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1<sup>st</sup> International symposium

# STNPD-2019

Science and Technology of Nano-Polycrystalline Diamond 2019

28 February - 2 March, Matsuyama, Japan

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## Geodynamics Research Center, Ehime University

Supported by  
Joint Usage/Research Center program, "PRIUS"  
Grant-in-aid for Scientific Research in Innovative Areas,  
"Interaction and Coevolution of the Core and Mantle"



## Science and Technology of Nano-Polycrystalline Diamond 2019

(STNPD-2019)



### Scope:

Since the first report of synthesis of ultra-hard nano-polycrystalline diamond (NPD) in 2003 by the Geodynamics Research Center (GRC) of Ehime University, efforts have been made to apply this novel material to cutting-edge high-pressure researches in geoscience, physics, chemistry, materials science, etc., through a number of inter-laboratory collaborations with the GRC. We will have an international symposium on the synthesis, physical properties, and applications of NPD and relevant materials for further development of science and technology in high-pressure and related research fields, as well as for promotion of research collaborations using NPD. We invite not only the NPD users but also those who are interested in using NPD for their individual studies to this first international symposium on science and technology of NPD to be held at the GRC in Matsuyama, where it was born. This symposium is supported by the Joint Usage/Research Center program ("PRIUS") run by the GRC and the Grant-in-aid for Scientific Research in Innovative Areas ("Interaction and Coevolution of the Core and Mantle").

### Contents:

Information	----- p.2
Program for oral sessions	----- p.3
Program for poster session	----- p.7
List of participants	----- p.9

## STNPD-2019

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### Venue:

Geodynamics Research Center, Ehime University, Matsuyama, Japan  
(30 min. from Matsuyama airport by taxi or 50 min. by bus + tram;  
<http://www.grc.ehime-u.ac.jp/en/about/access>).

### Date:

28 February - 2 March 2019  
(subsequent to the "PRIUS symposium", mostly given in Japanese, 27-28 February).

### Deadlines for contributed papers/posters and registration:

15 December 2018 (extended to 15 February 2019 for contributed poster presentation and registration; registration can also be made on site except for unofficial dinner at March 1).

### Registration fee:

Free of charge.

### Banquet:

5000 yen (on-site payment at the registration desk, cash only).

### Unofficial Dinner:

"Ginjiro" near Okaido. 5000 yen (on-site payment at the registration desk, cash only). →p.5

### Excursion to Uchiko-town:

2000 yen (on-site payment at the registration desk, cash only; including bus fair, lunch, drink).

### Presentation:

30 minutes for keynote and 20 minutes for other speakers. Posters (should be prepared in English) shall be displayed throughout the whole period of the symposium for presentation/discussion with some core times. The poster should be in A0 size (about 90 cm X 120 cm), vertical (→p.7-8).

### Accommodation:

Many hotels are located in walking distance (15-20 minutes) from the GRC in the famous Dogo onsen area and the Ohkaido downtown area. Most of the invited speakers will stay at Daiwa Roynet Hotel (<https://www.daiwaroynet.jp/matsuyama/>) near the entrance of Ohkaido

### Organizing Committee:

Tetsuo Irifune (Chair)	Hiroaki Ohfuji	Yoshio Kono	Fumitaro Ishikawa
Takeshi Sakai	Masayuki Nishi	Toru Shinmei	Akira Yamada
(GRC members)			

### Contact:

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## **Program for oral sessions**

**[28 February]**

13:30-15:00

### **1. Synthesis of NPD and related materials (Chair: H. Ohfuji)**

13:30-14:00 **KEYNOTE: Tetsuo Irifune** (GRC, Ehime Univ.)

"Synthesis, characterization, and application of NPD: An overview"

14:00-14:20 **Masayuki Nishi** (GRC, Ehime Univ.)

"Polycrystalline diamond sintered from ultradispersed nanodiamonds"

14:20-14:40 **Nico A. Gaida** (Fac. Eng., Nagoya Univ.)

"Transparent nanoceramics composed of birefringent crystals"

14:40-15:00 **Norimasa Nishiyama** (MSL, Tokyo Inst. Tech.)

"Fabrication of transparent polycrystalline cubic silicon nitride and its physical properties"

15:00-15:50

**Break & Poster**

15:50-17:40

### **2. Features and physical properties (Chair: N. Nishiyama)**

15:50-16:20 **KEYNOTE: Yanbin Wang** (GSECARS, Univ. Chicago)

"The strength and plastic deformation of NPD"

16:20-16:40 **Tsutomu Mashimo** (Inst. Pulsed Power Sci., Kumamoto Univ.)

"Shock-compression behavior and strength of diamond"

16:40-17:00 **Hiroaki Ohfuji** (GRC, Ehime Univ.)

"Microstructure and crystallization mechanism of synthetic and natural NPDs"

17:00-17:20 **Angelika Rosa** (Mat. Extreme Cond., ESRF)

"NPD: a key device for high quality XAS at extreme P/T conditions"

17:20-17:40 **Fumitaro Ishikawa** (Fac. Eng. & GRC, Ehime Univ.)

"Impurity doping for electronic carrier control of diamond using high pressure and high temperature technique"

17:40-18:20

**Lab tour**

18:30-20:30

**Banquet: University cafeteria**

**[1 March]**

8:30-10:00

**3. Applications to ultrahigh pressure generation (Chair: Y. Wang)**

8:30-9:00 **KEYNOTE: Takehiko Yagi** (GCRC, Univ. Tokyo)

"Ultra-high pressure generation using double stage diamond anvil technique and the properties of nano polycrystalline diamond"

9:00-9:20 **Takeshi Sakai** (GRC, Ehime Univ.)

"Equations of state at multi-megabar pressure"

9:20-9:40 **Katsuya Shimizu** (Kyokugen, Osaka Univ.)

"Mbar-superconductivity and NPD"

9:40-10:00 **Florent Occelli** (CEA)

"A new diamond anvil tip geometry aimed at reaching multi-Mbar pressures"

10:00-10:30

**Break**

10:30-12:00

**4. Applications to X-ray spectroscopy under pressure (Chair: Y. Kono)**

10:30-11:00 **KEYNOTE: Max Wilke** (Inst. Earth & Environ., Univ. Potsdam)

"Using Nanopolycrystalline Diamonds for EXAFS on glass and melt at extreme conditions"

11:00-11:20 **Naoki Ishimatsu** (Fac. Sci., Hiroshima Univ.)

"Element-selective local structure studied by X-ray absorption spectroscopy using NPD anvils"

11:20-11:40 **Saori Kawaguchi** (JASRI, SPring-8)

"Structure determination of liquid Fe-Ni-S alloys at high pressure"

11:40-12:00 **Christele Sanloup** (IMPMC, Sorbonne Université)

"Incorporation of trace elements in magmas at depth"

12:00-13:00

**Lunch**

13:00-14:10

**5. Applications to other high-pressure studies (Chair: N. Ishimatsu)**

13:00-13:30 **KEYNOTE: Yoshio Takano** (NIMS)

"Exploration of pressure induced superconductors using materials informatics"

13:30-13:50 **Longjian Xie** (BGI, Univ. Bayreuth)

"Boron-doped diamond in multi-anvil apparatus and its implication for in-situ falling sphere viscometry"



13:50-14:10 **Hiroshi Fukui** (Fac. Sci., Univ. Hyogo Pref.)

"NPD applied to X-ray Raman Scattering and suggestions to improve the usability"

14:10-15:00

## Break & Poster

15:00-18:00

## A visit to Matsuyama castle or University museum

~30 minute-walking from GRC, visiting the castle tower on the top of the hill. Another option is to visit the Museum of Ehime Univ. on the campus, about 5 minutes from the GRC, where some NPD products are being displayed, including brilliant-cut NPD with a diameter of 1 cm and NPD with perfectly spherical shape of 7 mm diameter. Both excursions will be attended by some volunteer guides.

18:30-

## Unofficial dinner

"Ginjiro", serving local cuisine of Ehime (near the Daiwa Roynet Hotel), about 5000 yen.

Please sign up whether:

Group (1): Visit to Matsuyama castle at 15:00-18:00 before dinner.

Group (2): Stay at GRC or visit to University Museum, and gather at the entrance of GRC building at 17:50.

Groups (1) and (2) will meet at the north entrance of Okaido street at 18:10, and will move to:

Restaurant: Sennenn Japanese Restaurant Ginjiro (千年和食銀次郎)

Address: 3-7-15 NiBancho, Matsuyama, Ehime Prefecture

<MAP>



Contact information of Yoshio KONO, E-mail: [kono.yoshio.rj@ehime-u.ac.jp](mailto:kono.yoshio.rj@ehime-u.ac.jp)

[2 March]

9:00-10:30

**6. New ideas and other applications (Chair: S. Pascarelli)**

9:00-9:30 **KEYNOTE: Yoshio Kono** (GRC, Ehime Univ.)

"Opposed-type double-stage cell for large volume experiments at >100 GPa and its potential use of NPD"

9:30-9:50 **Guillaume Morard** (CNRS)

"Pure iron phase diagram probed by multiple techniques"

9:50-10:10 **Norimasa Ozaki** (Fac. Eng., Osaka Univ.)

"Study on shock-compressed nanopolycrystalline material"

10:10-10:30 **Madhusoodhan Satish-Kumar** (Fac. Sci., Niigata Univ.)

"NPD as a carbon isotope standard for in situ analysis"

10:30-11:40

**7. Discussion and future perspectives (Chair: T. Irifune)**

10:30-11:00 **KEYNOTE: Sakura Pascarelli** (Mat. Extreme Cond., ESRF)

"Use of Nanopolycrystalline Diamond Anvils overseas: scientific impact, present status and future needs"

11:00-11:40 **Discussion**

12:00-18:00

**Excursion to Uchiko town**

Historical town in Edo era (some 200 years ago), about one hour from Matsuyama by a chartered bus (lunch box + drink will be served). The tour will be attended by some volunteer guides.

18:00-

**You are free**

## **Program for poster session**

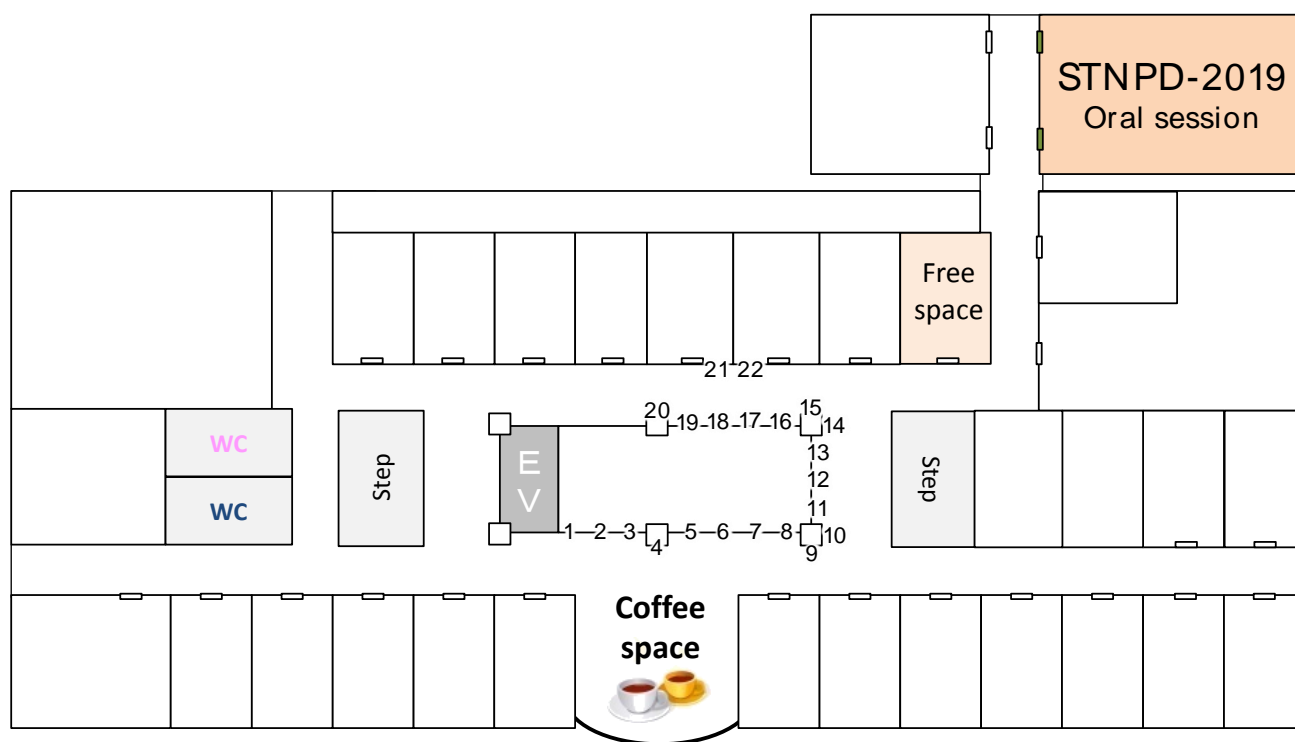
- ✧ **General Research Building I, 4F**
- ✧ **Core time:** 28 February, 15:00-15:50 / 1 March, 14:10-15:00
- ✧ **Display:** from 2/28 (Thu) 12:30 pm. Please use “tools” on the table at front of Coffee space.
- ✧ **Remove:** by 3/2 (Sat) 12:30 pm
- ✧ **Poster size:** A0 size (about 90 x 120 cm), vertical (portrait style).

Poster no.	Name	Title
NPD-P01	Denis Mikhailenko	TEM characterization of carbon polymorphs in Ultra High pressure rocks from Kokchetav massif (Northern Kazakhstan)
NPD-P02	Trishit Ruj	Early Martian crustal dynamics; Investigation from oldest highland terrain
NPD-P03	Keyur De	Palaeostress regime responsible for crustal extension in Pyrrhae Regio, Mars
NPD-P04	Eleonora Kulik	(1)Mechanical properties of polycrystalline perovskite- and ilmenite-type $\text{MgSiO}_3$
NPD-P05	Eleonora Kulik	(2)Synthetic Mn-doped jadeite-creation of nanostructures by extreme
NPD-P06	Gréaux Steeve	Sound velocity of $\text{CaSiO}_3$ suggests the presence of basaltic crust in the Earth's lower mantle
NPD-P07	Nozomi Kondo	Major element composition of the Hadean crust: constrains from Sm-Nd isotope systematics and high-pressure melting experiments
NPD-P08	Xinguo Hong	Structural changes of $\text{GeO}_2$ glass under high pressure using NPD and single-crystalline diamond anvils
NPD-P09	Huiyang Gou	Revealing the structural and mechanical properties of Mo borides
NPD-P10	Fumitoshi Iga	Material Design of Novel Rare-Earth Dodecaborides by High-Prssure Synthesis
NPD-P11	Alena Krupp (Astrid Holzheid)	Synthetic nanocomposite ceramics - tailored alternative materials of high-pressure minerals
NPD-P12	Toshiki Hamatani	Development of Ultra-high Pressure's Technique Using Improved Toroidal Shaped Diamond Anvil
NPD-P13	Yuki Nakamoto	High pressure generation using nano-polycrystalline diamond anvils



## STNPD-2019

NPD-P14	Ryosuke Takeda	Generation of ultra-high pressures towards metallic hydrogen using a double-stage diamond anvil cell
NPD-P15	Takehiro Kunimoto	High pressure generation to 90 GPa in Kawai-type multianvil apparatus using nano-polycrystalline diamond anvils.
NPD-P16	Yu Nishihara	Effect of pressure on electromotive force of type-R thermocouple
NPD-P17	Yoshinori Tange	Time-resolved XFEL observation of shock-wave propagating material
NPD-P18	Rei Fukuda	Epitaxial formation of pyramidal structure on CVD diamond by high pressure and high temperature treatment
NPD-P19	Toru Shinmei	NPD and other novel material synthesis at GRC using large-volume multianvil apparatus
NPD-P20	Nadezda Chertkova	A compact diamond anvil cell for in situ spectroscopic measurements at high pressures and high temperatures
NPD-P21	Hirokazu Kadobayashi	Time-resolved x-ray diffraction and Raman studies of the phase transition mechanisms of methane hydrate
NPD-P22	Hideaki Kawamura	Decomposition of magnesite in the presence of reduced C-H-O fluid under upper mantle conditions



## **List of participants**

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## STNPD-2019

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## STNPD-2019

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## STNPD-2019

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