

# Chao Tang

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## CV

### SUMMARY OF QUALIFICATIONS

- **Distinctive research ability and analytical skills:** Research and development experience more than five years in world-top university, research institute and industrial.
- **Multilingual abilities and cross-cultural communication skills:** Fluent conversation in English, Japanese, Chinese. Abilities of writing & translation among these languages.
- **International research collaboration:** Organization of three international conferences and workshops, invitation and arrangement of the travel for over several hundred participants. Collaboration with researchers from different countries and research fields.
- **Strong team and project leadership, teaching ability:** Experience in Leading a community of over 50 individuals, teaching lessons of physics and languages, tutor of foreign graduated students.
- **Specialization:**
  1. **Crystal growth technique:** Be proficient in crystal growth techniques like the Bridgman method and zone-melting method. Creation of the vapor pressure controlled liquid phase crystal growth technology. Nonlinear optical crystals like LBO, GaSe, GaP, and Van der Waals crystals like InSe, MoS<sub>2</sub>, Bi<sub>2</sub>Se<sub>3</sub> .... have been prepared by these techniques.
  2. **THz light source and detection technique:** Terahertz (THz) generation via nonlinear optical processes such as difference frequency generation (DFG) implemented with crystals like GaP and GaSe. Construction of THz imaging system for nondestructive detection. Construction of pump-probe optics system using Ti-sapphire fs laser for THz applications.....
  3. **Construction of optics system:** Construction of a photoluminescence (PL) and a Raman spectroscopy optics system. Construction of second harmonic generation (SHG) optics system to investigate the second-order susceptibility in optical crystals.....
  4. **2D materials experiments:** The cleavage, transfer, and stacking of Van der Waals crystals. Construction of the dry-peeling and welding-transfer equipment for the stacking of 2D heterostructures. Be proficient in material characterization methods like SEM, AFM, XRD, XRP, STEM, ICP-MS, EELS.....
  5. **Thin film preparation and device fabrication technique:** Experience of thin film crystal growth using CVD, MBE, PVD, ALD more than four years; Be able to use the *in situ* characterizations such as Quartz Crystal Resonators (QCR), low energy electron diffraction (LEED) and RHEED,

# RELEVANT EXPERIENCE

## **Research Institute of Electrical Communication, Tohoku University**

**April 2021 – Present**

- Selected as a Foreign JSPS Research fellow working at RIEC for the development of THz light sources detectors.
- Selected as a center of excellence (COE) research fellow in Research Institute of Electrical Communication (RIEC), Tohoku University. Research related to 2D materials and semiconductor processes.
- Participation in a project funded (Over 1 Million USD) by the Japan Science and Technology Agency (JST) related to the development of THz light source implemented with graphene and other material.
- Organizing the international conference RJUSE 2021 as a member of the local organizing committee.

## **Research Fellow, Japan Society for the Promotion of Science**

**April 2018 - April 2021**

- Selected as a special research fellow DC1 of Japan Society for the Promotion of Science (JSPS). Research related to the crystal growth of Van der Waals crystal and THz generation via nonlinear optical process.
- Leading a project financially supported by the Ministry of Education, Culture, Sports, Science and Technology (MEXT) of Japan, related to the development of THz detection system.
- Organizing the international conference 2019 Joint Symposium on Material Science and Engineering.

## **Graduate School of Engineering, Tohoku University**

**October 2016 – March 2021**

- Selected as a research assistant for the creation of the growth method of nonlinear optical crystals.
- Developing the THz imaging system for the detection of corrosion in infrastructure. Collaboration with TOYOTA Motor Corp., JX Nippon Mining & Metals Corp., Dowa Electronic Materials Co., Ltd....
- Development of rare-earth fluorescent material with Koito Manufacturing Co., Ltd.
- Teaching assistant of quantum mechanics and physics experiments. Tutor of foreigner MS course students.

## **College of Engineering and Applied Science, Nanjing University**

**September 2012 – June 2016**

- Organizing the international workshop STEM2016.
- Guide for foreign exchange students from the University of Tokyo, Nagoya University, Hokkaido University..., in Office of International Cooperation and Exchanges of Nanjing University.
- President of Microsoft club in Nanjing University. Organizing several computer science workshops and programming competitions. Awarded as 'Best student club president' by Microsoft Research Lab Asia.

# EDUCATION

## **Ph. D Material Science, Tohoku University (2018-2020)**

- Research about the nonlinear optical phenomenon (SHG, DFG), the THz technologies (THz-TDS, pump-probe).
- Experiments related to thin semiconductor processes and thin film preparations.

## **MS degree, Material Science, Tohoku University (2016-2018)**

- Learned the crystal growth technique like melting-zone method, Bridgman method, TDM-CVP....
- Learned the material characterization methods like SEM, AFM, XRD, XRP, RHEED....

## **BS degree, Material physics, Nanjing University (2012-2016)**

- Learned the basics of condensed matter physics, quantum mechanics, statistical mechanics, thermal dynamic...
- Learned advanced mathematics. Trained for writing and listening language skills of Japanese and English.

# RESEARCH ACHIEVEMENT & AWARD

## Research achievements

- First observation of the diffraction of THz wave in a micrometer-periodically arranged composite fibers.
- First direct measurement of Van der Waals force in the layer-stacking crystals and proposing the related model to analyze the mechanical strength in the Van der Waals crystals.
- Creation of crystal growth method for the preparation of transition metal chalcogenide bulk using chalcogen element vapor, being able to control the stoichiometry of sample within 0.2 at%.
- Growth of mixed-crystal GaSe/InSe applied as nonlinear optical crystals for THz wave generation. As a result, increase the generation efficiency by 26 times.

## Awards

- Winner of the President Award of the School of Engineering at Tohoku University.
- Awarded the best presentation in the International Conference on Nano Science Technology (ICNST)
- Awarded the best presentation in the meeting of the Japan Institute of Metals and Materials (JIM).
- Awarded the best paper in the proceedings of Institute of Electronics, Information and Communication Engineers (IEICE).

# REPRESENTATIVE PUBLICATIONS

## Peer-reviewed Papers

- [1] C. Tang, Y. Sato, K. Watanabe, T. Tanabe, Y. Oyama, Selective crystal growth of indium selenide compounds from saturated solutions grown in a selenium vapor, *Results in Materials*, 13 100253 (2022). doi:10.1016/j.rinma.2022.100253
- [2] Y. Sato, C. Tang, K. Watanabe, M. Nakajima, T. Yamamoto, N. Tezuka, T. Tanabe, Y. Oyama, Optical and Electrical Properties of  $\text{In}_x\text{Ga}_{1-x}\text{Se}$  Mixed Crystal Grown from Indium Flux by Traveling Heater Method, *J. Electron. Mater.* 50 (2021) 2649–2655. doi:10.1007/s11664-020-08689-4.
- [3] Shutaro Karube, Daichi Sugawara, C. Tang, Tadao Tanabe, Yutaka Oyama, Junsaku Nitta, Enhancement of spin-charge current interconversion by oxidation of rhenium, *Journal of Magnetism and Magnetic Materials* 516, 167298 (2020). doi:10.1016/j.jmmm.2020.167298
- [4] Y. Sato, C. Tang, K. Watanabe, J. Ohsaki, T. Yamamoto, N. Tezuka, T. Tanabe, Y. Oyama, Terahertz wave generation via difference frequency generation using 2D  $\text{In}_x\text{Ga}_{1-x}\text{Se}$  crystal grown from indium flux, *Optics Express*, 28 (2020) 472. doi:10.1364/OE.28.000472.
- [5] Y. Sato, M. Nakajima, C. Tang, K. Watanabe, T. Tanabe, Y. Oyama, Phase matching condition for THz wave generation via difference frequency generation using  $\text{In}_x\text{Ga}_{1-x}\text{Se}$  mixed crystals, *Optics Express*, 28 (2020) 20888–20897. doi:10.1364/oe.393948.
- [6] C. Tang, T. Tanabe, S. Yodate, Y. Oyama, Quantitative evaluation of fiber structure by using coherent terahertz wave, *Composites Part B: Engineering*, 159 (2019) 1–3. doi:10.1016/j.compositesb.2018.08.135.
- [7] T. Tanabe, C. Tang, Y. Sato, Y. Oyama, Direct determination of the interlayer van der Waals bonding force in 2D indium selenide semiconductor crystal, *Journal of Applied Physics*, 123 (2018) 245107. doi:10.1063/1.5024313.
- [8] C. Tang, Y. Sato, T. Tanabe, Y. Oyama, Low temperature liquid phase growth of crystalline InSe grown by the temperature difference method under controlled vapor pressure, *Journal of Crystal Growth*, 495 (2018) 54–58. doi:10.1016/j.jcrysgro.2018.05.016.

Check the full list of publications in my homepage (<http://ctang.cc/lop/index.html>)