Tanaka† 2, Masamichi Yoshimura 2, Kazuyuki Ueda 2

•Report the first synthesis of vertically aligned carbon nanofibers decorated with carbon nanowalls, so-called carbon nanoflags, by a plasma-enhanced chemical vapor deposition method.

•Vertically aligned carbon nanoflags film was formed under a plasma ion current of 0.23 A.

•Both density and average diameter of the carbon nanofibers increase with the increase in plasma ion current. The above studies suggest that carbon nanowalls are initiated on the defective lateral wall of carbon nanofibers.

B020

# Spectroscopic study of linear-polyyne encapsulating carbon nanotubes: polyyne peapods

**Daisuke Nishide** 1, Tomonari Wakabayashi 2, Toshiki Sugai 1, Ryo Kitaura 1, Hisanori Shinohara 1

- New hybrid material C10H2@SWNTs, linearly bonded sp-carbon atoms encased in single-wall carbon nanotubes (SWNTs), has been synthesized and characterized by Raman spectroscopy.

- The hybrid material exhibits a Raman signal at 2066 cm-1 attributable to the stretching vibration of the C10H2 molecules interacting with SWNTs. Being trapped inside the SWNTs, C10H2 molecules are shown to be stable well above 300 °C even under dry-air conditions.

B021

# Preparation of Fe3O4 / SnO2 Particle Catalysts for the Growth of Carbon Nanocoils

Nobuharu Okazaki 1, Yugo Higashi 2, Lujun Pan 3, Yoshikazu Nakayama 3

- New method to prepare powder catalysts for producing carbon nanocoils is shown in this study.

- Polyol process was used to prepare powder catalysts. With this method, the Fe3O4 / SnO2 composite catalysts in powder form could be prepared only by boiling mixtures of Fe ions and SnO2 particles in polyol in a few minutes.

- Structures of the catalyst particles depended on the composition ratios of Fe3O4 and SnO2, and the difference in structures of the catalyst particles largely influenced to the probability of CNC growth.

B022

# Shrinking Carbon Nanotubes

Thomas D Yuzvinsky 1, W Mickelson 2, S Aloni 2, G Begtrup 2, A Kis 2, A Zettl 2

We report a method to control the diameter of an individual carbon nanotube.

Electronic transport measurements performed in situ reveal a striking dependence of conductance on nanotube geometry. As the diameter of the nanotube is reduced to near zero, we observe negative differential resistance.

B023

# Template-growth of self-assembly interconnected carbon nanotube networks

Zhi An Ren, Jun Akimitsu

•Growth method for large-scale interconnected two-dimensional carbon nanotube (CNT) networks. From a well-prepared nano-channel network formed in porous anodic aluminum oxide (AAO) template, CNT network film was self-assembly produced by pyrolysis of hydrocarbon molecules.

•This network film is fully interconnected together by billions of nanotube segments, with centimeter-size large and only single-tube thickness

• Provide a novel route for the controllable growth of nanotube architectures and the development of nanotube-based integrated electronic devices.

B024

# Bridging Nano-Gaps in Nanotubes

Gavi E Begtrup 1, Thomas D Yuzvinsky 2, Keith G Ray 2, Brian M Kessler 2, Alex K Zettl 2

- Method to fabricate highly reproducible nanometer scale gaps in multi-walled carbon nanotubes.

- Devices are fabricated in an architecture compatible with transmission electron microscopy, which allows the gap to be imaged with atomic resolution and correlated to electrical measurements.

- The gap can be bridged with individual molecules or nanocrystals to produce a variety of behaviors.

B025

# Graphitic tube formation induced by flush discharge with Ga

Shotaro Nakazawa 1, Shotaro Nakazawa 1, Satoshi Okada 1, Yukinori Ochiai 2, Masahiko Ichida 2, Toshinari Ichihashi 2, Takashi Kaito 3, Shinji Matsui 4, Jun-ichi Fujita 1

We have found that an amorphous carbon pillar containing Ga, which originated from fabrication using focused-ion-beam induced chemical vapor deposition (FIB-CVD), transformed into a graphite tube with a flush discharge

instantaneous current injection, transformed the pillar into a multi-walled carbon nanotube that contained a characteristic structure with regular intervals of Ga droplets.

Iinner graphitized tube was still covered with a thin amorphous carbon layer. Such an outer surrounding carbon residue has shown a very high resistivity about 100 Ωcm

B026

# Synthesis of carbon nanocoils using organic metals as a catalyst

Shogo Hokushin, Lujun Pan, Yoshikazu Nakayama

The effectiveness of carboxylic acid metals as a precursor of the catalyst for nanocoils' growth has been investigated.

The Fe-In-Sn catalyst were formed by spin coating the solution on Si substrates and sintering at 450 ℃.

found that carbon nanocoils were synthesized uniformly all over the substrate. The line diameter of the grown nanocoils are ranged from 100 nm to 200 nm and the diameters of coils are several hundreds of nanometer.

revealed that carboxylic acid metals are efficient as a precursor of the catalyst for nanocoils' growth.\\

B027

# Microstructures of Catalyst Particles at the Tip of Carbon Nanocoils Grown from Fe-In-Sn-O Catalysts

Hideki Kume 1, Yoshito Nishikawa 1, Toshikazu Nosaka 1, Nobuharu Okazaki 2, Yugo Higashi 3, Lujun Pan 4, Yoshikazu Nakayama 4

**Microstructures of catalyst particles at the tip of carbon nanocoils and other carbon products**

**The statistical studies of TEM images proved that most of the catalyst particles at the tip of carbon nanocoils had anisotropic morphologies, while those of filament carbon products were isotropic.**

**The growth of carbon nanocoils is considered to be due to the nonuniformity of the carbon extrusion speed at different parts of the catalyst particle**

B028

# Isolation of Toroidal Aggregates of Single-Walled Carbon Nanotubes by Ultrasonic Atomization

Naoki Komatsu 1, Takanori Shimawaki 2, Shuji Aonuma 2, Takahide Kimura 1

sonoprocess for the isolation of toroidal aggregates of single-walled carbon nanotubes (SWNTs) is reported.

found to exclusively consist of toroidal aggregates of SWNTs about 0.5 - 3 mm in diameter.

worth noting that wreath-shaped aggregates of SWNTs were observed, when much shorter SWNTs, oxidatively cut HiPco, were sonicated under the same conditions.

B029

# Vertically aligned conical carbon nanofibers : Synthesis and Field emission

**Prakash R Somani** 1, Savita P. Somani 2, T. Yoshida 2, T. Suzuki 2, A. Yoshida 3, M. Noda 2, M. Umeno 2

**Vertically aligned conical carbon nanofibers were deposited on silicon coated with thin film of cobalt using pulsed discharge plasma chemical vapor deposition.**

**FE-SEM observations indicate that they are vertically well aligned, with an average diameter of about 200 nm at the bottom and with a tip of about 70 nm to 100 nm in diameter and a length of about 2 microns.**

**observed turn-on field and threshold field is about 1.5 V/um and 4.2 V/um, respectively and field enhancement factor of about 2437 (as calculated from the FN plot).**

B030

# Lateral alignment of single walled carbon nanotubes by selective laser ablation

**Mun Seok Jeong** 1, Soo-Bong Choi 1, Ok Hwan Cha 1, Clare C Byeon 1, Do-Kyeong Ko 1, Jongmin Lee 1, Ha Kyu Choi 2, Ki Kang Kim 2, Kay Hyeok An 2, Young Hee Lee 2

present the results on the selective ablation of single walled carbon nanotubes by use of femtosecond laser.

random networks of single walled carbon nanotubes are reconstructed to laterally aligned one dimensional nanostructure oriented perpendicular to the polarization direction with 100nm width.

analyzed with UV-VIS-NIR absorption spectroscopy, polarized Raman spectroscopy, scanning electron microscopy (SEM), and transmission electron microscopy (TEM).

B031

# Synthesis of GaN nanowires using NiI2-filled carbon nanotubes

Tsung-Wu Lin 1, Si-Young Choi 2, Young-Heon Kim 3, David J. H. Cockayne 2, Malcolm L. H. Green 1

report the synthesis of GaN nanowires using single-walled carbon nanotubes (SWNTs) or graphite as the starting materials in the presence of Ni catalyst.

GaN nanowires synthesized from graphite reveal that the growth of GaN nanowires in the presence of Ni catalyst is template-independent

most of GaN nanowires have nickel particles on the tips and this result suggests the formation of GaN nanowires could be through Vapor-Liquid-Solid process

B032

# Novel Hybrid Nanomaterial: Fullerene-Functionalised Carbon Nanotubes

Albert G. Nasibulin 1, Peter V. Pikhitsa 2, Hua Jiang 3, Paula Queipo, Anna Moisala, David P. Brown, David Gonzalez, Anton S. Anisimov 1, Giulio Lolli 4, Arkady V. Krasheninnikov 5, Sergey D. Shandakov 1, Daniel E. Resasco 4, Mansoo Choi 2, David Tománek 6, Esko I. Kauppinen 1

**discovered a novel hybrid nanomaterial combining these structures, i.e. consisting of fullerenes covalently attached to the outside surface of CNTs, called fullerene-functionalised CNTs.**

**Two one-step continuous methods for their selective synthesis have been developed: using pre-made iron catalyst particles by a hot wire generator method and particles grown *in situ* via ferrocene vapour decomposition in the presence of CO and trace amounts of H2O and CO2 etching agents.**

B033

# ORGANIC ACIDS ASSISTED SYNTHESIS OF TITANATE RELATED MATERIALS WITH VARIOUS SHAPES AND MICROSTRUCTURES

Ming-Chiao Tsai 1, Hsin-tien Chiu 2, Chi-young Lee 2, Tsung-ying Ke

report a novel synthesized strategy of titanate related materials with various morphologies assisted by organic acids such as acetic and formic acids.

the wire-like materials will be acquired at 90 ℃ with either acetic acid or formic acid, however, the lath-like and petal-like products will be obtained at higher reaction temperature (150 ℃) with acetic and formic acids, respectively.

XANES shows the two structures both consisted of octahedral coordination around Ti atoms with the characteristic of triple peaks at near edge.

B034

# Carbon Nanotube Fabrication using HW-VHF-PECVD Method

Sukirno Sukirno 1, Satria Zulkarnaen Bisri 2, Lilik Hasanah 3, Mursal Mursal 4, Ida Usman 5, Adi Bagus Suryamas 2, Irmelia Irmelia 2

nanotube fabrication using HW-VHF-PECVD is being done by using only one single gas source, which is methane (CH4).

By using the Hot-wire, it is expected some of the methane will dissociate to produce some free H radicals, which are needed in carbon nanotube growth process.

From the growth process on relatively low temperature, 400oC, some better signatures of carbon nanotube are present.

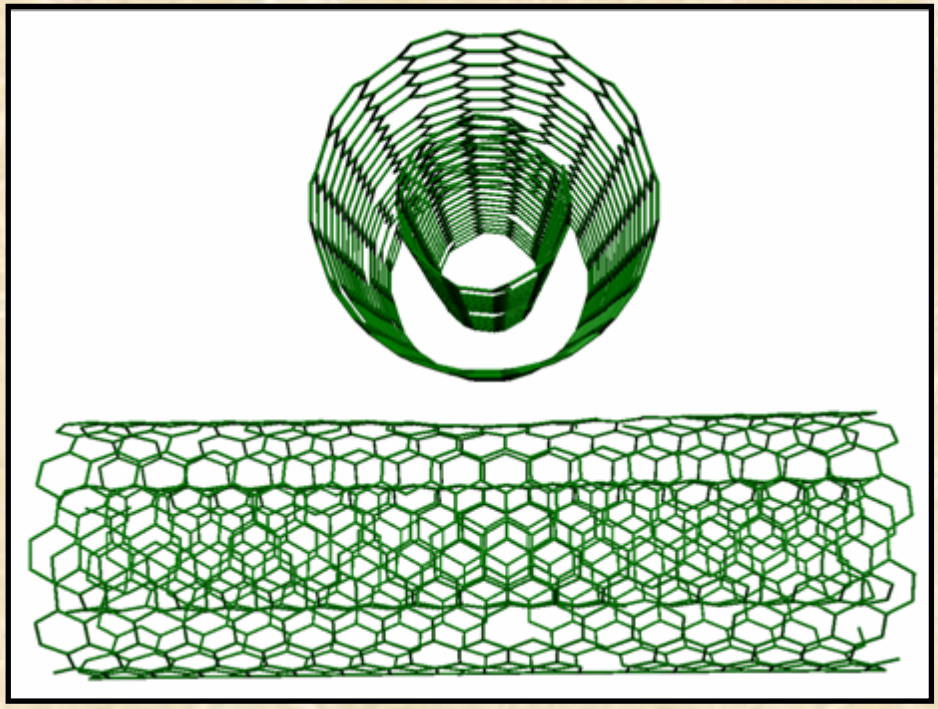
grain or nanotube size has diameters less than 100 nm, which make much convincing result of formed nanotube possibilities.

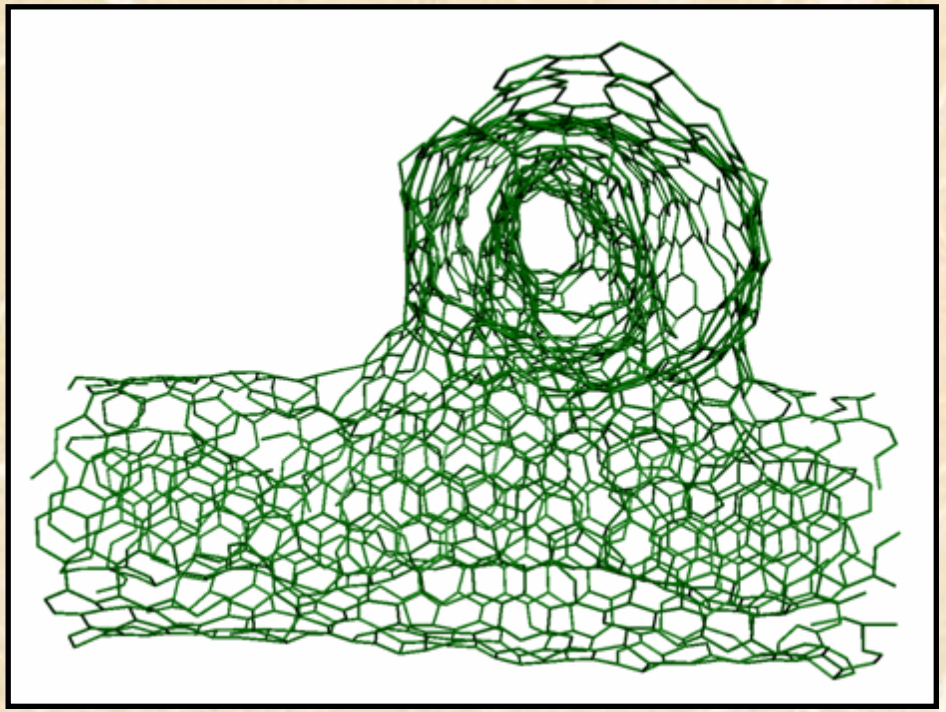
B035

# Simulating the X-junction formation of double-walled carbon nanotubes

Yuta Shiba, Takuya Hayashi, Shinji Imai, Hiroshi Kajitani, Satoru Naokawa, Shusuke Furui, Morinobu Endo

discuss the results on MD simulations on the coalescence of X-junction formation between DWNTs and the effect of defects in the tubes for the coalescence at the junction.





B036

# Discovery and optical properties of the Thermal Conversion of Bundled Carbon Nanotubes into Graphitic Ribbons

Un Jeong Kim 1, Humberto R. Gutierrez 2, Peter C. Eklund 2, Eun Ju Bae 1, Yo-Sep Min 1, Wanjun Park 1

Raman scattering and optical absorption were used to study the thermal evolution of purified bundled single-walled carbon nanotubes (SWNTs)

Structural modifications observed in HiPCO and ARC SWNTs involved tube-tube coalescence (HTT~1300-1400°C), formation of multiwalled carbon nanotubes (HTT~1600-1800°C).

At HTT~1800°C only ARC material was found to then evolve to Graphitic Nanoribbons (GNRs), a new form of filamentary carbon.

B037

# Electric Double Layer Capacitance of Nanoporous Carbon and Carbon Nanotubes

Soshi Shiraishi, Asao Oya

Investigated the correlation of the double layer capacitance on the kind of the electrolyte (tetraalkylammonium salts) for various nanoporous carbons or carbon nanotubes.

The capacitance strongly depends on the physical size of the ion in the case of the activated carbons with narrow micropores.

multi-walled carbon nanotube shows the perfect indepedence of the ion and the current density. It is due to the open structure of the naotubes.

B038

# Synthesis of multi-walled CNTs from flames and CVD reactors

Kozo Saito 1, Kazunori Kuwana 1, Tianxiang Li 1, Wahed Wasel 1, Rodney Andrews 1, Dali Qian 1, Eric A Grulke 1, Jiayi Shan 2, Fuminori Munekane 2

Experimental and numerical studies on synthesis of CNTs using flames and CVD method.

result differs from the commonly accepted belief that CNTs are formed in the flame with temperature around 1,200 to 1,400 oC, while CNTs are formed in CVD with temperature around 700 to 800 oC.

CNT synthesis mechanism was divided into four separate processes consisting of the flow and heat transfer, gas-phase reactions, catalyst particle formation, and CNT growth on the surface of the catalyst particle.

Let's go to the poster session!

With snacks....