

Welcome to the 36th Symposium on Phase Change Oriented Science (PCOS2024)

On behalf of the PCOS Committee, we welcome you to the 2024 Symposium on Phase Change Oriented Science (PCOS). After three years of COVID-19's effects, PCOS returned to in-person meetings in 2023; PCOS2024 will be held at Akiu Ryokusuitei, Sendai, Japan.

It is well known that the rearrangement of internal chemical bonding (Phase Change) will give rise to a myriad of changes in the optical, electrical, thermal, and magnetic properties of substances. Interestingly, such variations are typically produced rapidly (even in response to femtosecond laser pulses) and reversibly (10^{5-10} cycles or more) leading to the bistable behavior of so-called phase-change materials. With these particularities, phase-change materials such as Ge-Sb-Te and Ag-In-Sb-Te have been applied to optical disks such as DVDs and Blu-ray disks and electrical memories, the so-called Phase-Change Random Access Memory (PCRAM); moreover, their atomic and electronic structures have been of great interest to researchers in numerous academic fields.

This year, there will be 20 oral talks, 11 invited and 9 contributed, as well as 18 poster presentations on a variety of topics relating to phase-change materials and their properties, applications of phase-change technology to other fields, as well as thermoelectric applications.

We hope you will enjoy these talks and have fruitful discussions over the next two days.

Toshiharu Saiki (Chair of Program Committee)

Yuji Sutou (*Tohoku University*)

Yuta Saito (*Tohoku University*)

Symposium Committee

The Society of Phase Change Oriented Science

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Hiroshi Tanimura, Tohoku University

Takashi Yagi, National Institute of Advanced Industrial Science and Technology

Keiichiro Yusu, Japan Science and Technology Agency

PCOS2024 Co-Chairs

Yuji Sutou, Tohoku University

Yuta Saito, Tohoku University

PCOS2024 TECHNICAL PROGRAM

November 28th (Thursday), 2024

13:00 – 13:05 **Opening Remark:** Symposium Co-Chair, Yuta Saito (*Tohoku University*)

Session 1

Session Chairs: Yuta Saito (*Tohoku University*)
Toshiharu Saiki (*Keio University*)

13:05 – 13:30 (Invited)

1. Hydrogen induced Quantum Phase Change in Metal Oxide Thin Films

Hidekazu Tanaka^{1,2} and Haobo Li¹

¹ SANKEN (*Institute of Scientific and Industrial Research*), *Osaka University*

² Spintronics Research Network Division, *OTRI, Osaka University*

13:30 – 13:55 (Invited)

2. Nanoscale Control of Phase Change Materials Using a Terahertz Scanning Tunneling Microscope

Ikufumi Katayama

Yokohama National University

13:55 – 14:20 (Invited)

3. Metamaterial Thermoelectric Conversion and Nonradiative Cooling

Wakana Kubo

Tokyo University of Agriculture and Technology

14:20 – 14:40

4. Graphite thermal Tesla valve

Masahiro Nomura and Xin Huang

Institute of Industrial Science, The University of Tokyo

14:40 – 15:00

5. First Principles Investigations of the Layered Metastable Alloy GeTe₂

P. Fons¹, Keisuke Hamano^{1,2}, Mihyeon Kim³, Shogo Hatayama², and Yuta Saito^{3,4}

¹ *Department of Electronics and Electronic Engineering, Keio University*

² *Semiconductor Frontier Research Center, National Institute of Advanced Industrial Science and Technology*

³ *Department of Materials Science, Graduate School of Engineering, Tohoku University*

⁴ *Research Center for Green X-Tech, Tohoku University*

Session 2 Poster Session

15:00 – 16:20

P1. Investigation of the Phase-change Behaviors of Cr-Te Thin Films

Takuya Tsuruta¹, Yi Shuang^{1,2}, Daisuke Ando¹, and Yuji Sutou^{1,2}

¹ *Department of Materials Science, Graduate School of Engineering, Tohoku University*

² *Advanced Institute for Materials Research (AIMR), Tohoku University*

P2. Voltage-triggered infrared light switching of VO₂ thin films grown on transparent conductive Al-doped ZnO

Peng Yu¹, Rai Hiranabe¹, Junpei Kidokoro¹, Kunio Okimura¹, Md. Suruz Mian², and Yosuke Nakata³

¹ *Graduate School of Engineering, Tokai University*

² *Faculty of Science and Technology, Seikei University*

³ Graduate School of Engineering Science, Osaka University

P3. Fabrication of Mn-Si-Te ternary films by sputtering using amorphous-crystallization process

Fumiya Sano¹, Shogo Hatayama², Mihyeon Kim¹, and Yuta Saito^{1,2,3}

¹ Department of Material Science, Graduate School of Engineering, Tohoku University

² Semiconductor Frontier Research Center, National Institute of Advanced Industrial Science and Technology

³ Research Center for Green X-Tech, Tohoku University

P4. X-ray diffraction study on modulation of insulator-metal transition of VO₂ films grown on Al₂O₃(001) with crystallization of capping GST layer

Yiqi Liu¹, Kunio Okimura¹, Keisuke Kudo¹, Ryota Kasai¹, Joe Sakai², and Masashi Kuwahara³

¹ Graduate School of Engineering, Tokai University

² Toshima Manufacturing Co., Ltd.

³ National Institute of Advanced Industrial Science and Technology

P5. Feasibility Study of V-Te Thin Film as a Phase-Change Material

Shuhei Orihara¹, Yi Shuang^{1,2}, Daisuke Ando¹, and Yuji Sutou^{1,2}

¹ Department of Materials Science, Graduate School of Engineering, Tohoku University

² Advanced Institute for Materials Research (AIMR), Tohoku University

P6. Meta-stabilization of photo-induced rutile phase of Nb_{1-x}Ti_xO₂

Takumi Nakajima¹, Hiroshi Tanimura¹, Akihiro Ishii², Hitoshi Takamura², and Tetsu Ichitsubo¹

¹ Institute of Materials Research, Tohoku University

² Department of Materials Science, Graduate School of Engineering, Tohoku University

P7. Fabrication of metastable SiTe₂ thin film as a transistor channel material

Kohki Tonoike¹, Shogo Hatayama², Mihyeon Kim¹, and Yuta Saito^{1,2,3}

¹ Department of Material Science, Graduate School of Engineering, Tohoku University

² Semiconductor Frontier Research Center, National Institute of Advanced Industrial Science and Technology

³ Research Center for Green X-Tech, Tohoku University

P8. Investigation of V-doped CrN Thin Film as Phase-Change Material and Approach to Energy Saving

Wei-Chiao Chang¹, Yi Shuang^{1,2}, Daisuke Ando¹, and Yuji Sutou^{1,2}

¹ Department of Materials Science, Graduate School of Engineering, Tohoku University

² Advanced Institute for Materials Research (AIMR), Tohoku University

P9. Development of metastable van der Waals semiconductor material GeTe

Yu Kato¹, Shogo Hatayama², Mihyeon Kim¹, and Yuta Saito^{1,2,3}

¹ Department of Material Science, Graduate School of Engineering, Tohoku University

² Semiconductor Frontier Research Center, National Institute of Advanced Industrial Science and Technology

³ Research Center for Green X-Tech, Tohoku University

Session 3

Session Chairs: Toshimichi Shintani (National Institute of Advanced Industrial Science and Technology)
Muneaki Hase (University of Tsukuba)

16:20 – 16:45 (Invited)

6. Structural phase transition during the growth of Bi ultra-thin films on Si(111) substrates

Kan Nakatsuji

Department of Materials Science and Engineering, Institute of Science Tokyo

16:45 – 17:10 (Invited)

7. Pressure-induced reversal of Peierls-like distortions elicits the polyamorphic transition in GeTe

and GeSe

Eiji Nishibori¹, Tomoki Fujita², and Shuai Wei²

¹ Department of Physics and Tsukuba Research Center for Energy Materials Science, University of Tsukuba

² Department of Chemistry, Aarhus University

17:10 – 17:35 (Invited)

8. Mechanoluminescence and mechanical recording properties in ferroelectric materials

Tomoki Uchiyama¹, Xu-Guang Zheng^{1,2}, and Chao-Nan Xu¹

¹ Department of Material Science, Faculty of Engineering, Tohoku University

² Department of Physics, Faculty of Science and Engineering, Saga University

17:35 – 17:55

9. Valence Transition Material: A New Class of Material for Nonvolatile Recording Applications

Shogo Hatayama¹, Shunsuke Mori², Yuta Saito^{1,2}, Paul Fons³, Yi Shuang^{2,4}, and Yuji Sutou^{2,4}

¹ Semiconductor Frontier Research Center, National Institute of Advanced Industrial Science and Technology (AIST)

² Department of Materials Science, Graduate School of Engineering, Tohoku University

³ Department of Electronics and Electrical Engineering, Faculty of Science and Technology, Keio University

⁴ WPI Advanced Institute Materials Research, Tohoku University

17:55 – 18:15

10. Changes in magnetic property of Cr-incorporated MnTe film

Mihyeon Kim¹, Ryoga Nakajima², Takashi Harumoto², Yi Shuang¹, Daisuke Ando¹, Nobuki Tezuka¹, Yuta Saito^{1,3}, and Yuji Sutou^{1,4}

¹ Department of Materials Science, Graduate School of Engineering, Tohoku University

² Department of Materials Science and Engineering, School of Materials and Chemical Technology, Tokyo Institute of Technology

³ Research Center for Green X-Tech, Tohoku University

⁴ WPI Advanced Institute for Materials Research, Tohoku University

November 29th (Friday), 2024

Session 4

Session Chairs: Takashi Yagi (National Institute of Advanced Industrial Science and Technology)
Hiroshi Tanimura (Tohoku University)

9:00 – 9:25 (Invited)

11. Thermal switching of electrical resistivity by crystalline phase changes in layered Ni oxides

Hideyuki Kawasoko

Department of Chemistry, Graduate School of Science, Tokyo Metropolitan University

9:25 – 9:50 (Invited)

12. Doped Sb₃Te for High-Performance Phase-Change Device

You Yin, Shota Yoshimoto, Syuhei Fukuda, Shunsuke Yahagi, and Mutsumi Miuchi
Gunma University

9:50 – 10:10

13. GeTe-S on Sb₂Te₃: Growth and crystallisation

Nur Qalishah Adanan¹, Simon Wredth¹, Lim Poh Chong², Dong Zhaogang², Joel K.W. Yang¹, and Robert E. Simpson³

¹ Engineering Product Development, Singapore University of Technology and Design (SUTD)

² Institute of Materials Research and Engineering (IMRE), A*STAR

³ School of Engineering, University of Birmingham

10:10 – 10:30

14. Optical Detection Performance in the THz range by Self-Organized Metallic Nanogap Structures

During the Phase Transition of VO₂

Ai I. Osaka^{1,2}, Masaya Nagai³, Shingo Genchi², Boyuan Yu², Hidekazu Tanaka², and Azusa N. Hattori²

¹ *Graduated School of Engineering, University of Hyogo*

² *SANKEN, Osaka University*

³ *Graduate School of Engineering Science, Osaka University*

10:30 – 10:50 **Break**

Session 5

Session Chairs: Masashi Kuwahara (*National Institute of Advanced Industrial Science and Technology*)
Takashi Harumoto (*Institute of Science Tokyo*)

10:50 – 11:15 (Invited)

15. Unraveling electric current and heat flow through nanomaterials by time-domain thermoreflectance using an Au electrode

Kan Ueji

National Metrology Institute of Japan, National Institute of Advanced Industrial Science and Technology (AIST)

11:15 – 11:40 (Invited)

16. Innovative Phase Change Materials for PCRAM Application Targeting Low Thermal Power Consumption

Yi Shuang^{1,2} and Yuji Sutou^{1,2}

¹ *Department of Material Science, Graduate School of Engineering, Tohoku University*

² *WPI Advanced Institute for Materials Research, Tohoku University*

11:40 – 12:00

17. Monitoring non-reversible photo-induced phase transitions and small polarons with Infrared streaming spectroscopy

Gael Privault^{1,3}, M. Hervé^{2,3}, N. Godin^{2,3}, R. Bertoni^{2,3}, S. Akagi⁴, M. Hada¹, J. Kubicki⁵, H. Tokoro^{3,4}, S. Ohkoshi^{3,6}, M. Lorenz^{2,3}, and Eric Collet^{2,3,7}

¹ *Institute of Pure and Applied Science and Tsukuba Research Center for Energy Materials Science (TREMS), University of Tsukuba*

² *Univ Rennes, CNRS, IPR (Institut de Physique de Rennes)*

³ *CNRS, Univ Rennes, DYNACOM (Dynamical Control of Materials Laboratory), University of Tokyo*

⁴ *Department of Materials Science, Faculty of Pure and Applied Sciences, University of Tsukuba*

⁵ *Faculty of Physics, Adam Mickiewicz University in Poznań, Uniwersytetu Poznańskiego*

⁶ *Department of Chemistry, School of Science, University of Tokyo*

⁷ *Institut Universitaire de France (IUF)*

Taking group photos in the Conference Room

12:05 – 13:00 **Lunch Break**

Session 6 Poster Session

13:00 – 14:20

P10. Direct Measurement of Electron Pulse Duration Using Terahertz Streaking Method

Ryota Nishimori¹, Haruki Taira¹, Godai Noyama¹, Gaël Privault¹, Yusuke Arashida¹, Kou Takubo², Shin-ya Koshihara², Shoji Yoshida¹, and Masaki Hada¹

¹ *University of Tsukuba*

² *Institute of Science Tokyo*

P11. Size-selective particle collection by AC electric field-induced flow on phase-change substrate

Kinnosuke Yasutani¹, Shogo Hatayama², Kotaro Makino², and Toshiharu Saiki¹

¹ Keio University

² National Institute of Advanced Industrial Science and Technology

P12. Surface Structural Change of Crystalline GST During Amorphization

Shota Awaduhara^{1,2}, Isamu Arai^{1,2}, Masashi Kuwahara², Aiko Narazaki², Joe Sakai³, and Satoshi Katano¹

¹ Toyo University

² National Institute of Advanced Industrial Science and Technology

³ Toshima Manufacturing Co., Ltd.

P13. Understanding the Electronic Dimensionality of Carbon Nanostructures through Ultrafast Dynamics of Photoexcited Carrier Relaxation

Godai Noyama¹, Thomas Gauthier², Yusuke Arashida¹, Yui Iwasaki¹, Riyo Nagao¹, Yuri Saida¹, Nicolas Godin², Gaël Privault¹, Hiroo Suzuki³, Yasuhiko Hayashi³, Shota Ono⁴, Roman Bertoni², and Masaki Hada¹

¹ University of Tsukuba

² University of Rennes, CNRS, IPR (Institut de Physique de Rennes)

³ Okayama University

⁴ Muroran Institute of Technology

P14. Fabrication of MnTe Crystal on Si surface at Different Substrate Temperatures

Isamu Arai^{1,2}, Shota Awazuhara^{1,2}, Masashi Kuwahara², Aiko Narazaki², Kunio Okimura³, and Satoshi Katano¹

¹ Graduate School of Science and Engineering, Toyo University

² National Institute of Advanced Industrial Science and Technology

³ Faculty of Engineering, Tokai University

P15. Phase-change optical switch using a new material - MnTe

Tomoya Yazaki¹, Masashi Kuwahara², Hitoshi Kawashima², and Hiroyuki Tsuda¹

¹ Graduate School of Science and Technology, Keio University

² National Institute of Advanced Industrial Science and Technology

P16. Collection and separation of microparticles in liquid by induced-charge electroosmosis using phase-change floating electrode

Shota Eto¹, Neo Ohkubo¹, Shogo Hatayama², Kotaro Makino², Yuta Saito³, and Toshiharu Saiki¹

¹ Graduate School of Science and Technology, Keio University

² Device Technology Research Institute, National Institute of Advanced Industrial Science and Technology

³ Graduate School of Engineering, Tohoku University

P17. Effect of annealing on magnetic properties of CrMnTe thin films

R. Nakajima¹, M. Kim², T. Harumoto¹, Y. Shuang², Y. Saito², Y. Sutou², and J. Shi¹

¹ Department of Materials Science and Engineering, School of Materials and Chemical Technology, Institute of Science Tokyo

² Department of Materials Science, Graduate School of Engineering, Tohoku University

P18. Using Machine-learned potential to investigate GeTe₆ local structure

Keisuke Hamano^{1,2}, Milos Krbal³, Kotaro Makino², Shogo Hatayama², Yuta Saito⁴, and Paul Fons¹

¹ Department of Electronics and Electronic Engineering, Keio University

² Semiconductor Frontier Research Center, National Institute of Advanced Industrial Science and Technology

³ Center of Materials and Nanotechnologies (CEMNAT), Faculty of Chemical Technology, University of Pardubice

⁴ Research Center for Green X-Tech & Department of Materials Science, Graduate School of Engineering, Tohoku University

Session 7

Session Chairs: Yuji Sutou (*Tohoku University*)
Yuta Saito (*Tohoku University*)

14:20 – 14:45 (Invited)

18. Ultrafast optical spectroscopy for photoinduced crystalline phase transition

Hiroshi Tanimura and Tetsu Ichitsubo
Institute of Materials Research, Tohoku University

14:45 – 15:05

19. Thermal conductivity switching of switchable mirror films

Takashi Yagi^{1,2} and Y. Shigesato²
¹ *National Institute of Advanced Industrial Science and Technology (AIST)*
² *Graduate School of Science & Engineering, Aoyama Gakuin University*

15:05 – 15:25

20. Diamond nonlinear photonics – Toward spatiotemporal extreme sensing using diamonds

Daisuke Sato¹, Junjie Guo¹, Takuto Ichikawa¹, Dwi Prananto², Toshi An², Paul Fons³, Shoji Yoshida¹,
Hidemi Shigekawa¹, and *Muneaki Hase¹
¹ *Department of Applied Physics, University of Tsukuba*
² *School of Materials Science, Japan Advanced Institute of Science and Technology*
³ *Department of Electronics and Electrical Engineering, Keio University*

15:25 – 15:30 **Award Ceremony & Closing Remark:** Symposium Co-Chair, Yuta Saito (*Tohoku University*)